Village of Arpin Public Noticed Permit Fact Sheet

General Information

Permit Number:	WI-0031267-08-0
Permittee Name:	Village of Arpin, 6190 Main Street, PO Box 38, Arpin WI 54410
Discharge Location:	Arpin Wastewater Treatment Facility, 6190 Main Street, Arpin WI 54410 North bank of Hemlock Creek, ¼ mile downstream of North Church St., ¼ mile upstream of Hwy 186. Lat.: N44°30'00'', Long.: 90° 00'7.5"
Receiving Water:	West Branch of Hemlock Creek (Arpin Branch) located in the Hemlock Creek Watershed (Central Wisconsin River Basin) in Wood County
StreamFlow ($Q_{7,10}$):	0 cfs
Stream Classification:	Limited aquatic life (LAL), non-public water supply
Discharge Type:	Existing, continuous
Design Flows	0.066 MGD Annual Average
Significant Industrial Loading?	None
Operator at Proper Grade?	No. Required: Basic – A3, D, P, SS. Holds: Advanced – A3, D. Needs SS and phosphorus subclass. A schedule has been included in the permit requiring the permittee have all necessary certifications.
Approved Pretreatment Program?	N/A

Facility Description

The Village of Arpin owns and operates a recirculating sand filter, biological wastewater treatment facility (WWTF). The WWTF is located in the Village of Arpin in Wood County and serves an estimated population of 330. The facility has an annual average design flow of 0.0656 million gallons per day (MGD) and had an actual annual flow of 0.0413 MGD from 01/01/2019 – 09/30/2023. There are no contributing industrial facilities to the sanitary sewer. Treatment is provided with fine screening, holding tanks, biofilters to a dosing chamber that pumps to a recirculating sand filter. A chemical feed is used to reduce phosphorus levels. Effluent is discharged to the West Branch of Hemlock Creek year-round and disinfected using ultraviolet light seasonally from May through September. Solids are removed from the septic tank as needed and hauled by a licensed contract hauler for final disposal. During the last permit term a new chemical feed system was installed. Significant effluent monitoring and/or limit changes in the upcoming permit term are as follows: 1) the addition of annual monitoring for total nitrogen, nitrite + nitrate nitrogen and total Kjeldahl nitrogen, 2) reduction in the chloride monitoring frequency, 3) an increase in the DO monitoring frequency, 4) fecal coliform monitoring and limits have been replaced with *Escherichia coli* (*E. coli*) monitoring and limits, and the monitoring frequency has been reduced from 2/week to weekly, and 5) the phosphorus mass limits per Arpin's approved wasteload allocation in the Wisconsin River Basin Total Maximum Daily Load (TMDL) have been added. The sample frequency for influent and effluent flow has been changed from "continuous" to "daily". Schedules have been included that require the permittee complete installation of all the chemical feed system components and have an operator with all proper certifications.

Substantial Compliance Determination

Enforcement During Last Permit: After a desk top review of all discharge monitoring reports, CMARs, land application reports, compliance schedule items and a facility inspection on September 11, 2023, this facility has been found to be in substantial compliance with their current permit. However, during that inspection it was determined that construction occurred to install a chemical feed system without plan approval, therefore a notice of noncompliance (NON) was sent to address this violation. A compliance schedule has been included to further address the violation.

Compliance determination entered by Logan Rubeck, Wastewater Engineer on 11/01/2023**.**

Sample Point Designation		
Sample Point Number	**Discharge Flow, Units, and Averaging Period**	**Sample Point Location, WasteType/sample Contents and Treatment Description (as applicable)**
702	0.0442 MGD (1/1/2019-9/30/2023)	Representative 24-Hr flow proportional composite samples shall be collected in the fine screen room before the fine screen.
003	0.0413 MGD (1/1/2019-9/30/2023)	Representative 24-Hr flow proportional composite samples shall be collected in the effluent channel immediately after the flow meter located between the sand filter and splitter box. Representative grab samples shall be collected at the far end of the splitter box (pH and DO) and bacteria grab samples are collected in the channel directly after UV disinfection.
901		Solids from septic tank of the wastewater treatment facility

1 Influent – Monitoring Requirements

Sample Point Number: 702- INFLUENT

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Continuous	
BOD5, Total		mg/L	2/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total		mg/L	2/Week	24-Hr Flow Prop Comp	

Changes from Previous Permit:

The sample frequency for flow has been changed from “continuous” to “daily” for eDMR reporting purposes.

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

Sample Point Number: 003- EFFLUENT to HEMLOCK CREEK

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Continuous	
BOD5, Total	Monthly Avg	20 mg/L	2/Week	24-Hr Flow Prop Comp	
BOD5, Total	Weekly Avg	30 mg/L	2/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total	Monthly Avg	20 mg/L	2/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total	Weekly Avg	30 mg/L	2/Week	24-Hr Flow Prop Comp	
pH Field	Daily Max	9.0 su	Daily	Grab	
pH Field	Daily Min	6.0 su	Daily	Grab	
Dissolved Oxygen	Daily Min	4.0 mg/L	Daily	Grab	
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	6.4 mg/L	2/Week	24-Hr Flow Prop Comp	Limit applies May - Sept
Nitrogen, Ammonia (NH3-N) Total	Monthly Avg	2.5 mg/L	2/Week	24-Hr Flow Prop Comp	Limit applies May - Sept
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	26 mg/L	2/Week	24-Hr Flow Prop Comp	Limit applies Oct - April
Nitrogen, Ammonia (NH3-N) Total	Monthly Avg	10 mg/L	2/Week	24-Hr Flow Prop Comp	Limit applies Oct - April
E. coli	Geometric Mean - Monthly	126 #/100 ml	Weekly	Grab	Limit & monitoring apply May - Sept
E. coli	% Exceedance	10 Percent	Monthly	Calculated	Limit & monitoring apply May - Sept
Chloride		mg/L	Monthly	24-Hr Flow Prop Comp	
Phosphorus, Total	Monthly Avg	1.0 mg/L	2/Week	24-Hr Flow Prop Comp	See TMDL section below
Phosphorus, Total	6-Month Avg	0.14 lbs/day	2/Week	Calculated	See TMDL section below
Phosphorus, Total	Monthly Avg	0.42 lbs/day	2/Week	Calculated	See TMDL section below
Phosphorus, Total		lbs/month	2/Week	Calculated	Calculate the Total Monthly Discharge of

