Permit Fact Sheet

General Information

Permit Number	WI-0031054-10-0
Permittee Name and Address	PLYMOUTH TOWN SANITARY DISTRICT #1 8219 W High St, Orfordville, WI 53576
Permitted Facility Name and Address	Plymouth Town Sanitary District #1 WWTF 8219 W High St Orfordville, WI 53576
Permit Term	April 01, 2026 to March 31, 2031
Discharge Location	NEQ, SEQ, SEC 14, T2N, R11E, Plymouth Twp.
Receiving Water	Bass Creek in Bass Creek of Rock River (lower) in Rock County
Stream Flow ($Q_{7,10}$)	6.6 cfs
Stream Classification	Warmwater Sport Fish, non-public water supply
Discharge Type	Existing, Continuous
Annual Average Design Flow (MGD)	0.03 MGD
Industrial or Commercial Contributors	None
Plant Classification	A4 - Ponds, Lagoons and Natural Systems; SS - Sanitary Sewage Collection System
Approved Pretreatment Program?	N/A

Facility Description

The Plymouth Town Sanitary District #1 operates a wastewater treatment plant (WWTP) that consists of a two-cell stabilization pond system built in the 1970's. The collection system drains (after flow measurement) to a single wet well where sewage is pumped to the treatment system. The first cell is a three-acre clay lined cell where the waste stabilization occurs. The second cell is one acre, clay lined and acts as a control structure for discharge of effluent. Effluent is discharged to Bass Creek. The facility is designed to treat 0.03 MGD and currently discharges on a yearly average 0.014 MGD

Substantial Compliance Determination

After a desk top review of all discharge monitoring reports, CMARs, land application reports, compliance schedule items, and a site visit on 6/3/2025, this facility has been found to be in substantial compliance with their current permit.

Compliance determination made by Ashley Brechlin, Wastewater Engineer on 6/24/2025.

Sample Point Descriptions

Sample Point Designation		
Sample Point Number		**Sample Point Location, Waste Type/Sample Contents and Treatment Description (as applicable)**
701	N/A	Influent: Grab sample collected at the manhole directly in front of the primary pond. Flow meter located in the influent dry well in the main lift station.
001	0.021 MGD (September 2020 – August 2025)	Effluent: Grab samples collected at the effluent manhole of the second lagoon, prior to discharge to Bass Creek. Flow is taken with the bucket method at the outfall.
002	N/A	Representative composite grab lagoon sludge samples shall be taken from each lagoon and then combined for one sample. If a lagoon is scheduled for desludging, additional sampling may be required.

Permit Requirements

1 Influent – Monitoring Requirements

1.1 Sample Point Number: 701- INFLUENT

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		gpd	Daily	Continuous	
BOD5, Total		mg/L	2/Month	Grab	
Suspended Solids, Total		mg/L	2/Month	Grab	

Changes from Previous Permit:

Influent limitations and monitoring requirements were evaluated for this permit term and no changes were required in this permit section.

Explanation of Limits and Monitoring Requirements

Monitoring of influent flow, BOD5 and total suspended solids is required by s. NR 210.04(2), Wis. Adm. Code, to assess wastewater strengths and volumes and to demonstrate the percent removal requirements in s. NR 210.05, Wis. Adm. Code, and in the Standard Requirements section of the permit.

2 Surface Water - Monitoring and Limitations

2.1 Sample Point Number: 001- EFFLUENT

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		gpd	Daily	Continuous	
BOD5, Total	Weekly Avg	45 mg/L	2/Month	Grab	
BOD5, Total	Monthly Avg	30 mg/L	2/Month	Grab	
Suspended Solids, Total	Monthly Avg	60 mg/L	2/Month	Grab	
Suspended Solids, Total	Weekly Avg	23.3 lbs/day	2/Month	Calculated	
Suspended Solids, Total	Weekly Avg	28.1 lbs/day	2/Month	Calculated	February
Suspended Solids, Total	Weekly Avg	24.1 lbs/day	2/Month	Calculated	April, June, September, and November
Suspended Solids, Total	Monthly Avg	14.19 lbs/day	2/Month	Calculated	January, March, May, July, August, October, and December
Suspended Solids, Total	Monthly Avg	17.14 lbs/day	2/Month	Calculated	February
Suspended Solids, Total	Monthly Avg	14.67 lbs/day	2/Month	Calculated	April, June, September, and November
pH Field	Daily Max	9.0 su	Daily	Grab	
pH Field	Daily Min	6.0 su	Daily	Grab	
Nitrogen, Ammonia Variable Limit		mg/L	2/Month	Grab	Look up the variable ammonia limit from the 'Variable Ammonia Limitation' table and report the variable limit in the Ammonia Variable Limit column on the eDMR.
Nitrogen, Ammonia (NH3-N) Total	Daily Max - Variable	mg/L	2/Month	Grab	Report the daily maximum Ammonia result in the Nitrogen, Ammonia (NH3-N) Total column of the eDMR. See Ammonia Limitation Section.
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	108 mg/L	2/Month	Grab	
Nitrogen, Ammonia (NH3-N) Total	Monthly Avg	108 mg/L	2/Month	Grab	
E. coli		#/100 ml	Weekly	Grab	Monitoring May through

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
					September 2026 in 2026.
E. coli	Geometric Mean - Monthly	126 #/100 ml	Weekly	Grab	Monitoring and limit effective May through September annually per the Effluent Limitations for E. coli Schedule.
E. coli	% Exceedance	10 Percent	Monthly	Calculated	Monitoring and limit effective May through September annually per the Effluent Limitations for E. coli Schedule. See the E. coli Percent Limit section below. Enter the result in the DMR on the last day of the month.
Chloride		mg/L	Monthly	Grab	Monitoring in 2030 only.
Phosphorus, Total	Monthly Avg	4.2 mg/L	2/Month	Grab	
Phosphorus, Total	Monthly Avg	1.766 lbs/day	2/Month	Calculated	January
Phosphorus, Total	Monthly Avg	1.758 lbs/day	2/Month	Calculated	February
Phosphorus, Total	Monthly Avg	1.118 lbs/day	2/Month	Calculated	March
Phosphorus, Total	Monthly Avg	0.756 lbs/day	2/Month	Calculated	April
Phosphorus, Total	Monthly Avg	0.628 lbs/day	2/Month	Calculated	May and October
Phosphorus, Total	Monthly Avg	0.702 lbs/day	2/Month	Calculated	June
Phosphorus, Total	Monthly Avg	0.543 lbs/day	2/Month	Calculated	July
Phosphorus, Total	Monthly Avg	0.543 lbs/day	2/Month	Calculated	August
Phosphorus, Total	Monthly Avg	0.611 lbs/day	2/Month	Calculated	September
Phosphorus, Total	Monthly Avg	0.964 lbs/day	2/Month	Calculated	November
Phosphorus, Total	Monthly Avg	1.289 lbs/day	2/Month	Calculated	December
Nitrogen, Total Kjeldahl		mg/L	See Listed Qtr(s)	Grab	Annual in rotating quarters. See Nitrogen Series Monitoring section.
Nitrogen, Nitrite + Nitrate Total		mg/L	See Listed Qtr(s)	Grab	Annual in rotating quarters. See Nitrogen Series Monitoring section.
Nitrogen, Total		mg/L	See Listed Qtr(s)	Calculated	Annual in rotating quarters. See Nitrogen Series Monitoring section. Total

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
					Nitrogen shall be calculated as the sum of reported values for Total Kjeldahl Nitrogen and Total Nitrite + Nitrate Nitrogen.

Changes from Previous Permit

Effluent limitations and monitoring requirements were evaluated for this permit term and the following changes were made from the previous permit. See additional explanation of limits under "Explanation of Limits and Monitoring Requirements" below.

- **Flow-** The sample type for flow has been updated to the correct type from "total daily" to "continuous".
- **Disinfection & E. coli-** At the end of the compliance schedule, Disinfection requirements and E. coli limits of 126 #/100 ml as a monthly geometric mean that may not be exceeded and 410 #/100 ml as a daily maximum that may not be exceeded more than 10 percent of the time in any calendar month will apply. Monitoring is not required until the limit becomes effective and the end of the compliance schedule.
- **Ammonia-** Daily variable ammonia limit added.
- **Chloride-** Sampling year updated.
- **Total Nitrogen Monitoring (TKN, N02+N03 and Total N)**- Annual monitoring is required in specific quarters as outlined in the permit.

Explanation of Limits and Monitoring Requirements

Detailed discussions of limits and monitoring requirements can be found in the attached water quality-based effluent limits (WQBEL) memo dated 11/5/2025.

Monitoring Frequencies- The Monitoring Frequencies for Individual Wastewater Permits guidance (April 12, 2021) recommends that standard monitoring frequencies be included in individual wastewater permits based on the size and type of the facility, in order to characterize effluent quality and variability, to detect events of noncompliance, and to ensure consistency in permits issued across the state. Guidance and requirements in administrative code were considered when determining the appropriate monitoring frequencies for pollutants that have final effluent limits in effect during this permit term.

Disinfection & *E. coli*- Revisions to bacteria surface water quality criteria to protect recreational uses and accompanying E. coli WPDES permit implementation procedures became effective May 1, 2020.

Section NR 102.04(5)(a), Wis. Adm. Code, states that all surface waters shall be suitable for recreational use and meet the E. coli criteria established to protect this use. Section NR 102.04(5)(b), Wis. Adm. Code, states that exceptions to the disinfection requirement can be made if the department determines, in accordance with the procedures specified in s. NR 210.06(3), Wis. Adm. Code, that disinfection is not required to meet water quality criteria. As part of the reissuance process, the requirements for disinfection were reviewed under s. NR 210.06(3), Wis. Adm. Code.

