

Public Noticed Chili SD Draft Permit Fact Sheet

General Information

Permit Number:	WI-0030961-10-0	
Permittee Name:	Chili Sanitary District	
Address:	P O Box 53	
City/State/Zip:	Chili WI 54420	
Discharge Location:	Chili SD #1, W1200 Chili Rd, Chili, WI 54420 NW corner of 2nd cell of lagoon into wetland approx. 1 mile from unnamed trib to south of the yellow river	
Receiving Water:	an unnamed tributary to the South Branch of the Yellow River in the Upper Yellow River Watershed of the Upper Wisconsin River Basin located in Clark County	
Stream Flow (Q _{7,10}):	0 cfs	
Stream Classification:	Limited Aquatic Life, Non-public Water Supply	
Discharge Type:	Existing, Fill and Draw (seasonal, typically May and October)	
Design Flow(s)	Daily Maximum	0.050 MGD
Significant Industrial Loading?	No	
Operator at Proper Grade?	Yes	
Approved Pretreatment Program?	N/A	

Facility Description

The Chili Sanitary District treats wastewater from the community of Chili at an average annual design flow of 0.05 million gallons per day (MGD). The actual annual average influent flow for 2023 was 0.022 MGD. The stabilization pond type wastewater facility is a 2-cell system that discharges on a fill and draw basis to a tributary of the South Branch of the Yellow River. No major operational changes are proposed for this issuance. Proposed significant monitoring changes include 1) new seasonal monthly average ammonia effluent limit, 2) new monthly average phosphorus effluent interim limit and final mass limit were added based on the Wisconsin River Basin (WIRB) Total Maximum Daily Load (TMDL), along with other phosphorus mass reporting requirements that are consistent with tracking compliance with the WIRB TMDL, 3) addition of annual effluent monitoring for total nitrogen, nitrite + nitrate nitrogen and total Kjeldahl nitrogen, and 4) PFAS sludge sampling has been included in the proposed WPDES permit pursuant to ss. NR 214.18(5)(b) and NR 204.06(2)(b)9., Wis. Adm. Code to quantitate risk.

Substantial Compliance Determination

Enforcement During Last Permit: The Chili Sanitary District received an NON in September 2020 for missing influent samples in April 2020. The facility reviewed sampling requirements and did not miss any further sampling during the permit term.

After a desk top review of all Discharge monitoring reports, Land application reports, and compliance schedule items, and an inspection on 09/27/2023, Chili WWTF has been found to be in substantial compliance with their current permit.

Sample Point Designation		
Sample Point Number	Discharge Flow, Units, and Averaging Period	Sample Point Location, WasteType/sample Contents and Treatment Description (as applicable)
701	0.022 MGD in 2023	Representative influent samples shall be collected from the influent lift station.
001	0.024 MGD in 2023	Representative effluent samples shall be collected from the discharge manhole.
002	No pond sludge has been removed in over 10 yrs, and not planned for this permit term.	Representative sludge grab samples shall be collected from the primary pond and monitored for list 1 parameters and PFAS once in 2025. If the permittee plans to remove sludge, they shall monitor sludge for Lists 1, 2, 3 & 4 prior to land application. The Department shall be notified at least 30 days in advance of sludge removal so that appropriate monitoring forms can be provided. Approval of landspreading sites must be completed prior to sludge removal.

1 Influent – Monitoring Requirements

Sample Point Number: 701- INFLUENT LIFT STATION

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

Changes from Previous Permit:

None

Explanation of Limits and Monitoring Requirements

Influent monitoring is required by NR 210 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: 001- EFFLUENT DISCHARGE MANHOLE

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Flow Rate	Daily Max	0.2 MGD	Daily	Total Daily	
BOD5, Total	Monthly Avg	20 mg/L	2/Week	Grab	
BOD5, Total	Weekly Avg	30 mg/L	2/Week	Grab	
Suspended Solids, Total	Monthly Avg	60 mg/L	2/Week	Grab	