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
					phosphorus and report on the last day of the month on the DMR. See TMDL section below.
Phosphorus, Total		lbs/yr	2/Week	Calculated	Calculate the 12-Month Rolling Sum of Total Monthly mass of phosphorus discharged and report on the last day of the month on the DMR. See TMDL section below.
Nitrogen, Total Kjeldahl		mg/L	See Listed Qtr(s)	24-Hr Flow Prop Comp	Monitoring required annually in specific quarters. See Nitrogen Series Monitoring section below.
Nitrogen, Nitrite + Nitrate Total		mg/L	See Listed Qtr(s)	24-Hr Flow Prop Comp	
Nitrogen, Total		mg/L	See Listed Qtr(s)	Calculated	

Changes from Previous Permit

1) the addition of annual monitoring for total nitrogen, nitrite + nitrate nitrogen and total Kjeldahl nitrogen, 2) the chloride monitoring frequency has been reduced from 4/month to monthly, 3) the DO monitoring frequency increased from weekly to daily, 4) the sample frequency for flow has been changed from "continuous" to "daily" for eDMR reporting purposes, and 5) Fecal coliform monitoring and limits have been replaced with Escherichia coli (E. coli) monitoring and limits, and the monitoring frequency has been reduced from 2/week to weekly, and 6) the phosphorus mass limits per Arpin's wasteload allocation in the Wisconsin River Basin Total Maximum Daily Load (TMDL) have been added.

Explanation of Limits and Monitoring Requirements

The effluent monitoring frequency for all parameters were considered. Monitoring frequencies are based on the size and type of the facility and are established to best characterize effluent quality and variability, to detect events of noncompliance, and to ensure fairness and consistency in permits issued across the state. Requirements in administrative code (NR 108, 205, 210 and 214 Wis. Adm. Code) and Section 283.55, Wis. Stats. were considered, where applicable, when determining the appropriate monitoring frequencies for pollutants that have final effluent limits in effect during this permit term. For more information see the March 22, 2021 version of the Bureau of Water Quality Program Guidance Document "Monitoring Frequencies for Individual Wastewater Permits". Using the criteria previously stated, the department has determined the DO monitoring will be increased from weekly to daily, the chloride monitoring frequency will be decreased from 4/month to monthly, and the flow frequency will be changed from continuous to daily as mentioned above.

Limits were determined for Arpin's existing discharge to the tributary to Hemlock Creek using chs. NR 102, 105, 106, 205, 210 and 217 of the Wisconsin Administrative Code (where applicable). For additional information on any of the limits see the November 2, 2023 memo from Ben Hartenbower to Holly Heldstab titled "Water Quality-Based Effluent Limitations for the Arpin Wastewater Treatment Facility WPDES Permit No. WI-0031267".

MUNICIPAL EFFLUENT LIMITS –In accordance with the federal regulation 40 CFR 122.45(d), and to comply with the expression of limits requirements in ss. NR 106.07 and NR 205.065(7), Wis. Adm. Codes, limits in this permit are to be expressed as weekly average and monthly average limits whenever practicable.

BOD, TSS, pH and Dissolved Oxygen (DO): Other than the increase in the DO monitoring frequency as discussed above, monitoring and limits for these pollutants correspond to the requirements of the current permit. The facility has not increased the capacity of the wastewater treatment system since the last permit issuance, nor are increases expected during this permit term.

Ammonia: Current acute and chronic ammonia toxicity criteria for the protection of aquatic life are included in Tables 2C and 4B of ch. NR 105, Wis. Adm. Code. Subchapter IV of ch. NR 106 establishes the procedure for calculating water quality based effluent limitations (WQBELs) for ammonia. Based on effluent ammonia data submitted with the permit reissuance application, seasonally variable weekly average and monthly average ammonia limits are required. Weekly average limits are required to meet the requirements of s. NR 106.07 Wis. Adm. Code.

***E. coli*/Disinfection:** Arpin disinfects the effluent May-Sept using UV light prior to discharge to West Branch of Hemlock Creek. Revisions to bacteria surface water quality criteria to protect recreational uses and accompanying E. coli WPDES permit implementation procedures became effective May 1, 2020. The new rule requires that WPDES permits for facilities with required disinfection include monitoring for E. coli while facilities are disinfecting during the recreation period, and establish effluent limitations for E. coli established in s. NR 210.06 (2), Wis. Adm Code. The administrative code rule changes included the following actions: revised the bacteria water quality criteria from fecal coliform to E. coli to protect recreation in ch. NR 102, Wis. Adm. Code.; removed fecal coliform criteria for certain individual waters from ch. NR 104, Wis. Adm. Code.; revised permit requirements for publicly and privately owned sewage treatment works in ch. NR 210, Wis. Adm. Code.; and, updated approved analytical methods for bacteria in ch. NR 219, Wis. Adm. Code.