It was determined that the permittee is required to disinfect, during the following months May – September. See WQBEL for further explanation.

3 Land Application - Monitoring and Limitations

Municipal Sludge Description						
Sample Point	**Sludge Class (A or B)**	**Sludge Type (Liquid or Cake)**	**Pathogen Reduction Method**	**Vector Attraction Method**	**Reuse Option**	**Amount Reused/Disposed (Dry Tons/Year)**
002	B	Liquid	N/A	N/A	Land Application	Lagoon System

Does sludge management demonstrate compliance? **Yes**

Is additional sludge storage required? **No**

Is Radium-226 present in the water supply at a level greater than 2 pCi/liter? **No, private wells**

If yes, special monitoring and recycling conditions will be included in the permit to track any potential problems in landapplying sludge from this facility

Is a priority pollutant scan required? **N/A**

Priority pollutant scans are required once every 10 years at facilities with design flows between 5 MGD and 40 MGD, and once every 5 years if design flow is greater than 40 MGD.

3.1 Sample Point Number: 002- LAGOON SLUDGE

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Solids, Total		Percent	Once	Composite	
Arsenic Dry Wt	Ceiling	75 mg/kg	Once	Composite	
Arsenic Dry Wt	High Quality	41 mg/kg	Once	Composite	
Cadmium Dry Wt	Ceiling	85 mg/kg	Once	Composite	
Cadmium Dry Wt	High Quality	39 mg/kg	Once	Composite	
Copper Dry Wt	Ceiling	4,300 mg/kg	Once	Composite	
Copper Dry Wt	High Quality	1,500 mg/kg	Once	Composite	
Lead Dry Wt	Ceiling	840 mg/kg	Once	Composite	
Lead Dry Wt	High Quality	300 mg/kg	Once	Composite	
Mercury Dry Wt	Ceiling	57 mg/kg	Once	Composite	
Mercury Dry Wt	High Quality	17 mg/kg	Once	Composite	
Molybdenum Dry Wt	Ceiling	75 mg/kg	Once	Composite	
Nickel Dry Wt	Ceiling	420 mg/kg	Once	Composite	

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Nickel Dry Wt	High Quality	420 mg/kg	Once	Composite	
Selenium Dry Wt	Ceiling	100 mg/kg	Once	Composite	
Selenium Dry Wt	High Quality	100 mg/kg	Once	Composite	
Zinc Dry Wt	Ceiling	7,500 mg/kg	Once	Composite	
Zinc Dry Wt	High Quality	2,800 mg/kg	Once	Composite	
Nitrogen, Total Kjeldahl		Percent	Per Application	Composite	
Nitrogen, Ammonia (NH3-N) Total		Percent	Per Application	Composite	
Phosphorus, Total		Percent	Per Application	Composite	
Phosphorus, Water Extractable		% of Tot P	Per Application	Composite	
Potassium, Total Recoverable		Percent	Per Application	Composite	
PCB Total Dry Wt	Ceiling	50 mg/kg	Once	Composite	Once in 2027.
PCB Total Dry Wt	High Quality	10 mg/kg	Once	Composite	Once in 2027.
PFOA + PFOS		ug/kg	Once	Calculated	Report the sum of PFOA and PFOS. See PFAS Permit Sections for more information.
PFAS Dry Wt			Once	Grab	Perfluoroalkyl and Polyfluoroalkyl Substances based on updated DNR PFAS List. See PFAS Permit Sections for more information.

Changes from Previous Permit:

Sludge limitations and monitoring requirements were evaluated for this permit term and the following changes were made from the previous permit. See additional explanation of limits under "Explanation of Limits and Monitoring Requirements" below.

PCB- Monitoring year updated.

PFAS –Monitoring is required annually pursuant to s. NR 204.06(2)(b)9, Wis. Adm. Code.

Explanation of Limits and Monitoring Requirements

Requirements for disposal, including land application of municipal sludge, are determined in accordance with ch. NR 204, Wis. Adm. Code. Ceiling and high-quality limits for metals in sludge are specified in s. NR 204.07(5), Wis. Adm. Code. Requirements for pathogens are specified in s. NR 204.07(6) and in s. NR 204.07 (7), Wis. Adm. Code for vector attraction requirements. Limitations for PCBs are addressed in s. NR 204.07(3)(k), Wis. Adm. Code.

PFAS- The presence and fate of PFAS in municipal and industrial sludges is an emerging public health concern. EPA has developed a draft risk assessment to determine future land application rates and released this risk assessment in January of 2025. The department is evaluating this new information. Until a decision is made, the "Interim Strategy for Land Application of Biosolids and Industrial Sludges Containing PFAS" should be followed

Collecting sludge data on PFAS concentrations from a wide range of wastewater treatment facilities will help protect public health from exposure to elevated levels of PFAS and determine the department's implementation of EPA's recommendations. To quantitate this risk, PFAS sampling has been included in this WPDES permit pursuant to ss. NR 214.18(5)(b) and NR 204.06(2)(b)9, Wis. Adm. Code.

4 Schedules

4.1 Effluent Limitations for E. coli

The permittee shall comply with surface water limitations for E. coli as specified. No later than 14 days following each compliance date, the permittee shall notify the Department in writing of its compliance or noncompliance. If a submittal is required, a timely submittal fulfills the notification

Required Action	Due Date
Status Update: The permittee shall submit information within the discharge monitoring report (DMR) comment section documenting the steps taken in preparation for properly monitoring and testing for E. coli including, but not limited to, selected test method and location of sampling.	05/21/2026
Operational Evaluation Report: The permittee shall prepare and submit an Operational Evaluation Report to the Department for review and approval. The report shall include an evaluation of collected effluent data and proposed operational improvements that will optimize efficacy of disinfection at the treatment plant during the period prior to complying with final E. coli limitations and, to the extent possible, enable compliance with the final E. coli limitations. The report shall include a plan and schedule for implementation of the operational improvements. These improvements shall occur as soon as possible, but not later than **4/30/2027**. The report shall state whether the operational improvements are expected to result in compliance with the final E. coli limitations. The permittee shall implement the operational improvements in accordance with the approved plan and schedule specified in the Operational Evaluation Report and in no case later than **4/30/2027.** If the Operational Evaluation Report concludes that the operational improvements are expected to result in compliance with the final E. coli limitations, the permittee shall comply with the final E. coli limitations by **4/30/2027** and the permittee is not required to comply with subsequent milestones identified below in this compliance schedule ('Submit Facility Plan', 'Final Plans and Specifications', 'Treatment Plant Upgrade to Meet Limitations', 'Construction Upgrade Progress Report', 'Complete Construction', 'Achieve Compliance'). FACILITY PLAN - If the Operational Evaluation Report concludes that operational improvements alone are not expected to result in compliance with the final E. coli limitations, the permittee shall initiate development of a facility plan for meeting final E. coli limitations and comply with the remaining required actions in this schedule of compliance. If the Department disagrees with the conclusion of the report and determines that the permittee can	11/30/2026

achieve final E. coli limitations using the existing treatment system with only operational improvements, the Department may reopen and modify the permit to include an implementation schedule for achieving the final E. coli limitations sooner than **4/30/2030.**	
Submit Facility Plan: If the Operational Evaluation Report concluded that the permittee cannot achieve final E. coli limitations with operational improvements alone, the permittee shall submit a Facility Plan per s. NR 110.09, Wis. Adm. Code. The permittee may submit an abbreviated facility plan if the Department determines that the modifications are minor.	04/30/2027
Final Plans and Specifications: The permittee shall submit final construction plans to the Department for approval pursuant to ch. NR 108, Wis. Adm. Code, specifying treatment plant upgrades that must be constructed to achieve compliance with final E. coli limitations and a schedule for completing construction of the upgrades by the complete construction date specified below.	03/31/2028
Treatment Plant Upgrade to Meet Limitations: The permittee shall initiate bidding, procurement, and/or construction of the project. The permittee shall obtain approval of the final construction plans and schedule from the Department pursuant to s. 281.41. Stats., prior to initiating activities defined as construction under ch. NR 108, Wis. Adm. Code. Upon approval of the final construction plans and schedule by the Department pursuant to s. 281.41, Stats., the permittee shall construct the treatment plant upgrades in accordance with the approved plans and specifications.	09/30/2028
Construction Upgrade Progress Report: The permittee shall submit a progress report on construction upgrades.	09/30/2029
Complete Construction: The permittee shall complete construction of wastewater treatment system upgrades.	03/31/2030
Achieve Compliance: The permittee shall achieve compliance with final E. coli limitations.	04/30/2030

Explanation of Schedule

A compliance schedule is included in the permit to provide time for the permittee to submit plans and specs and install disinfection treatment for meeting effluent E. coli water quality-based effluent limits and disinfection requirements pursuant s. NR 210.06, Wis. Adm. Code.

4.2 Desludging Management Plan

Required Action	Due Date
Submit Desludging Management Plan: The permittee shall submit a management plan for approval if removal of sludge will occur during the life of this permit. At a minimum, the plan shall address how the sludge will be sampled, removed, transported and disposed of. No desludging may occur unless approval of the Department is obtained. Daily logs shall be kept that record where the sludge has been disposed. The plan is due 60 days prior to desludging.	

Explanation of Schedule

A desludge plan is required if the permittee needs to desludge the lagoon(s).