Chloride: Acute and chronic chloride toxicity criteria for the protection of aquatic life are included in Tables 1 and 5 of ch. NR 105, Wis. Adm. Code. Subchapter VII of ch. NR 106 establishes the procedure for calculating water quality based effluent limitations (WQBELs) for chloride. In previous permits, Arpin completed chloride source reduction measures as part of an approved chloride variance which reduced effluent chloride concentrations significantly. When the representative data is compared to the calculated limits, the data shows there is no reasonable potential for Arpin to exceed the calculated limits. Therefore, no chloride limits are included in the permit. However, Arpin should continue to implement chloride source reduction measures and monitor effluent chloride concentrations monthly. The sample frequency of 4/month that was required in the last permit term has been decreased to monthly as it's believed representative chloride effluent data will still be provided at this frequency.

Phosphorus: Phosphorus requirements are based on the Phosphorus Rules that became effective 12/1/2010 as detailed in NR 102 Water Quality Standards and NR 217 Effluent Standards and Limitations for Phosphorus. Chapter NR 217 of the Wis. Adm. Code addresses point source dischargers of phosphorus to surface waters. NR 217 also specifies WQBELs for discharges of phosphorus to surface waters of the state from publicly and privately owned wastewater facilities and a facility/site that is regulated under NR 216 where the standards in NR151 and 216 are not sufficient to meet phosphorus criteria. WQBELs for phosphorus are needed whenever the discharge contains phosphorus at concentrations or loadings that will cause or contribute to an exceedance of the water quality standards.

Arpin is included within the Wisconsin River Basin TMDL, which was approved by EPA April 26, 2019. The TMDL establishes Waste Load Allocations (WLAs) for point source dischargers and determines the maximum amounts of phosphorus that can be discharged and still protect water quality. The final effluent limits and monitoring expressed in the permit were derived from Site-Specific Criteria (SSC) for Lakes Petenwell, Castle Rock, and Wisconsin originally included in Appendix K of the TMDL report and approved by the U.S. Environmental Protection Agency on July 9, 2020. The permittee's approved TMDL SSC-based limits are consistent with the assumptions and requirements of the EPA-approved WLA in the TMDL, which is 42 lbs/yr annual total, which equates to limits of 0.42 lbs/day (monthly average) and 0.14 lbs/day (6-month average). The monthly average limit of 1.0 mg/L remains in the permit to prevent backsliding.

As outlined in Section 4.6 of the department's *TMDL Development and Implementation Guidance: Integrating the WPDES and Impaired Waters Program*, mass limits must be given in the permit that are consistent with the TMDL WLA

and the phosphorus impracticability agreement that was approved by USEPA in 2012 (see NPDES MOA Addendum dated July 12, 2012 at https://prodoasint.dnr.wi.gov/swims/downloadDocument.do?id=167886175). For the reasons explained in the April 30, 2012 paper entitled 'Justification for Use of Monthly, Growing Season and Annual Average Periods for Expression of WPDES Permit Limits for Phosphorus Discharges in Wisconsin', WDNR has determined that it is impracticable to express the phosphorus WQBEL for the permittee as a maximum daily or weekly value. The final effluent limit for phosphorus is expressed as a monthly average. This final effluent limit was derived from and complies with the applicable water quality criterion.

Total Nitrogen Monitoring (NO2+NO3, TKN and Total N): The Department has included effluent monitoring for Total Nitrogen in the permit through the authority under §§ 283.55(1)(e), Wis. Stats., which allows the department to require the permittee to submit information necessary to identify the type and quantity of any pollutants discharged from the point source, and through s. NR 200.065(1)(h), Wis. Adm. Code, which allows for this monitoring to be collected during the permit term. More information on the justification to include total nitrogen monitoring in wastewater permits can be found in the "Guidance for Total Nitrogen Monitoring in Wastewater Permits" dated October 1, 2019. Annual tests are scheduled in the following rotating quarters:

- 2nd quarter (April – June) 2024
- 4th quarter (October – December) 2025
- 3rd quarter (July – September) 2026
- 1st quarter (January – March) 2027
- 2nd quarter (April – June) 2028

PFOS and PFOA: NR 106 Subchapter VIII – Permit Requirements for PFOS and PFOA Dischargers became effective on August 1, 2022. Pursuant to s. NR 106.98(3)(b), Wis. Adm. Code, the department evaluated the need for PFOS and PFOA monitoring taking into consideration the presence of potential PFOS or PFOA industrial wastes, remediation sites and other potential sources of PFOS or PFOA. Based on information available at the time the proposed permit was drafted, the department has determined the permittee does not need to sample for PFOS or PFOA as part of this permit reissuance. 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.

Whole Effluent Toxicity (WET): Whole effluent toxicity (WET) testing requirements and limits (if applicable) are determined in accordance with ss. NR 106.08 and NR 106.09 Wis. Adm. Code, as revised in August 2016. (See the current version of the Whole Effluent Toxicity Program Guidance Document and checklist and WET information, guidance and test methods at http://dnr.wi.gov/topic/wastewater/wet.html). No WET testing is required because information related to the discharge indicates low to no risk for toxicity**.**

Mercury: The permit application did not require monitoring for mercury because the Arpin Wastewater Treatment Facility 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." Sludge sample data are not available because the Arpin WWTF is a recirculating sand filter and generates solids which are hauled away as septage. Based on similar municipal treatment plants and the lack of industrial influent to the Arpin WWTF however, it is not expected that there are exceedances of the high-quality mercury concentration. Therefore, no mercury monitoring is required at Outfall 003.