4.3 Land Application Management Plan

A management plan is required for the land application system.

Required Action	Due Date

Land Application Management Plan Submittal: Submit an update to the management plan to optimize the land application system performance and demonstrate compliance with ch. NR 204, Wis. Adm. Code, by the Due Date. This management plan shall 1) specify information on pretreatment processes (if any); 2) identify land application sites; 3) describe site limitations; 4) address vegetative cover management and removal; 5) specify availability of storage; 6) describe the type of transporting and spreading vehicle(s); 7) specify monitoring procedures; 8) track site loading; 9) address contingency plans for adverse weather and odor/nuisance abatement; and 10) include any other pertinent information. Once approved, all landspreading activities shall be conducted in accordance with the plan. Any changes to the plan must be approved by the Department prior to implementing the changes. This report is due 60 days prior to land application.	

Explanation of Schedule

An up-to-date Land Application Management Plan is required that documents how the permittee will manage the land application of biosolids consistent with ch. NR 204, Wis. Adm. Code

Other Comments

None

Attachments

Water Quality Based Effluent Limits dated 11/5/2025

Justification Of Any Waivers From Permit Application Requirements

No waivers requested or granted as part of this permit reissuance.

Prepared By:
Jennifer Jerich, Wastewater Specialist

Date: 1/14/2026
Date amended post Fact Check:1/27/2026
Date amended post Public Notice:

CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: November 5, 2025

TO: Jennifer Jerich – SCR/Horicon

FROM: Zainah Masri – WY/3

SUBJECT: Water Quality-Based Effluent Limitations for the Town of Plymouth Sanitary District #1 Wastewater Treatment Facility

WPDES Permit No. WI-0031054-10-0

This is in response to your request for an evaluation of the need for water quality-based effluent limitations (WQBELs) using chapters NR 102, 104, 105, 106, 207, 210, 212, and 217 of the Wisconsin Administrative Code (where applicable) for the discharge from the Town of Plymouth Sanitary District #1 WWTF in Rock County. This municipal wastewater treatment facility (WWTF) discharges to the Bass Creek located in the Bass Creek Watershed (LR03) in the Lower River Rock Basin. This discharge is included in the Rock River Total Maximum Daily Load (TMDL) as approved by EPA on 09/28/2011.

The evaluation of the permit recommendations is discussed in more detail in the attached report.

Based on our review, the following recommendations are made on a chemical-specific basis at Outfall 001:

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Flow Rate						1,2
BOD_5			45 mg/L	30 mg/L		1
TSS				60 mg/L		1,3,4
pH	9.0 s.u.	6.0 s.u.				1
Ammonia Nitrogen	Variable		**108 mg/L**	**108 mg/L**		1, 5, 6
Bacteria						
Final Limit *E. coli*				126 #/100 mL geometric mean		7
Chloride						1, 8
Phosphorus				4.2 mg/L		1, 4,9
TKN, Nitrate+Nitrite, and Total Nitrogen						10

Footnotes:

1. No changes from the current permit.
2. Monitoring only.
3. The TSS limit is a variance limit according to s. NR 210.07(2), Wis. Adm. Code, where aerated lagoons and stabilization ponds are the principal treatment processes.
4. Additional phosphorus and TSS mass limitations are required in accordance with the waste load allocations specified in the Rock River TMDL

Month	Monthly Ave TSS Effluent Limit (lbs/day)	Weekly Ave TSS Effluent Limit (lbs/day)	Monthly Ave Total P Effluent Limit (lbs/day)
January	14.19	23.3	1.766
February	17.14	28.1	1.758
March	14.19	23.3	1.118
April	14.67	24.1	0.756
May	14.19	23.3	0.628
June	14.67	24.1	0.702
July	14.19	23.3	0.689
August	14.19	23.3	0.543
September	14.67	24.1	0.611
October	14.19	23.3	0.628
November	14.67	24.1	0.964
December	14.19	23.3	1.289

5. The variable daily maximum ammonia nitrogen limit table corresponding to various effluent pH values may be included in the permit in place of the single limit.

Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L
$6.0 \leq pH \leq 6.1$	108	$7.0 < pH \leq 7.1$	66	$8.0 < pH \leq 8.1$	14
$6.1 < pH \leq 6.2$	106	$7.1 < pH \leq 7.2$	59	$8.1 < pH \leq 8.2$	11
$6.2 < pH \leq 6.3$	104	$7.2 < pH \leq 7.3$	52	$8.2 < pH \leq 8.3$	9.4
$6.3 < pH \leq 6.4$	101	$7.3 < pH \leq 7.4$	46	$8.3 < pH \leq 8.4$	7.8
$6.4 < pH \leq 6.5$	98	$7.4 < pH \leq 7.5$	40	$8.4 < pH \leq 8.5$	6.4
$6.5 < pH \leq 6.6$	94	$7.5 < pH \leq 7.6$	34	$8.5 < pH \leq 8.6$	5.3
$6.6 < pH \leq 6.7$	89	$7.6 < pH \leq 7.7$	29	$8.6 < pH \leq 8.7$	4.4
$6.7 < pH \leq 6.8$	84	$7.7 < pH \leq 7.8$	24	$8.7 < pH \leq 8.8$	3.7
$6.8 < pH \leq 6.9$	78	$7.8 < pH \leq 7.9$	20	$8.8 < pH \leq 8.9$	3.1
$6.9 < pH \leq 7.0$	72	$7.9 < pH \leq 8.0$	17	$8.9 < pH \leq 9.0$	2.6

6. Additional limits to comply with the expression of limits requirements in ss. NR 106.07 and NR 205.065(7), Wis. Adm. Codes, are included in bold.
7. Bacteria limits apply during the disinfection season of May through September. Additional final limit: No more than 10 percent of *E. coli* bacteria samples collected in any calendar month may exceed 410 count/100 mL.
8. Monitoring at a frequency to ensure that 11 samples are available at the next permit issuance.
9. **The current concentration limit of 4.2 mg/L, which is included in the current permit, and was carried over from the previous permit, where it was the 1-day P_{99} of data taken from April 2009 – June 2011.**
10. As recommended in the Department's October 1, 2019 Guidance for Total Nitrogen Monitoring in Wastewater Permits, annual total nitrogen monitoring is recommended for all minor municipal permittees. Sections 283.37(5) and 283.55(1)(e), Wis. Stats, and ss. NR 200.065(1)(g) and NR 200.065(1)(h), Wis. Adm. Codes, provide the authority to request this monitoring during the permit term. Total Nitrogen is the sum of nitrate (NO_3), nitrite (NO_2), and total Kjeldahl nitrogen (TKN) (all expressed as N).

Please consult the attached report for details regarding the above recommendations. If there are any questions or comments, please contact Zainah.Masri@wisconsin.gov or Diane Figiel at Diane.Figiel@wisconsin.gov.

Attachments (5) – Narrative, Map, Lagoon Volumetric Capacity Information, Ammonia Nitrogen Calculations and 7-Q_{10} Estimate for Bass Creek

PREPARED BY: Zainah Masri, Water Resources Engineer Zainah Masri

APPROVED BY: Diane Figiel Date: 11/05/2025
Diane Figiel, PE,
Water Resources Engineer

E-cc: Ashley Brechlin, Wastewater Engineer – SCR/Fitchburg
Lisa Creegan, Regional Wastewater Supervisor – SCR/Fitchburg
Diane Figiel, Water Resources Engineer – WY/3
Nate Willis, Environmental Engineering Manager – WY/3
Kari Fleming, Natural Resources Program Manager– WY/3

Attachment #1

Water Quality-Based Effluent Limitations for
Town of Plymouth **Sanitary District #1 Wastewater Treatment Facility**

WPDES Permit No. WI-0031054-10-0

Prepared by: Zainah Masri – WY/3

PART 1 – BACKGROUND INFORMATION

Facility Description

The Town of Plymouth Sanitary District #1 Wastewater Treatment facility consists of a two-cell, clay lined stabilization pond system built in the 1970's and provides treatment to domestic wastewater. After flow measurement, the collection system drains to a single wet well where sewage is pumped to the treatment system. The first cell is a three-acre cell where waste stabilization occurs. The second cell is a one-acre cell that acts as a control structure for discharge of effluent. The facility is a continuous discharger.

Attachment #2 is a map of the area showing the approximate location of Outfall 001.

Existing Permit Limitations

The current permit, which expired on September 30, 2025 includes the following effluent limitations and monitoring requirements.

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Flow Rate						1
BOD_5			45 mg/L	30 mg/L		1
TSS				60 mg/L		1,4
pH	9.0 s.u.	6.0 s.u.				1
Ammonia Nitrogen	Variable		**108 mg/L**	**108 mg/L**		2
Chloride						3
Phosphorus				4.2 mg/L		4,5
TKN, Nitrate+Nitrite, and Total Nitrogen						6

Footnotes:

1. These limitations are not being evaluated as part of this review. Because the water quality criteria (WQC), reference effluent flow rates, and receiving water characteristics have not changed, limitations for these water quality characteristics do not need to be re-evaluated at this time.
2. The variable daily maximum ammonia nitrogen limit corresponds to various effluent pH values.

Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L
$6.0 \leq pH \leq 6.1$	108	$7.0 < pH \leq 7.1$	66	$8.0 < pH \leq 8.1$	14
$6.1 < pH \leq 6.2$	106	$7.1 < pH \leq 7.2$	59	$8.1 < pH \leq 8.2$	11

6.2 < pH ≤ 6.3	104	7.2 < pH ≤ 7.3	52	8.2 < pH ≤ 8.3	9.4
6.3 < pH ≤ 6.4	101	7.3 < pH ≤ 7.4	46	8.3 < pH ≤ 8.4	7.8
6.4 < pH ≤ 6.5	98	7.4 < pH ≤ 7.5	40	8.4 < pH ≤ 8.5	6.4
6.5 < pH ≤ 6.6	94	7.5 < pH ≤ 7.6	34	8.5 < pH ≤ 8.6	5.3
6.6 < pH ≤ 6.7	89	7.6 < pH ≤ 7.7	29	8.6 < pH ≤ 8.7	4.4
6.7 < pH ≤ 6.8	84	7.7 < pH ≤ 7.8	24	8.7 < pH ≤ 8.8	3.7
6.8 < pH ≤ 6.9	78	7.8 < pH ≤ 7.9	20	8.8 < pH ≤ 8.9	3.1
6.9 < pH ≤ 7.0	72	7.9 < pH ≤ 8.0	17	8.9 < pH ≤ 9.0	2.6

3. Monitoring in 2024 only.
4. Additional phosphorus and TSS mass limitations are required in accordance with the waste load allocations specified in the Rock River TMDL.

Month	Monthly Ave TSS Effluent Limit (lbs/day)	Weekly Ave TSS Effluent Limit (lbs/day)	Monthly Ave Total P Effluent Limit (lbs/day)
January	14.19	23.3	1.766
February	17.14	28.1	1.758
March	14.19	23.3	1.118
April	14.67	24.1	0.756
May	14.19	23.3	0.628
June	14.67	24.1	0.702
July	14.19	23.3	0.689
August	14.19	23.3	0.543
September	14.67	24.1	0.611
October	14.19	23.3	0.628
November	14.67	24.1	0.964
December	14.19	23.3	1.289

5. **The current concentration limit of 4.2 mg/L, which is included in the current permit, and was carried over from the previous permit, where it was the 1-day P_{99} of data taken from April 2009 – June 2011.**
6. As recommended in the Department's October 1, 2019 Guidance for Total Nitrogen Monitoring in Wastewater Permits, annual total nitrogen monitoring is recommended for all minor municipal permittees. Sections 283.37(5) and 283.55(1)(e), Wis. Stats, and ss. NR 200.065(1)(g) and NR 200.065(1)(h), Wis. Adm. Codes, provide the authority to request this monitoring during the permit term. Total Nitrogen is the sum of nitrate (NO_3), nitrite (NO_2), and total Kjeldahl nitrogen (TKN) (all expressed as N).

Receiving Water Information

- Name: Bass Creek
- Waterbody Identification Code (WBIC): 795800
- Classification used in accordance with chs. NR 102 and 104, Wis. Adm. Code: Warm Water Sport Fish (WWSF) community, Exceptional Resource Water (ERW), non-public water supply and recreational use.
- Low flows used in accordance with chs. NR 106 and 217, Wis. Adm. Code: The 7-Q_{10} and 7-Q_2 flows are based on a ratio using flows from USGS station #05430600 located at Bass Creek near Janesville with a drainage area of 58.1 mi^2. The calculations can be found in attachment #5. The 7-Q_{10} is 7.7 cfs

and 7-Q_2 is 11 cfs at the station. The drainage area at Outfall 001 is 49.5 mi^2.

$$7Q_{10} = (7.7cfs)\frac{49.5mi^2}{58.1mi^2} = 6.6\ cfs$$
$$7Q_2 = (11\ cfs)\frac{49.5mi^2}{58.1mi^2} = 9.4\ cfs$$

Harmonic Mean Flow = 18.2 cfs using a drainage area of 49.5 mi^2. The Harmonic Mean has been estimated based on average flow and the 7-Q_{10} using an equation from U.S. EPA's *Technical Support Document for Water Quality-Based Toxics Control* (March 1991, EPA/505/2-90-001, pgs. 88-89).

- Hardness = 325 mg/L as CaCO3. This value represents the geometric mean of receiving water data as reported on WET tests from Footville Wastewater Treatment Facility from 2009-2013.
- % of low flow used to calculate limits in accordance with s. NR 106.06(4)(c)5., Wis. Adm. Code: 25%
- Source of background concentration data: Metals data from Afton, WI is used for this evaluation because there is no data available for the Bass Creek. Rock River is within the same ecological landscape so ambient water quality characteristics are expected to be similar. The numerical values are shown in the tables below. If no data is available, the background concentration is assumed to be negligible and a value of zero is used in the computations. Background data for calculating effluent limitations for ammonia nitrogen are described later.
- Multiple dischargers: Footville Wastewater Treatment Facility which is approximately 3.6 miles upstream of the Town of Plymouth Sanitary District #1 WWTF, also discharges to the Bass Creek however they are not in the immediate vicinity and the mixing zones do not overlap. Therefore, the other dischargers do not impact this evaluation.
- Impaired water status: Bass Creek is listed as impaired for total phosphorus at the point of discharge (listed 04/01/2014). The Rock River is also listed as impaired for total phosphorus and total suspended solids and has an EPA-approved TMDL in place.

Effluent Information

- Design flow rate:
  Annual average = 0.03 million gallons per day (MGD)
  For reference, the actual average flow from September 2020 to August 2025 was 0.021 MGD.
- Hardness = 287 mg/L as $CaCO_3$. This value represents the geometric mean of four samples collected in May 2024 -June 2024 which were reported on the permit application.
- Acute dilution factor used in accordance with s. NR 106.06(3)(c), Wis. Adm. Code: Not applicable – this facility does not have an approved Zone of Initial Dilution (ZID).
- Water supply: Municipality waterworks and private wells.
- Additives: None.
- Effluent characterization: This facility is categorized as a minor municipality so the permit application required effluent sample analyses for a limited number of common pollutants, as specified in s. NR 200.065, Table 1, Wis. Adm. Code, primarily metal substances plus ammonia, chloride, hardness and phosphorus.
- Effluent data for substances for which a single sample was analyzed is shown in the tables in Part 2, in the column titled “MEAN EFFL. CONC.”. Otherwise, substances with multiple effluent data are shown in the tables below or in their respective parts in this evaluation.

Attachment #1

Copper Effluent Data

Sample Date	Copper (µg/L)	Sample Date	Copper (µg/L)	Sample Date	Copper (µg/L)
05/14/2024	<3.2	06/18/2024	<3.2	08/15/2024	<3.2
05/20/2024	<3.2	08/01/2024	<3.2	08/19/2024	<3.2
05/27/2024	<3.2	08/06/2024	<3.2	08/24/2024	<3.2
06/12/2024	<3.2	08/11/2024	<3.2		

"<" means that the pollutant was not detected at the indicated limit of detection. The mean concentration was calculated using zero in place of the non-detected results.

Chloride Effluent Data

	Chloride (mg/L)
1-day P_{99}	237
4-day P_{99}	225
30-day P_{99}	135
Mean	89
Std	25
Sample size	36
Range	<0 - 210

The following table presents the average concentrations and loadings at Outfall 001 from September 2020 to August 2025 for all parameters with limits in the current permit to meet the requirements of s. NR 201.03(6), Wis. Adm. Code:

Parameters with Effluent Limits

	Average Measurement	Average Mass Discharged
BOD_5	7.2 mg/L*	-
TSS	17 mg/L	0.66 lbs/day
pH field	7.8 s.u.	-
Ammonia Nitrogen	3.8 mg/L	-
Phosphorus	1.4 mg/L	0.15 lbs/day

*Results below the limit of detection (LOD) were included as zeroes in calculation of average.

PART 2 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR TOXIC SUBSTANCES – EXCEPT AMMONIA NITROGEN

Permit limits for toxic substances are required whenever any of the following occur:

1. The maximum effluent concentration exceeds the calculated limit (s. NR 106.05(3), Wis. Adm. Code)
2. If 11 or more detected results are available in the effluent, the upper 99th percentile (or P_{99}) value exceeds the comparable calculated limit (s. NR 106.05(4), Wis. Adm. Code)
3. If fewer than 11 detected results are available, the mean effluent concentration exceeds 1/5 of the calculated limit (s. NR 106.05(6), Wis. Adm. Code)

Acute Limits based on 1-Q_{10}

Daily maximum effluent limitations for toxic substances are based on the acute toxicity criteria (ATC), listed in ch. NR 105, Wis. Adm. Code. Previously daily maximum limits for toxic substances were calculated as two times the ATC. However, changes to ch. NR 106, Wis. Code, (September 1, 2016) require the Department to calculate acute limitations using the same mass balance equation as used for other limits along with the 1-Q_{10} receiving water low flow to determine if more restrictive effluent limitations are needed to protect the receiving stream from discharges which may cause or contribute to an exceedance of the acute water quality standards. The mass balance equation is provided below.

$$\text{Limitation} = \frac{(WQC)\,(Qs + (1-f)\,Qe) - (Qs - f\,Qe)\,(Cs)}{Qe}$$

Where:

WQC =Acute toxicity criterion or secondary acute value according to ch. NR 105, Wis. Adm. Code.

Qs = average minimum 1-day flow which occurs once in 10 years (1-day Q_{10}) if the 1-day Q_{10} flow data is not available = 80% of the average minimum 7-day flow which occurs once in 10 years (7-day Q_{10}).

Qe = Effluent flow (in units of volume per unit time) as specified in s. NR 106.06(4)(d), Wis. Adm. Code.

f = Fraction of the effluent flow that is withdrawn from the receiving water, and

Cs = Background concentration of the substance (in units of mass per unit volume) as specified in s. NR 106.06(4)(e), Wis. Adm. Code.

If the receiving water is effluent dominated under low stream flow conditions, the 1-Q_{10} method of limit calculation produces the most stringent daily maximum limitations and should be used while making reasonable potential determinations. This is not the case for the Town of Plymouth Sanitary District #1 WWTF and the limits are set based on two times the acute toxicity criteria.

The following tables list the calculated WQBELs for this discharge along with the results of effluent sampling for all the detected substances. All concentrations are expressed in terms of micrograms per Liter (µg/L), except for hardness and chloride (mg/L).

Daily Maximum Limits based on Acute Toxicity Criteria (ATC)

RECEIVING WATER FLOW = 5.3 cfs, (1-Q_{10} (estimated as 80% of 7-Q_{10})), as specified in s. NR 106.06(3)(bm), Wis. Adm. Code.

SUBSTANCE	REF. HARD.* mg/L	ATC	MEAN BACK-GRD.	MAX. EFFL. LIMIT**	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	1-day P_{99}	1-day MAX. CONC.
Arsenic		340	1.3	680	136	1.3		
Cadmium	287	35	0.02	69	13.8	<0.17		
Chromium	287	4,276	0.79	8,552	1,710	<3.3		
Copper	287	42	2.1	84	17	<3.2		
Lead	287	296	0.83	592	119	<5.4		
Nickel	268	1,080	1.3	2,161	432	<4.7		
Zinc	287	303	5.2	605	121	5.0		
Chloride (mg/L)		757	61.8	1,514			237	210

* The indicated hardness may differ from the effluent hardness because the effluent hardness exceeded the maximum range in ch. NR 105, Wis. Adm. Code, over which the acute criteria are applicable. In that case, the maximum of the range is used to calculate the criterion.

* * The 2 × ATC method of limit calculation yields a more restrictive limit than consideration of ambient concentrations and 1-Q_{10} flow rates per the changes to s. NR 106.07(3), Wis. Adm. Code, effective 09/01/2016.

Weekly Average Limits based on Chronic Toxicity Criteria (CTC)

RECEIVING WATER FLOW = 1.65 cfs (¼ of the 7-Q_{10}), as specified in s. NR 106.06(4)(c), Wis. Adm. Code

SUBSTANCE	REF. HARD.* mg/L	CTC	MEAN BACK-GRD.	WEEKLY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	4-day P_{99}
Arsenic		152	1.3	5,516	1,103	1.3	
Cadmium	175	3.8	0.02	139	28	<0.17	
Chromium	301	326	0.79	11,877	2,375	<3.3	
Copper	325	28	2.1	963	193	<3.2	
Lead	325	87	0.83	3,167	633	<5.4	
Nickel	268	120	1.3	4,346	869	<4.7	
Zinc	325	337	5.2	12,147	2,429	5.0	
Chloride (mg/L)		395	61.8	12,239			225

* The indicated hardness may differ from the receiving water hardness because the receiving water hardness exceeded the maximum range in ch. NR 105, Wis. Adm. Code, over which the chronic criteria are applicable. In that case, the maximum of the range is used to calculate the criterion.

Monthly Average Limits based on Wildlife Criteria (WC)

The effluent characterization did not include any effluent sampling results for substances for which Wildlife Criteria exist.

Monthly Average Limits based on Human Threshold Criteria (HTC)

RECEIVING WATER FLOW = 4.6 cfs (¼ of Harmonic Mean), as specified in s. NR 106.06(4), Wis. Adm. Code.

SUBSTANCE	HTC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Cadmium	370	0.02	36,637	7,327	<0.17
Chromium (+3)	3,818,000	0.79	378,066,555	75,613,311	<3.3
Lead	140	0.83	13,782	2,756	<5.4
Nickel	43,000	1.3	4,257,826	851,565	<4.7

Monthly Average Limits based on Human Cancer Criteria (HCC)

RECEIVING WATER FLOW = 4.6 cfs (¼ of Harmonic Mean), as specified in s. NR 106.06(4), Wis. Adm. Code.

SUBSTANCE	HCC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Arsenic	13	1.3	1,190	238	1.3

Conclusions and Recommendations

Based on a comparison of the effluent data and calculated effluent limitations, **effluent limitations are not required but monitoring is recommended for chloride.** Limits and/or monitoring recommendations are made in the paragraphs below:

Copper – Considering available effluent data from the current permit term from May 2024 to August 2024 the mean concentration was <3.2 µg/L , with a maximum concentration of <3.2 µg/L. The maximum effluent concentration and the mean of the effluent data did not exceed the calculated daily maximum limit, **therefore concentration and mass limits, as well as monthly monitoring, are not required.**

Chloride – Considering available effluent data from the current permit term March 2024 to December 2024, the 1-day P_{99} chloride concentration is 237 mg/L, and the 4-day P_{99} of effluent data is 225 mg/L.

These effluent concentrations are below the calculated WQBELs for chloride, **therefore no effluent limits are needed. Chloride monitoring is recommended to ensure that 11 sample results are available at the next permit issuance to meet the data requirements of s. NR 106.85, Wis. Adm. Code.**

Mercury – The permit application did not require monitoring for mercury because the Town of Plymouth Sanitary District #1 WWTF is categorized as a minor facility as defined in s. NR 200.02(8), Wis. Adm. Code. In accordance with s. NR 106.145(3)(a)3, Wis. Adm. Code, a minor municipal discharger shall monitor, and report results of influent and effluent mercury monitoring once every three months if, "there are two or more exceedances in the last five years of the high-quality sludge mercury concentration of 17 mg/kg specified in s. NR 204.07(5), Wis. Adm. Code." A review of the past five years of sludge characteristics data reveals that all the sample results are within expected analytical ranges and well below the 17 mg/kg level. The concentration in the sludge from November 4, 2020 was 0.03 mg/kg. **Therefore, no mercury monitoring is recommended at Outfall 001.**

PFOS and PFOA – The need for PFOS and PFOA monitoring is evaluated in accordance with s. NR 106.98(2), Wis. Adm. Code. Based on the type of discharge, the effluent flow rate, and unknown levels of PFOS/PFOA in the source water **PFOS and PFOA monitoring is not recommended.** The Department may re-evaluate the need for sampling at the next permit reissuance if new information becomes available that suggests PFOS or PFOA may be present in the discharge.

PART 3 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR AMMONIA NITROGEN

The State of Wisconsin promulgated revised water quality standards for ammonia nitrogen in ch. NR 105, Wis. Adm. Code, effective March 1, 2004 which includes criteria based on both acute and chronic toxicity to aquatic life. The current permit has daily maximum, weekly average and monthly average limits. These limits are re-evaluated at this time due to the following changes:

- Subchapter IV of ch. NR 106, Wis. Adm. Code allows limits based on available dilution instead of limits set to twice the acute criteria.
- The maximum expected effluent pH has changed

Daily Maximum Limits based on Acute Toxicity Criteria (ATC)
Daily maximum limitations are based on acute toxicity criteria in ch. NR 105, Wis. Adm. Code, which are a function of the effluent pH and the receiving water classification. The acute toxicity criterion (ATC) for ammonia is calculated using the following equation:

$$\text{ATC in mg/L} = [A \div (1 + 10^{(7.204 - \text{pH})})] + [B \div (1 + 10^{(\text{pH} - 7.204)})]$$

Where:

A = 0.411 and B = 58.4 for a Warm Water Sport fishery, and
pH (s.u.) = that characteristic of the effluent.

The effluent pH data was examined as part of this evaluation. A total of 1402 sample results were reported from September 2020 to August 2025. The maximum reported value was 9.2 s.u. (Standard pH Units). The effluent pH was 8.9 s.u. or less 99% of the time. The 1-day P_{99}, calculated in accordance with s. NR 106.05(5), Wis. Adm. Code, is 9.3 s.u. The mean plus the standard deviation multiplied by a factor of 2.33, an estimate of the upper ninety ninth percentile for a normally distributed dataset, is 9.2 s.u. The facility must be in compliance with the daily maximum p.H. limit of 9.0 s.u. Therefore, a value of 9.0 s.u. is believed to represent the maximum reasonably expected pH and most appropriate for determining daily maximum limitations for ammonia nitrogen. Substituting a value of 9.0 s.u. into the equation above yields an ATC = 1.3 mg/L.

Daily Maximum Ammonia Nitrogen Effluent Limitations Calculation Method
In accordance with s. NR 106.32(2), Wis. Adm. Code daily maximum ammonia limitations are calculated using the 1-Q_{10} receiving water low flow if it is determined that the previous method of acute ammonia limit calculation (2×ATC) is not sufficiently protective of the fish and aquatic life. The more restrictive calculated limits shall apply.

The calculated daily maximum ammonia nitrogen effluent limits using the mass balance approach with the 1-Q_{10} (estimated as 80 % of 7-Q_{10}) and the 2×ATC approach are shown below.

Daily Maximum Ammonia Nitrogen Determination

	Ammonia Nitrogen Limit mg/L
2×ATC	2.6
1-Q_{10}	103

The 2×ATC method yields the most stringent limits for the Town of Plymouth Sanitary District #1 WWTF.

The current permit has variable daily maximum effluent limits based on effluent pH. Presented below is a table of daily maximum limitations corresponding to various effluent pH values.