Thermal: Requirements for Temperature are included in NR 102 Subchapter II Water Quality Standards for Temperature and NR 106 Subchapter V Effluent Limitations for Temperature. The daily maximum effluent temperature limitation shall be 86 °F for discharges to surface waters classified as Limited Aquatic Life according to s. NR 104.02(3)(b)1, Wis. Adm. Code, except for those classified as wastewater effluent channels and wetlands regulated under ch. NR 103 [s. NR 106.55(2), Wis. Adm. Code] which has a daily maximum effluent temperature limitation of 120 °F. For treatment systems like Arpin, which operates a recycling sand filter system and consists mainly of domestic waste, there is no reasonable potential for the discharge to exceed this limit. Therefore, temperature limits nor monitoring are not required.

3 Septage Management - Monitoring and Limitations

Septage management is required in accordance ch. NR 113, Wisconsin Administrative Code. Records must be kept and made available to the Department on request. Required record keeping includes volumes of septage pumped, dates when the septage was removed, land application site DNR number and method used to satisfy pathogen and vector control, and/or the treatment plant where septage is disposed. Annual reporting is required when the permittee land applies the septage. Annual reporting is also required when the permittee disposes of septage at a designated treatment facility.

Sample Point Number: 901- Septic Tank

Changes from Previous Permit:

No changes

Explanation of Limits and Monitoring Requirements

Requirements for septage management are determined in accordance with ch. NR 113, Wis. Adm. Code.

4 Schedules

4.1 Complete Installation of Chemical Feed System

Required Action	Due Date
Initiate Installation: Permittee shall initiate installation of the final components of the chemical feed system per the Plans & Specifications approved by the Department.	06/30/2024
Complete Installation: Permittee shall complete installation of the final components of the chemical feed system per the Plans & Specifications approved by the Department.	09/30/2024

Explanation of schedule: During a facility inspection on September 11, 2023, it was determined that Arpin constructed a chemical feed system for phosphorus removal without final plans and specifications being submitted to and approved by the Department per Section 281.41, Wis. Stats. And s. NR 108.03, Wis. Adm. Code. Therefore, a notice of noncompliance (NON) was sent to address this violation. This compliance schedule further addresses the violation and brings the permittee into compliance. See the NON dated 10/20/2023 from Logan Rubeck sent to the Village of Arpin.

4.2 Operator Certification

Required Action	Due Date
Operator Certification: Per s. NR 114.53 Wis. Adm. Code, the permittee shall have an operator in charge with the proper certification by the due date. Within 30 days of receiving certification, the permittee shall notify the department in writing of the certified operator's name and certification number with all proper certification.	09/30/2024

Explanation of Schedule: Per s. NR 114.53 Wis. Adm. Code, Arpin WWTF must have an operator in charge that holds all certifications at the proper level.

Special Reporting Requirements

None

Other Comments:

Publishing newspaper: The Daily Tribune, 220 1st Ave. South, Wisconsin Rapids, WI 54494-8090

Attachments:

Water Quality Based Effluent Limits: November 2, 2023 memo from Ben Hartenbower to Holly Heldstab titled “Water Quality-Based Effluent Limitations for the Arpin Wastewater Treatment Facility WPDES Permit No. WI-0031267”.

Expiration Date:

March 31, 2029

Justification Of Any Waivers From Permit Application Requirements

N/A

Prepared By: Holly Heldstab, Wastewater Specialist **Date:** February 1, 2024

CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: December 21, 2023

TO: Holly Heldstab– WCR/Eau Claire

FROM: Benjamin Hartenbower – WCR/Eau Claire

SUBJECT: Water Quality-Based Effluent Limitations for the Arpin Wastewater Treatment Facility WPDES Permit No. WI-0031267

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 Arpin Wastewater Treatment Facility in Wood County. This municipal wastewater treatment facility (WWTF) discharges to Hemlock Creek, located in the Hemlock Creek Watershed in the Central Wisconsin River Basin. This discharge is included in the Wisconsin River TMDL as approved by EPA on April 26, 2019 with site-specific criteria approved by EPA on July 9, 2020. 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 003:

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Flow Rate						1,2
BOD_5	30 mg/L			20 mg/L		1
TSS	30 mg/L			20 mg/L		1
pH	9.0 s.u.	6.0 s.u.				1
Dissolved Oxygen		4.0 mg/L				1
Ammonia Nitrogen May-September October-April			 6.4 mg/L 26 mg/L	 2.5 mg/L 10 mg/L		1
Bacteria *E. coli*				 126#/100 mL geometric mean		3
Chloride						1,2
Phosphorus TMDL Limit				 0.42 lbs/day	 0.14 lbs/day	4
TKN, Nitrate+Nitrite, and Total Nitrogen						5

Footnotes:

1. No changes from the current permit.
2. Monitoring only.
3. Bacteria limits apply during the disinfection season of May-September. Additional limit: No more than 10 percent of *E. coli* bacteria samples collected in any calendar month may exceed 410 count/100 mL.
4. The phosphorus mass limit is based on the Total Maximum Daily Load (TMDL) for the Wisconsin River Basin to address phosphorus water quality impairments within the TMDL area. The TMDL was approved by EPA on April 26, 2019 with site-specific criteria approved by EPA on July 9, 2020.

5. 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. 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 Benjamin Hartenbower at (715) 225-4705 or Benjamin.Hartenbower@wisconsin.gov or Diane Figiel at Diane.Figiel@wisconsin.gov.

Attachments (2) – Narrative & Map

PREPARED BY: _____ Date: 12/21/2023

Benjamin Hartenbower, PE,
Water Resources Engineer

E-cc:

Logan Rubeck, Wastewater Engineer – WCR/Eau Claire
Geisa Thielen, Regional Wastewater Supervisor – WCR/Eau Claire
Diane Figiel, Water Resources Engineer – WY/3
Scott Provost, Water Quality Biologist – WCR/Wisconsin Rapids
Nate Willis, Wastewater Engineer – WY/3

Attachment #1

Water Quality-Based Effluent Limitations for the Arpin Wastewater Treatment Facility WPDES Permit No. WI-0031267

Prepared by: Benjamin P. Hartenbower

PART 1 – BACKGROUND INFORMATION

Facility Description:
The Village of Arpin operates a recirculating sand filter biological wastewater treatment facility. Treatment includes fine screening, holding tanks, biofilters to a dosing chamber that pumps to a recirculating sand filter, and ultraviolet disinfection. A chemical feed is used to reduce phosphorus levels. The outfall is located on the west branch of the Hemlock creek 1/4 mile down stream from Church Road bridge.

Attachment #2 is a map of the area showing the approximate location of Outfall 003.

Existing Permit Limitations
The current permit, expiring on December 31, 2023, includes the following effluent limitations and monitoring requirements.

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Footnotes
Flow Rate					1,2
BOD_5	30 mg/L			20 mg/L	1
TSS	30 mg/L			20 mg/L	1
pH	9.0 s.u.	6.0 s.u.			1
Dissolved Oxygen		4.0 mg/L			1
Ammonia Nitrogen May-September October-April			 6.4 mg/L 26 mg/L	 2.5 mg/L 10 mg/L	
Fecal Coliform May-September			 780#/100 mL geometric mean	 400#/100 mL geometric mean	
Chloride					2
Phosphorus Interim HAC Interim Limit				 3.6 mg/L 1.0 mg/L	3

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. Monitoring only.
3. Under the phosphorus variance, a highest attainable condition (HAC) limit of 1.0 mg/L was effective November 1, 2022.

Receiving Water Information

- Name: Hemlock Creek
- Waterbody Identification Code (WBIC): 1366300
- Classification used in accordance with chs. NR 102 and 104, Wis. Adm. Code: Limited Aquatic Life (LAL), non-public water supply.
- Low flows used in accordance with chs. NR 106 and 217, Wis. Adm. Code: :
  $7\text{-}Q_{10} = 0$ cfs
  $7\text{-}Q_{2} = 0$ cfs
  Harmonic Mean Flow = 0 cfs
- Hardness = 245 mg/L as $CaCO_3$. This value represents the geometric mean effluent data. Effluent hardness is used in place of receiving water because there is no receiving water flow upstream of the discharge.
- % of low flow used to calculate limits in accordance with s. NR 106.06(4)(c)5., Wis. Adm. Code: Not applicable where the receiving water low flows are zero.
- Source of background concentration data: Background concentrations are not included because they do not impact the calculated WQBEL when the receiving water low flows are equal to zero.
- Multiple dischargers: The Vesper WWTF also discharges to Hemlock 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: This discharge is located within the Wisconsin River TMDL for phosphorus

Effluent Information:

- Design Flow Rates(s):
  Annual Average = 0.066 MGD (Million Gallons per Day)
  For reference, the actual average flow from January 2019 to August 2023 was 0.039 MGD.
- Hardness = 245 mg/L as $CaCO_3$. This value represents the geometric mean of 4 effluent samples collected from 06/09/2023 to 06/19/2023.
- 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 Source: Domestic wastewater with water supply from private wells.
- Additives: None
- Total Phosphorus Wasteload Allocation: 42 lbs/year = 0.115 lbs/day
- 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 hardness. The permit-required monitoring for Ammonia, Chloride, and Phosphorus from January 2019 to August 2023 is used in this evaluation.

Attachment #1

Chemical Specific Effluent Data at Outfall 003

	Chloride mg/L
1-day P_{99}	356
4-day P_{99}	276
30-day P_{99}	232
Mean	276
Std	51
Sample size	244
Range	23 - 377

Chemical Specific Effluent Data at Outfall 003

Sample Date	Copper µg/L
06/09/2023	4.891
06/12/2023	6.020
06/15/2023	4.920
06/19/2023	6.410
06/22/2023	1.990
06/26/2023	3.900
06/29/2023	5.730
07/03/2023	4.910
07/06/2023	6.660
07/10/2023	6.040
07/13/2023	5.831
1-day P_{99}	9.1
4-day P_{99}	7.0

Effluent data for substances for which a single sample was analyzed is shown in the tables in Part 2 below, in the column titled "MEAN EFFL. CONC.".

The following table presents the average concentrations and loadings at Outfall 003 from January 2019 to August 2023 for all parameters with limits in the current permit to meet the requirements of s. NR 201.03(6):

Parameter Averages with Limits

	Average Measurement
BOD_5	2.0 mg/L*
TSS	1.0 mg/L*
pH	6.40 s.u.
Dissolved Oxygen	7.50 mg/L
Ammonia Nitrogen	0.285 mg/L*
Fecal Coliform	6#/100 mL
Phosphorus	1.69 mg/L

*Results below the level 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 the case for the Arpin Wastewater Treatment Facility.