Attachment #1

Daily Maximum Ammonia Nitrogen Limits – WWTF

Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L
$6.0 \leq pH \leq 6.1$	108	$7.0 < pH \leq 7.1$	66	$8.0 < pH \leq 8.1$	14
$6.1 < pH \leq 6.2$	106	$7.1 < pH \leq 7.2$	59	$8.1 < pH \leq 8.2$	11
$6.2 < pH \leq 6.3$	104	$7.2 < pH \leq 7.3$	52	$8.2 < pH \leq 8.3$	9.4
$6.3 < pH \leq 6.4$	101	$7.3 < pH \leq 7.4$	46	$8.3 < pH \leq 8.4$	7.8
$6.4 < pH \leq 6.5$	98	$7.4 < pH \leq 7.5$	40	$8.4 < pH \leq 8.5$	6.4
$6.5 < pH \leq 6.6$	94	$7.5 < pH \leq 7.6$	34	$8.5 < pH \leq 8.6$	5.3
$6.6 < pH \leq 6.7$	89	$7.6 < pH \leq 7.7$	29	$8.6 < pH \leq 8.7$	4.4
$6.7 < pH \leq 6.8$	84	$7.7 < pH \leq 7.8$	24	$8.7 < pH \leq 8.8$	3.7
$6.8 < pH \leq 6.9$	78	$7.8 < pH \leq 7.9$	20	$8.8 < pH \leq 8.9$	3.1
$6.9 < pH \leq 7.0$	72	$7.9 < pH \leq 8.0$	17	$8.9 < pH \leq 9.0$	2.6

Weekly and Monthly Average Limits based on Chronic Toxicity Criteria (CTC)

Weekly and monthly average limits are not included in the current permit but are being evaluated here due to changes to ch. NR 106, Wis. Adm. Code. **The weekly and monthly average ammonia nitrogen limits calculation from the previous memo do not change** because there have been no changes in the effluent and receiving water flow rates. The calculations from the previous WQBEL memo are shown in attachment #2.

Effluent Data

The following table evaluates the statistics based upon ammonia data reported from September 2020 to August 2025.

Ammonia Nitrogen Effluent Data

	Ammonia Nitrogen mg/L
1-day P_{99}	13
4-day P_{99}	7.2
30-day P_{99}	3.5
Mean*	1.9
Std	3.2
Sample size	214
Range	<0.025 - 12

*Values lower than the limit of detection were substituted with a zero

Reasonable Potential

The permit currently has daily maximum limits year-round as well as weekly and monthly limits year round. The daily maximum limit shows reasonable potential. Where there are existing ammonia nitrogen limits in the permit, the limits must be retained regardless of reasonable potential, consistent with s. NR 106.33(1)(b), Wis. Adm. Code:

> (b) If a permittee is subject to an ammonia limitation in an existing permit, the limitation shall be included in any reissued permit. Ammonia limitations shall be included in the permit if the permitted facility will be providing treatment for ammonia discharges.

Expression of Limits

Revisions to ch. NR 106, Wis. Adm. Code, in September 2016 aligned Wisconsin's WQBELs with 40 CFR § 122.45(d), which specifies that effluent limits for continuous dischargers must be expressed as weekly and monthly averages for publicly owned treatment works and as daily maximums and monthly averages for all other dischargers, unless shown to be impracticable. Because a daily maximum ammonia limit is necessary for Town of Plymouth Sanitary District #1 WWTF, weekly and monthly average limits are also required under this code revision.

The methods for calculating limitations for municipal treatment facilities to conform to 40 CFR 122.45(d) are specified in s. NR 106.07(3), Wis. Adm. Code, and are as follows:

> Whenever a daily maximum limitation is determined necessary to protect water quality, a weekly and monthly average limitation shall also be included in the permit and set equal to the daily maximum limit unless a more restrictive limit is already determined necessary to protect water quality.

In this case, the recommended daily maximum limits vary with effluent pH, so additional limits should be set equal to the highest recommended limit. Therefore, **monthly and weekly average limits of 108 mg/L** are recommended in the permit.

Conclusions and Recommendations

In summary, after rounding to two significant figures, the following ammonia nitrogen limitations are recommended. No mass limitations are recommended in accordance with s. NR 106.32(5), Wis. Adm Code.

Final Ammonia Nitrogen Limits

	Daily Maximum mg/L	Weekly Average mg/L	Monthly Average mg/L
Year round	Variable	**108 mg/L**	**108 mg/L**

PART 4 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR BACTERIA

Section NR 102.04(5), Wis. Adm. Code, states that all surface waters shall be suitable for supporting recreational use and shall meet *E. coli* criteria during the recreation season. Section NR 102.04(5)(b), Wis. Adm. Code, allows the Department to make exceptions when it determines, in accordance with s. NR 210.06(3), Wis. Adm. Code, that wastewater disinfection is not required to meet E. coli limits and protect the recreational use. Section NR 210.06(3), Wis. Adm. Code, tasks the Department with determining the need for disinfection using a site-specific analysis based on potential risk to human or animal health. It sets out the factors that must be considered in determining the necessity to disinfect municipal wastewater or to change the length of the disinfection season.

It is recognized the Town of Plymouth Sanitary District #1 Wastewater Treatment Facility potentially has a detention time of at least 180 days, in which the resulting discharged effluent is thought to not pose a risk to human and animal heath, as described in s. NR 210.06(3)(h), Wis. Adm. Code.

The maximum 180-day rolling average flowrate for the facility is 0.047 MGD (September 2020– August 2025) including days discharge did not occur. The volumetric capacity of the lagoons is approx. 6.52 MG, calculated based on the size of the lagoons and depths provided by a sludge measurement study included in attachment #2. Therefore, the estimated shortest detention time for the facility **is approximately 6.52 MG / 0.047 MGD = 139 days and is less than the 180-day minimum, therefore, disinfection is required.**

Effluent monitoring is recommended to ensure that the discharge can meet bacteria limits during the recreation season without disinfection, according to s. NR 210.06(3)(d), Wis. Adm. Code, and as discussed in the "Disinfection Requirements for Discharges to Surface Waters" guidance. *E. coli* effluent monitoring should be included in the permit in order to ensure that the recreational use is being protected (criteria are being met) without disinfection.

Section NR 210.06(2)(a)1, Wis. Adm. Code, includes two limits which must be included in permits for facilities:
1. The geometric mean of E. coli bacteria in effluent samples collected in any calendar month may not exceed 126 counts/100 mL.
2. No more than 10 percent of E. coli bacteria samples collected in any calendar month may exceed 410 counts/100 mL.

These limits are required during May through September. **Monitoring should be conducted at a minimum of weekly for the disinfection season during the permit term. A compliance schedule may be included in the permit.**

PART 5 – PHOSPHORUS and TOTAL SUSPENDED SOLIDS (TSS)

Technology-Based Effluent Limit
Subchapter II of Chapter NR 217, Wis. Adm. Code, requires municipal wastewater treatment facilities that discharge greater than 150 pounds of total phosphorus per month to comply with a monthly average limit of 1.0 mg/L, or an approved alternative concentration limit.

Because the Town of Plymouth Sanitary District #1 WWTF does not currently have an existing technology-based limit, the need for this limit in the reissued permit is evaluated. The data demonstrates that the annual monthly average phosphorus loading is less than 150 lbs/month, which is the threshold for municipalities in accordance to s. NR 217.04(1)(a)1, Wis. Adm. Code, and therefore no technology-based limit is required.

Annual Average Mass Total Phosphorus Loading

Month	Average Phosphorus Concentration (mg/L)	Total Effluent Flow (Million Gallons)	Calculated Mass (lbs/month)
January 2024	0.66	0.017	11
February 2024	0.49	0.03	9.5
March 2024	0.94	0.047	11
April 2024	1.42	0.016	17
May 2024	0.49	0.095	6.2
June 2024	2.8	0.064	32
July 2024	2.0	0.025	16
August 2024	0.80	0.0051	6.6

September 2024	0.15	0.017	1.9
November 2024	0.33	0.011	2.7
December 2024	0.53	0.017	6.0
Average			**25**

Total P (lbs/month) = Monthly average (mg/L) × total flow (MG/month) × 8.34 (lbs/gallon)
Where total flow is the sum of the actual flow (MGD) for that month

In addition, the need for a WQBEL for phosphorus must be considered.

Water Quality-Based Effluent Limits (WQBEL)
Revisions to administrative rules regulating phosphorus took effect on December 1, 2010. These rule revisions include additions to s. NR 102.06, Wis. Adm. Code, which establish phosphorus standards for surface waters. Subchapter III of NR 217, Wis. Adm. Code, establishes procedures for determining WQBELs for phosphorus, based on the applicable standards in ch. NR 102, Wis. Adm. Code.

Section NR 217.16, Wis. Adm. Code, states that the Department may include a TMDL-derived WQBEL for phosphorus in addition to, or in lieu of, a s. NR 217.13 WQBEL in a WPDES permit. Because the discharge is to the Bass River, which is an impaired segment covered under an approved TMDL, the TMDL-based limit is protective of the immediate receiving water as well as downstream waters and can be included in the WPDES permit absent the s. NR 217.13 WQBEL. This limit should be expressed in a manner consistent with the wasteload allocation and assumptions of the TMDL. If after two permit terms, the Department determines the nonpoint source load allocation has not been substantially reduced, the Department may include the s. NR 217.13 WQBEL unless these reductions are likely to occur.

Effluent Data
The following table summarizes effluent total phosphorus monitoring data from September 2020 to August 2025.

Total Phosphorus Effluent Data

	Phosphorus mg/L
1-day P_{99}	3.1
4-day P_{99}	2.1
30-day P_{99}	1.6
Mean*	1.4
Std	0.55
Sample size	110
Range	0.5 - 2.8

Phosphorus lbs/day	**January**	**February**	**March**	**April**
Mean	0.24	0.24	0.23	0.13
Std	0.11	0.09	0.17	0.05
Sample size	10	10	10	10
Range	0.09- 0.41	0.1 - 0.36	0.04 - 0.62	0.1 - 0.22

Phosphorus lbs/day	May	June	July	August
Mean	0.13	0.07	0.19	0.09
Std	0.05	0.06	0.31	0.05
Sample size	10	9	10	8
Range	0.08 - 0.22	0.02 - 0.18	0.004 - 1.06	0.086 - 0.16

Phosphorus lbs/day	September	October	November	December
Mean	0.10	0.10	0.08	0.17
Std	0.07	0.08	0.04	0.07
Sample size	7	8	10	10
Range	0.02 - 0.22	0.02 - 0.28	0.027 - 0.14	0.06 - 0.32

TMDL Limits

Total phosphorus (TP) effluent limits in lbs/day are calculated as recommended in the *TMDL Development and Implementation Guidance: Integrating the WPDES and Impaired Waters Programs (April 2020)* and are based on the annual phosphorus wasteload allocation (WLA) given in lbs/yr. This WLA is found in Appendix P(pg. 147) of *Total Maximum Daily Loads for Total Phosphorus and Total Suspended Solids in the Rock River Basin* report (*July 2011)* and is expressed as a maximum annual load (lbs/yr). These limits are equivalent to concentrations ranging from 2.2 mg/L to 7.1 mg/L at the facility design flow of 0.03 MGD. **Monthly average mass effluent limits with accordance to the following table are recommended for the discharge.**

Total Phosphorus Effluent Limitations

Month	Monthly Total P WLA[1] (lbs/month)	Days Per Month	Monthly Ave Total P Effluent Limit[2] (lbs/day)
Jan	54.75	31	1.766
Feb	49.21	28	1.758
March	34.67	31	1.118
April	22.67	30	0.756
May	19.46	31	0.628
June	21.05	30	0.702
July	21.37	31	0.689
Aug	16.83	31	0.543
Sept	18.33	30	0.611
Oct	19.48	31	0.628
Nov	28.92	30	0.964
Dec	39.97	31	1.289

Footnotes:

1- Rock River TMDL Appendix P. Monthly Total Phosphorus Allocations by Wastewater Treatment Facility (p. 147)

2- Monthly Average Total P Effluent Limit (lbs/day) = Monthly Total P WLA (lbs/month) ÷ days per month

The current concentration limit of 4.2 mg/L, which is included in the current permit, and was carried over from the previous permit, where it was the 1-day P_{99} of data taken from April 2009 – June 2011. This limit should be retained in the reissued permit to prevent anti-degradation and anti-backsliding.

Point of Discharge Limits – Phosphorus

Section NR 217.16, Wis. Adm. Code, states that the Department may include a TMDL-derived water quality-based effluent limit (WQBEL) for phosphorus in addition to, or in lieu of, a s. NR 217.13 WQBEL in a WPDES permit. The Rock River Basin TMDL was developed to protect and improve the water quality of phosphorus-impaired waters within the basin. Allocations for the Town of Plymouth Sanitary District #1 WWTF were based upon 0.075 mg/L water quality criteria within Bass Creek. Therefore, the TMDL wasteload allocations are considered protective of the receiving water and do not require additional s. NR 217.13, Wis. Adm. Code, limits. If after two permit terms, the Department determines the nonpoint source load allocation has not been substantially reduced, the Department may include the s. NR 217.13 WQBEL unless these reductions are likely to occur.

Total Suspended Solids (TSS)

TMDL Limits

Total Suspended Solids (TSS) effluent limits in lbs/day are calculated as recommended in the *TMDL Development and Implementation Guidance: Integrating the WPDES and Impaired Waters Programs (April 2020).* This WLA is found in Appendix Q(pg. 150) of *Total Maximum Daily Loads for Total Phosphorus and Total Suspended Solids in the Rock River Basin* report (*July 2011)*are expressed as maximum annual loads (lbs/year). These limits are equivalent to concentrations ranging from 14.19 mg/L to 28.1 mg/L at the facility design flow of 0.03 MGD. **Monthly average mass effluent limits with accordance to the following table are recommended for the discharge.**

Total Suspended Solids Limitations

Month	Monthly TSS WLA[1] (lbs/month)	Weekly Ave TSS Effluent Limit (lbs/day)
Jan	14.19	23.3
Feb	17.14	28.1
March	14.19	23.3
April	14.67	24.1
May	14.19	23.3
June	14.67	24.1
July	14.19	23.3
Aug	14.19	23.3
Sept	14.67	24.1
Oct	14.19	23.3
Nov	14.67	24.1
Dec	14.19	23.3

The current concentration limit of 60 mg/L is a variance limit according to s. NR 210.07(2), Wis. Adm. Code, where aerated lagoons and stabilization ponds are the principal treatment processes and **should be retained the reissued permit to prevent anti-degradation and anti-backsliding.**

Effluent Data

The following table summarizes effluent total phosphorus monitoring data from September 2020 to August 2025.

Total Suspended Solids Effluent Data

	TSS mg/L
1-day P_{99}	55
4-day P_{99}	33
30-day P_{99}	22
Mean*	17
Std	10.69
Sample size	109
Range	<0 - 69

TSS lbs/day	January	February	March	April
Mean	1.7	1.8	1.9	1.8
Std	0.87	1.2	1.3	2.0
Sample size	10	10	10	10
Range	0.46 - 2.8	0.45 - 4.6	0.31 - 3.6	0.22 - 6.8

TSS lbs/day	May	June	July	August
Mean	0.33	0.90	4.6	2.3
Std	0.30	0.53	5.3	2.3
Sample size	9	8	10	8
Range	0.00001- 0.92	0.90 - 1.9	0.19 - 17	0.27 - 7

Phosphorus lbs/day	September	October	November	December
Mean	2.5	2.8	1.8	1.7
Std	2.0	2.4	1.2	0.74
Sample size	6	7	10	10
Range	0.17 - 5.8	0.84 - 7.4	0.2 - 3.78	0.62 - 2.7

PART 6 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR THERMAL

Surface water quality standards for temperature took effect on October 1, 2010. These regulations are detailed in chs. NR 102 (Subchapter II – Water Quality Standards for Temperature) and NR 106 (Subchapter V – Effluent Limitations for Temperature) of the Wisconsin Administrative Code. Daily maximum and weekly average temperature criteria are available for the 12 different months of the year depending on the receiving water classification.

Due to the amount of upstream flow available for dilution in the limit calculation (Qs:Qe >35.5:1), the lowest calculated limitation is 120° F (s. NR 106.55(6)(a), Wis. Adm. Code).

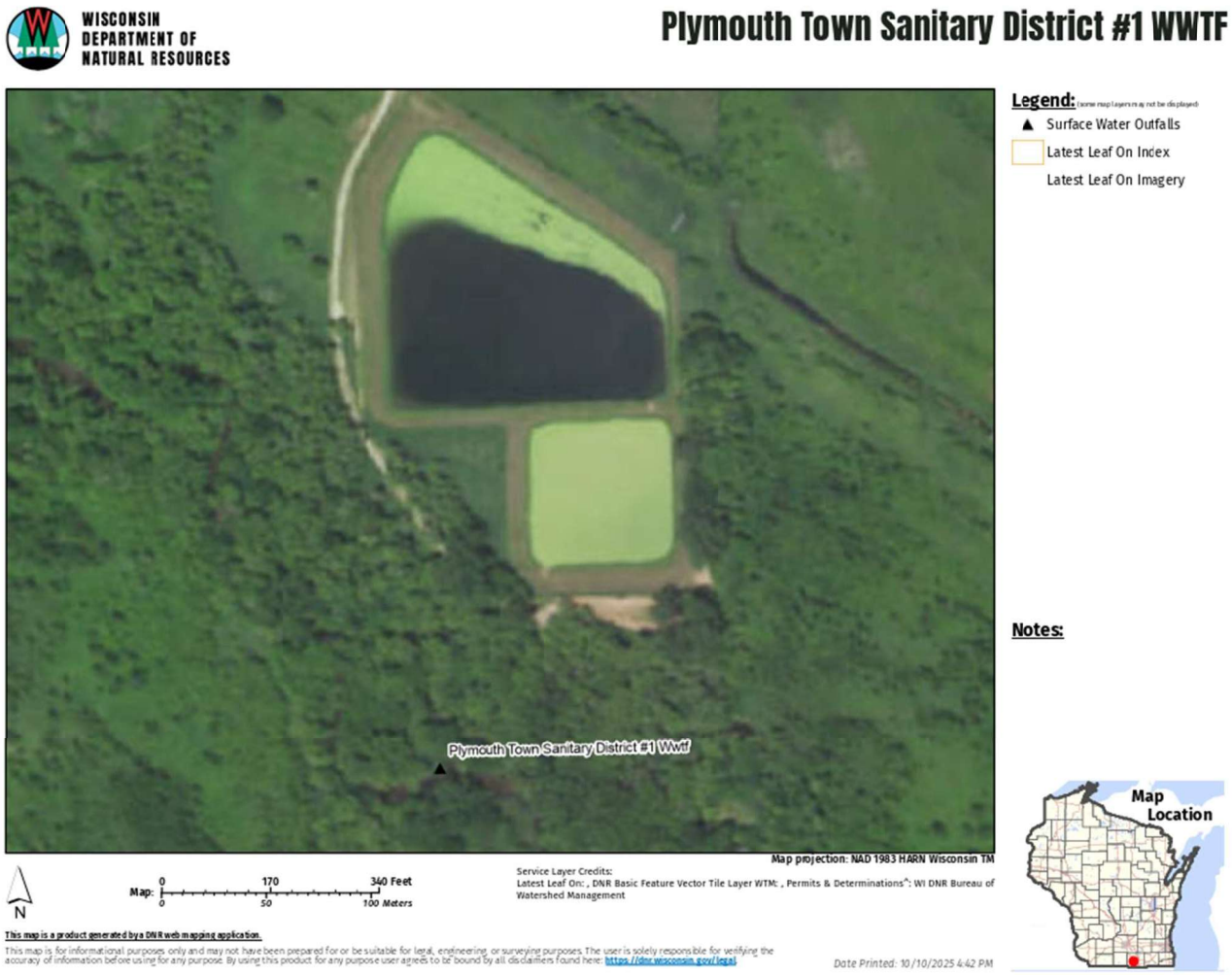
At temperatures above approximately 103° F, conventional biological treatment systems do not function properly and experience upsets. There is no indication that this has ever occurred in this treatment system. Therefore, there is no reasonable potential for the discharge to exceed this limit. **No monitoring or effluent limits are recommended for temperature.**