The following tables list the calculated WQBELs for this discharge along with the results of effluent sampling. 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 = 0.00 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 P99	1-day MAX. CONC.
Arsenic		339.8		339.8	68	<0.989		
Cadmium	245	80.6		80.6	16.1	<0.19		
Chromium	245	3752.9		3752.9	750.6	<1.1		
Copper	245	36.1		36.1			9.1	6.7
Lead	245	253.9		253.9	50.8	<4.3		
Nickel	245	1000.4		1000.4	200.1	3.5		
Zinc	245	263.3		263.3	52.7	9.3		
Chloride		757		757			356	377

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

Weekly Average Limits based on Chronic Toxicity Criteria (CTC)

RECEIVING WATER FLOW = 0.00 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 P99
Arsenic		152.2		152.2	30.4	<0.989	
Cadmium	175	3.8		3.8	0.8	<0.19	
Chromium	245	275		275	55	<1.1	
Copper	245	22.3		22.3			7.0
Lead	245	66.5		66.5	13.3	<4.3	
Nickel	245	156.6		156.6	31.3	3.5	
Zinc	245	263.3		263.3	52.7	9.3	
Chloride		395		395			276

* 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 = 0.00 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	880		880	176	<0.19
Chromium	8400000		8400000	1680000	<1.1
Lead	2240		2240	448	<4.3
Nickel	110000		110000	22000	3.5

Monthly Average Limits based on Human Cancer Criteria (HCC)
RECEIVING WATER FLOW = 0.00 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	40		40	8	<0.989

In addition to evaluating the need for limits for each individual substance for which HCC exist, s. NR 106.06(8), Wis. Adm. Code, requires the evaluation of the cumulative cancer risk. Because no effluent limits are needed based on HCC, determination of the cumulative cancer risk is not needed per s. NR 106.06(8), Wis. Adm. Code.

Conclusions and Recommendations: Based on a comparison of the effluent data and calculated effluent limitations, limits are not required for toxic substances.

Chloride – **Monitoring is recommended to continue.**

PFOS and PFOA – The need for PFOS and PFOA monitoring is evaluated in accordance with s. NR 106.98, Wis. Adm. Code. Based on the annual design flow and lack of nondomestic contributions, it is unlikely that the effluent will contain PFOS or PFOA. **Therefore, monitoring is not recommended**. If information becomes available that indicates PFOS or PFOA may be present in the effluent or source water, the monitoring requirements may change.

Mercury – The permit application did not require monitoring for mercury because the Arpin Wastewater Treatment Facility 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)." However, sludge sampling is not available because the Arpin Wastewater Treatment Facility is a recirculating sand filter and generates solids which are hauled away as septage. It is not expected that there are exceedances of the high-quality mercury concentration based on similar municipal treatment plants and the lack of industries. **No monitoring is recommended.**

Attachment #1

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 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.
- Section NR 106.07(3), Wis. Adm. Code requires weekly and monthly average limits for municipal treatment plants.
- 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.

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

Where:

A = 0.633 and B = 90.0 for Limited Aquatic Life, and
pH (s.u.) = that characteristic of the effluent.

The effluent pH data was examined as part of this evaluation. A total of 1704 sample results were reported from January 2019 to August 2023. The maximum reported value was 6.70 s.u. (Standard pH Units). The effluent pH was 6.60 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 6.61 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 6.61 s.u. Therefore, a value of 6.61 s.u. is believed to represent the maximum reasonably expected pH, and therefore most appropriate for determining daily maximum limitations for ammonia nitrogen. Substituting a value of 6.61 s.u. into the equation above yields an ATC = 71.86 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.

Attachment #1

	Ammonia Nitrogen Limit mg/L
2×ATC	143.72
1-Q_{10}	71.86

The 1-Q_{10} method yields the most stringent limits for the Arpin Wastewater Treatment Facility.

Presented below is a table of daily maximum limitations corresponding to various effluent pH values. Use of this table is not necessarily recommended in the permit, but it is presented herein for informational purposes.

Daily Maximum Ammonia Nitrogen Limits – LAL

Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L
6.0 ≤ pH ≤ 6.1	83	7.0 < pH ≤ 7.1	51	8.0 < pH ≤ 8.1	11
6.1 < pH ≤ 6.2	82	7.1 < pH ≤ 7.2	46	8.1 < pH ≤ 8.2	8.8
6.2 < pH ≤ 6.3	80	7.2 < pH ≤ 7.3	40	8.2 < pH ≤ 8.3	7.3
6.3 < pH ≤ 6.4	78	7.3 < pH ≤ 7.4	35	8.3 < pH ≤ 8.4	6.0
6.4 < pH ≤ 6.5	75	7.4 < pH ≤ 7.5	31	8.4 < pH ≤ 8.5	4.9
6.5 < pH ≤ 6.6	72	7.5 < pH ≤ 7.6	26	8.5 < pH ≤ 8.6	4.1
6.6 < pH ≤ 6.7	69	7.6 < pH ≤ 7.7	22	8.6 < pH ≤ 8.7	3.4
6.7 < pH ≤ 6.8	65	7.7 < pH ≤ 7.8	19	8.7 < pH ≤ 8.8	2.8
6.8 < pH ≤ 6.9	60	7.8 < pH ≤ 7.9	16	8.8 < pH ≤ 8.9	2.4
6.9 < pH ≤ 7.0	56	7.9 < pH ≤ 8.0	13	8.9 < pH ≤ 9.0	2.0

Weekly and Monthly Average Limits based on Chronic Toxicity Criteria (CTC)
The ammonia limit calculation also warrants evaluation of weekly and monthly average limits based on chronic toxicity criteria for ammonia, since those limits relate to the assimilative capacity of the receiving water.

Weekly average and monthly average limits for ammonia nitrogen are based on chronic toxicity criteria in ch. NR 105, Wis. Adm. Code.

The 30-day chronic toxicity criterion (CTC) for ammonia in waters classified as Limited Aquatic Life is calculated by the following equation, according to subchapter IV of NR 106, Wis. Adm. Code.

$$CTC = E \times \{[0.0676 \div (1 + 10^{(7.688 - pH)})] + [2.912 \div (1 + 10^{(pH - 7.688)})]\} \times C$$

Where:

pH = the pH (s.u.) of the receiving water,
E = 1.0,
$C = 8.09 \times 10^{(0.028 \times (25 - T))}$
T = the temperature (ºC) of the receiving water$\times 10^{(0.028 \times (25 - T))}$

The 4-day criterion is equal to the 30-day criterion multiplied by 2.5. The 4-day criteria are used in a mass-balance equation with the 7-Q_{10} (4-Q3, if available) to derive weekly average limitations. And the 30-day criteria are used with the 30-Q_5 (estimated as 85% of the 7-Q_2 if the 30-Q_5 is not available) to derive monthly average limitations. The stream flow value is further adjusted to temperature; 100% of the flow is used if the Temperature ≥ 16 ºC, 25% of the flow is used if the Temperature < 11 ºC, and 50% of the flow is used if the Temperature ≥ 11 ºC but < 16 ºC.

The "default" basin assumed values are used for temperature and background ammonia concentrations, because minimum ambient data is available. The values for pH are based on data collected from Hemlock Creek. These values are shown in the table below, with the resulting criteria and effluent limitations.

Weekly and Monthly Ammonia Nitrogen Limits – LAL

		May-September	October-April
Effluent Flow	Qe (MGD)	0.066	0.066
Background Information	7-Q_{10} (cfs)	0.00	0.00
	7-Q_2 (cfs)	0.00	0.00
	Ammonia (mg/L)	N/A	N/A
	Temperature (°C)	17.8	9.4
	pH (s.u.)	7.49	7.47
	% of Flow used	50	25
	Reference Weekly Flow (cfs)	0.000	0.000
	Reference Monthly Flow (cfs)	0.000	0.000
Criteria mg/L	4-day Chronic	58.44	101.18
	30-day Chronic	23.38	40.47
Effluent Limits mg/L	Weekly Average	58.44	101.18
	Monthly Average	23.38	40.47

Effluent Data

The following table evaluates the statistics based upon ammonia data reported from January 2019 to August 2023, with those results being compared to the calculated limits to determine the need to include ammonia limits in the Arpin Wastewater Treatment Facility permit for the respective month ranges.

Ammonia Nitrogen Effluent Data

Ammonia Nitrogen mg/L	May-September	October-April
1-day P_{99}	2.44	3.79
4-day P_{99}	1.23	2.09
30-day P_{99}	0.54	0.88
Mean*	0.22	0.34
Std	0.77	1.18
Sample size	211	273
Range	<0.13 - 3.336	<0.13 - 9.08

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

Based on this comparison, there is no reasonable potential for the discharge to exceed any of the calculated ammonia nitrogen limits.

The permit currently has weekly average and monthly average limits. 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.

Conclusions and Recommendations
In summary, current ammonia nitrogen limitations and monitoring are recommended. No mass limitations are recommended in accordance with s. NR 106.32(5), Wis. Adm Code.

Final Ammonia Nitrogen Limits

	Weekly Average mg/L	Monthly Average mg/L
May – September	6.4	2.5
October – April	26	10

PART 4 – WATER QUALITY-BASED Effluent Limitations FOR BACTERIA

On May 1, 2020, revisions to chs. NR 102 and NR 210, Wis. Adm. Codes, became effective which replace fecal coliform limits with new *Escherichia coli* (*E. coli*) limits for protection of recreational uses. Section NR 210.06(2)(a)1, Wis. Adm. Code, includes two limits which must be included in permits for facilities which are required to disinfect:

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.

E. coli monitoring is recommended at the same frequency that fecal coliform monitoring is required in the current permit. Because the Arpin Wastewater Treatment Facility permit requires 2/week monitoring, the 410 counts/100 mL limit will effectively function as a daily maximum limit unless the facility performs additional monitoring. Any additional monitoring beyond what is required by the permit must also be reported on the DMR as required in the standard requirements section of the permit.

These limits are required during May through September. No changes are recommended to the required disinfection season.

Effluent Data
The Arpin Wastewater Treatment Facility has monitored effluent *E. coli* from September 2022 to July 2023 and a total of 30 results are available. A geometric mean of 126 counts/100 mL was never exceeded, with a maximum monthly geometric mean of 2 counts/100 mL. Effluent data never exceeded 410 counts/100 mL. The maximum reported value was 26 counts/100 mL. Based on this effluent data it appears that **the facility can meet new *E. coli* limits and a compliance schedule is not needed in the reissued permit.**

PART 5 – PHOSPHORUS

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 Arpin Wastewater Treatment Facility 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 a technology-based limit is not required.

Annual Average Mass Total Phosphorus Loading

Month	Monthly Avg. mg/L	Total Flow MG/month	Total Phosphorus lb./mo.
Sep 2022	2.53	0.87	18.42
Oct 2022	3.13	0.66	17.15
Nov 2022	0.62	0.97	5.00
Dec 2022	0.27	0.84	1.85
Jan 2023	0.16	1.13	1.51
Feb 2023	0.13	0.87	0.97
Mar 2023	0.13	1.70	1.87
Apr 2023	0.14	2.54	3.01
May 2023	0.14	1.54	1.86
Jun 2023	0.19	0.72	1.11
Jul 2023	0.33	0.62	1.72
Aug 2023	0.48	0.58	2.33
		Average =	**4.73**

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 (not design) flow (in MGD) for that month

TMDL Limits – Phosphorus

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* (May 2020). The wasteload allocations (WLA) that implement site-specific criteria for Lakes Petenwell, Castle Rock, and Wisconsin are found in Appendix K of the *Total Maximum Daily Loads for Total Phosphorus in the Wisconsin River Basin (WRB TMDL)* report dated April 26, 2019 and are expressed as maximum annual loads (lbs/year) and maximum daily loads (lbs/day). The WLA that implement statewide criteria found in Appendix J of the TMDL report are no longer applicable following approval of these site-specific criteria. The daily WLAs in the WRB TMDL equals the annual WLA divided by the number of days in the year. Therefore, the daily WLA is an annual average. Since the derivation of daily WLAs from annual WLAs does not take effluent variability or monitoring frequency into consideration, maximum daily WLAs from the WRB TMDL should not be used directly as permit effluent limits.