PART 7 – WHOLE EFFLUENT TOXICITY (WET)

WET testing is used to measure, predict, and control the discharge of toxic materials that may be harmful to aquatic life. In WET tests, organisms are exposed to a series of effluent concentrations for a given time and effects are recorded. Decisions below related to the selection of representative data and the need for WET limits were made according to ss. NR 106.08 and 106.09, Wis. Adm. Code. WET monitoring frequency and toxicity reduction evaluation (TRE) recommendations were made using the best professional judgment of staff familiar with the discharge after consideration of the guidance in the *Whole Effluent Toxicity (WET) Program Guidance Document* (2022).

Guidance in Chapter 1.11 of the WET Guidance Document (WET Testing of Minor Municipal Discharges) was consulted. This is a minor municipal discharge (< 1.0 MGD) comprised solely of domestic wastewater, with no history of WET failures and no toxic compounds detected at levels of concern. **No WET testing is recommended at this time because of the low risk in effluent toxicity.**

Site Map:


WISCONSIN
DEPARTMENT OF
NATURAL RESOURCES
Plymouth Town Sanitary District #1 WWTF
Legend:
Surface Water Outfalls
Latest Leaf On Index
Latest Leaf On Imagery
Notes:
Plymouth Town Sanitary District #1 Wwtf
Map projection: NAD 1983 HARN Wisconsin TM
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Map:
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170
340 Feet
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50
100 Meters
Service Layer Credits:
Latest Leaf On: , DNR Basic Feature Vector Tile Layer WTM: , Permits & Determinations^: WI DNR Bureau of Watershed Management
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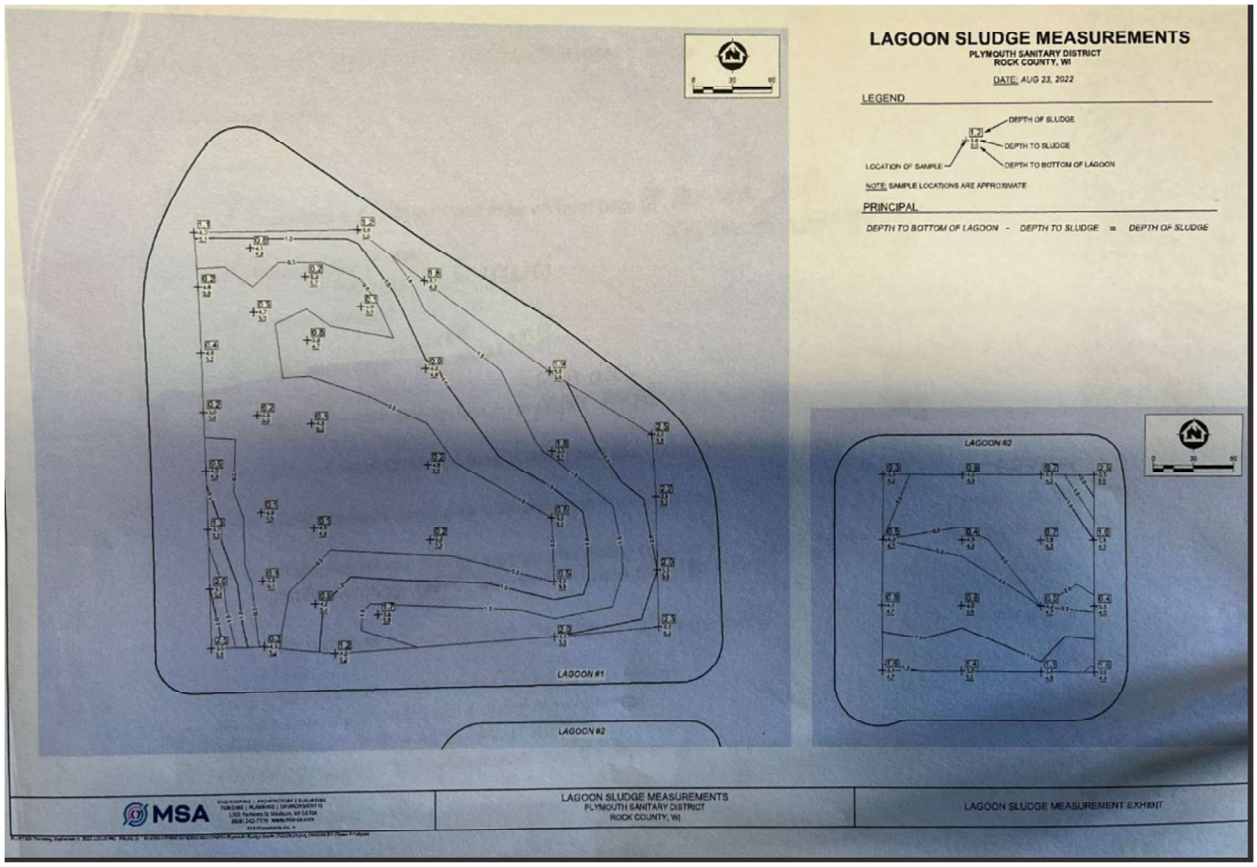
Date Printed: 10/10/2025 4:42 PM
Map Location

Attachment #3

Lagoon Volumetric Capacity Information:



Ammonia Nitrogen calculations from the WQBEL memo dated September 22, 2014

		Spring	Summer	Winter
		April & May	June – Sept.	Oct. - March
Effluent Flow	Qe (MGD)	0.03	0.03	0.03
Background Information	7-Q_{10} (cfs)	6.6	6.6	6.6
	7-Q_2 (cfs)	8.54	8.54	8.54
	Ammonia (mg/L)	0.09	0.07	0.17
	Temperature (°C)	9	23	3
	pH (s.u.)	7.82	7.95	7.82
	% of Flow used	25	100	25
	Reference Weekly Flow (cfs)	1.65	6.6	1.65
	Reference Monthly Flow (cfs)	1.81	7.26	1.81
Criteria mg/L	4-day Chronic			
	Early Life Stages Present	7.76	3.78	7.76
	Early Life Stages Absent	11.08	3.78	12.60
	30-day Chronic			
	Early Life Stages Present	3.10	1.51	3.10
	Early Life Stages Absent	4.43	1.51	5.04
Effluent Limitations mg/L	Weekly Average			
	Early Life Stages Present	280.41	531.33	277.56
	Early Life Stages Absent	401.60		454.47
	Monthly Average			
	Early Life Stages Present	120.94	227.03	117.81
	Early Life Stages Absent	174.13		195.45

Note in 2020: A new estimate for the 7-Q_2 is higher than the 7-Q_2 value that was used to calculate the limits above. While this would change the calculated limits, the daily limits are more restrictive, and the recommendations do not change.

7-Q_{10} Estimate for Bass Creek:

CORRESPONDENCE/MEMORANDUM — **State of Wisconsin**

DATE: August 8, 1997 FILE REF:

TO: Roger Schlesser - SCR

FROM: Eric Rortvedt - WT/2

SUBJECT: $_7Q_{10}$ Estimate for Bass Creek - near Hanover

RECEIVED AUG 11 1997 DEPT. OF NATURAL RESOURCES SOUTH CENTRAL REGION

You requested a $_7Q_{10}$ estimate for Bass Creek at the south line of the SE 1/4, NE 1/4, Section 14, T2N-R11E in Rock County.

The two closest USGS $_7Q_{10}$ estimates available on Bass Creek are as follows:

Locations	$_7Q_{10}$	$Q_{7,2}$	Drainage Area
Station LR60 (@ State HWY 11, 0.7 mi. south of Footville)	3.4 cfs	4.4	14.0 squ. mi.
Station #05430600 (@ at country road in SE 1/4, NW 1/4, Sec. 24,T2N-R11E)	7.7 cfs		58.1 squ. mi.

The location of concern has a drainage area of approximately 49.5 squ. mi.. Since the location of concern is relatively close to Station # 05430600, the $_7Q_{10}$ can be calculated because on difference in the size of their drainage areas as follows:

$$_7Q_{10} = 7.7 \text{ cfs} \times (49.5 / 58.1)$$

$$_7Q_{10} = 6.6 \text{ cfs}$$

find $Q_{7,2}$ at station #05430600

If you have any questions, please call me at 264-6273.

Attachment: Location Map