For the reasons explained in the April 30, 2012 paper entitled *Justification for Use of Monthly, Growing Season and Annual Average Periods for Expression of WPDES Permit Limits for Phosphorus Discharges in Wisconsin*, WDNR has determined that the phosphorus WQBELs set equal to WLAs would not be consistent with the assumptions and requirements of the TMDL.

Therefore, limits given to continuously discharging facilities covered by the WRB TMDL are given monthly average mass limits. If the equivalent effluent concentration is less than or equal to 0.3 mg/L, six-month average mass limits are also included. The following equation shows the calculation of equivalent effluent concentration:

$$\text{TP Equivalent Effluent Concentration} = \text{Daily WLA} \div (\text{Flow Rate} * \text{Conversion Factor})$$
$$= 0.115 \text{ lbs/day} \div (0.066 \text{ MGD} * 8.34)$$
$$= 0.21 \text{ mg/L}$$

Since this value is less than 0.3 mg/L, both a six-month average mass limit and a monthly average mass limit are applicable for total phosphorus. The monthly average limit is set equal to three times the six-month average limit.

$$\text{TP 6-Month Average Permit Limit} = \text{Daily WLA} * \text{6-Month average multiplier}$$
$$= 0.115 \text{ lbs/day} * 1.21$$
$$= 0.14 \text{ lbs/day}$$

$$\text{TP Monthly Average Permit Limit} = \text{TP 6-Month Average Permit Limit} * 3$$
$$= 0.14 \text{ lbs/day} * 3$$
$$= 0.42 \text{ lbs/day}$$

The multiplier used in the six-month average calculation was determined according to TMDL implementation guidance. A coefficient of variation was calculated, based on phosphorus mass monitoring data, to be 0.69. The facility is not able to meet the permit limits based on the WLA, so a standard CV of 0.6 is used. This value, along with monitoring frequency, is used to select the multiplier. The current permit specifies phosphorus monitoring as twice weekly; if a different monitoring frequency is used, the stated limits should be reevaluated.

The WRB TMDL establishes TP wasteload allocations to reduce the loading in the entire watershed including WLAs to meet water quality standards for tributaries to the Wisconsin River. Therefore, WLA-based WQBELs are protective of immediate receiving waters and TP WQBELs derived according to s. NR 217.13, Wis. Adm. Code are not required.

Since wasteload allocations are expressed as annual loads (lbs/yr), permits with TMDL-derived monthly average permit limits should require the permittee to calculate and report rolling 12-month sums of total monthly loads for TP. Rolling 12-month sums can be compared directly to the annual wasteload allocation. Six-month average limits apply in the periods May – October and November – April.

Total Phosphorus Statistics

	Concentration (mg/L)	Mass Discharge (lbs/day)
1-day P_{99}	5.65	1.73
4-day P_{99}	3.36	1.01
30-day P_{99}	2.21	0.65
Mean	1.69	0.49
Std	1.10	0.34
Sample Size	484	484
Range	0.05 - 3.91	0.02 - 2.08

Antidegradation and Antibacksliding

Because the mass-based effluent limitation for phosphorus is consistent with the wasteload allocation and assumptions of a US EPA approved TMDL that is designed to achieve water quality standards in ch. NR 102, Wis. Adm. Code, this TMDL based limitation may be included in a permit in lieu of the current phosphorus limit. Since the equivalent effluent concentration of the daily WLA is below the current interim limit of 1.0 mg/L, removal will not increase the concentration, level, or loading of phosphorus to Hemlock Creek. Therefore, antidegradation would not be applicable. The current interim limit may be removed in accordance with s. NR 207.12(4)(b), Wis. Adm. Code.

Conclusions:

In summary, the following limits are recommended by this evaluation:

- Monthly average Total Phosphorus mass limit of 0.42 lbs/day
- Six-month average Total Phosphorus mass limit of 0.14 lbs/day

Attachment #1

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 Chapters NR 102 (Subchapter II – Water Quality Standards for Temperature) and NR 106 (Subchapter V – Effluent Limitations for Temperature) of the Wisconsin Administrative Code. The daily maximum effluent temperature limitation shall be 86 °F for discharges to surface waters classified as Limited Aquatic Life according to s. NR 104.02(3)(b)1, Wis. Adm. Code, except for those classified as wastewater effluent channels and wetlands regulated under ch. NR 103 [s. NR 106.55(2), Wis. Adm. Code] which has a daily maximum effluent temperature limitation of 120 °F.

Reasonable Potential

Section NR 106.59(2)(b) allows the use of temperature effluent data, on a case-by-case basis, from at least two other POTWs within a 100-mile radius that utilize similar wastewater treatment technology and have a similar ratio of domestic to industrial waste stream composition, or representative data of the POTW.

A review of effluent temperature data collected from the Catawba Kennan Joint Sewage Commision and the Highland WWTF indicate it is unlikely that effluent temperatures from the Arpin Wastewater Treatment Facility which operates a recycling sand filter system and consists primarily of domestic sewage would exceed an effluent temperature of 86°F. **Therefore, no thermal limits or monitoring are required.**

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.

Attachment #2