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
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	5/Week	Grab	
Copper, Total Recoverable		ug/L	Monthly	Grab	
Hardness, Total as CaCO ₃		mg/L	Monthly	Grab	
Nitrogen, Ammonia (NH ₃ -N) Total	Monthly Avg	3.7 mg/L	2/Week	Grab	Limit effective June-September annually.
Nitrogen, Ammonia (NH ₃ -N) Total	Daily Max - Variable	mg/L	2/Week	Grab	Variable limit based on pH. See Ammonia subsection.
Nitrogen, Ammonia Variable Limit		mg/L	2/Week	Grab	Variable limit based on pH. See Ammonia subsection
Phosphorus, Total	Monthly Avg	2.4 mg/L	Weekly	Grab	Limit effective throughout the permit term.
Phosphorus, Total		lbs/month	Monthly	Calculated	Calculate the Total Monthly Discharge of phosphorus and report on the last day of the month on the DMR. See TMDL section in permit.
Phosphorus, Total	Annual Total	46 lbs/yr	Annual	Calculated	Monitoring required upon permit issuance. Limit effective April 1, 2026. Calculate the sum of total monthly mass of phosphorus discharged for the calendar year and report on the last day of the month on the DMR. See TMDL section in permit.
Nitrogen, Total Kjeldahl		mg/L	See Listed Qtr(s)	Grab	Monitoring required annually in specific quarters. See Nitrogen Series Monitoring subsection.
Nitrogen, Nitrite + Nitrate Total		mg/L	See Listed Qtr(s)	Grab	Monitoring required annually in specific quarters. See Nitrogen Series Monitoring subsection.
Nitrogen, Total		mg/L	See Listed Qtr(s)	Calculated	Total Nitrogen shall be calculated as the sum of reported values for Total Kjeldahl Nitrogen and Total Nitrite + Nitrate

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
					Nitrogen. See Nitrogen Series subsection.

Changes from Previous Permit

1) new seasonal monthly average ammonia effluent limit, 2) new monthly average phosphorus interim limit and final mass limit were added based on the Wisconsin River Basin (WIRB) Total Maximum Daily Load (TMDL), along with other phosphorus mass reporting requirements that are consistent with tracking compliance with the WIRB TMDL, 3) addition of annual effluent monitoring for total nitrogen, nitrite + nitrate nitrogen and total Kjeldahl nitrogen. Flow sample frequency was also changed from continuous to daily and dissolved oxygen from 2/week to 5/week for more accurate reporting.

Explanation of Limits and Monitoring Requirements

MUNICIPAL EFFLUENT LIMITS – Additional limits to comply with the expression of limits requirements in ss. NR 106.07 and NR 205.065(7), Wis. Adm. Codes, are not required due to the non-continuous nature of the discharge.

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”. Flow sample frequency was changed from continuous to daily and dissolved oxygen from 2/week to 5/week for more accurate reporting.

Limits were determined for this existing discharge using chapters NR 102, 104, 105, 106, 207, 210, 212, and 217 of the Wisconsin Administrative Code (where applicable). For additional information on any of the limits see the February 5, 2024 memo from Ben Hartenbower to Angela Parkhurst titled “Water Quality-Based Effluent Limitations for the Chili Sanitary District Wastewater Treatment Facility WPDES Permit No. WI-0030961”.

BOD, Dissolved Oxygen (DO) and pH: Monitoring and limits for BOD, DO and pH correspond to the requirements in the current permit since the facility has not increased the capacity of the wastewater treatment system since the last permit issuance, nor are increases expected during the term of the proposed permit.

TSS: A total suspended solids variance of 60 mg/L due to algae was continued for this permit term because the TSS values are not due to increased loadings or build-up of lagoon solids leading to less efficient operation, and under the authority of NR 210, the variance was continued for this reissuance. Specifically, the variance subsection NR 210.07(2) applies to TSS variances for lagoons.

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. The permit requires 3.7 mg/L monthly average June-September, in addition to variable daily maximum limits based on pH. See table below titled “Variable Daily Maximum Ammonia Limits” for more information.

Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L
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6.0 ≤ pH ≤ 6.1	76	7.0 < pH ≤ 7.1	46	8.0 < pH ≤ 8.1	10
6.1 < pH ≤ 6.2	74	7.1 < pH ≤ 7.2	41	8.1 < pH ≤ 8.2	8.0
6.2 < pH ≤ 6.3	73	7.2 < pH ≤ 7.3	37	8.2 < pH ≤ 8.3	6.6
6.3 < pH ≤ 6.4	71	7.3 < pH ≤ 7.4	32	8.3 < pH ≤ 8.4	5.4
6.4 < pH ≤ 6.5	68	7.4 < pH ≤ 7.5	28	8.4 < pH ≤ 8.5	4.5
6.5 < pH ≤ 6.6	66	7.5 < pH ≤ 7.6	24	8.5 < pH ≤ 8.6	3.7
6.6 < pH ≤ 6.7	62	7.6 < pH ≤ 7.7	20	8.6 < pH ≤ 8.7	3.1
6.7 < pH ≤ 6.8	59	7.7 < pH ≤ 7.8	17	8.7 < pH ≤ 8.8	2.6
6.8 < pH ≤ 6.9	55	7.8 < pH ≤ 7.9	14	8.8 < pH ≤ 8.9	2.2
6.9 < pH ≤ 7.0	50	7.9 < pH ≤ 8.0	12	8.9 < pH ≤ 9.0	1.8

Copper: Using effluent data from the current permit term, the effluent concentrations are below the calculated WQBELs for copper and therefore no effluent limits are needed. Monthly monitoring is required to meet the data requirements of s. NR 106.05, Wis. Adm. Code at next permit reissuance.

Mercury: The permit application did not require monitoring for mercury because the Chili Sanitary District 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). 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 average concentration in the sludge from 2021 was 2.80 mg/kg, with a maximum reported concentration of 2.80 mg/kg. Therefore, no mercury monitoring is recommended at Outfall 001.

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. Thermal discharges must meet the Public Health criterion of 120 degrees F and the Fish & Aquatic Life criteria which are established to protect aquatic communities from lethal and sub-lethal thermal effects. Temperature limits were calculated for each month of the year when a discharge occurs. Comparing the representative highest effluent temperature to the calculated effluent limits determines the reasonable potential of exceeding the effluent limits. Although effluent temperature data is missing for some months, temperature data from other months of the year with similar ambient temperatures indicate that there is not reasonable to exceed limits in these months. Based on this comparison, no temperature monitoring or limits are required.

Phosphorus: Phosphorus rules became effective December 1, 2010 per NR 217, Wis. Adm. Code, that required the permittee to comply with water quality based effluent limits (WQBELs) for total phosphorous. Chapter NR 217 of the Wis. Adm. Code addresses point source dischargers of phosphorus to surface waters. The code categorically limits industrial dischargers of more than 60 pounds of phosphorus per month and municipal dischargers of more than 150 pounds of phosphorus per month to 1.0 mg/L unless an alternative limit is approved. The annual monthly average phosphorus loading for Chili Sanitary District is less than 150 lbs/month, therefore, the categorical limit does not apply. NR 217 also specifies WQBELs (water quality based effluent limits) for discharges of phosphorus to surface waters of the state from publicly and privately owned wastewater facilities, noncontact cooling water discharges which contain phosphorus, concentrated animal feeding operations that discharge through alternative treatment 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.

Wisconsin River Total Maximum Daily Load (TMDL): The permitted facility is included within the Wisconsin River Basin Total Maximum Daily Load (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 SSC-based limits are consistent with the assumptions and requirements of the EPA-approved WLA in the TMDL, which is **46 lbs/yr** for the permitted facility.

The approved TMDL expresses WLAs as lbs/year and lbs/day (maximum annual load divided by 365 days). 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>). Methods for converting TMDL WLAs into permit limits for non-continuous discharges should be determined on a case-by-case basis and consistent with the assumptions in the TMDL. For controlled discharges (municipal lagoon systems) and other discharges where there is no valid statistical basis for transforming annual WLAs into shorter term limits, limits should be expressed as total annual discharge.

An interim limit of **2.4 mg/L** goes into effect upon reissuance and will remain in effect unless a more stringent limit is required at a future permit issuance by ss. NR 217.13 and NR 217.16(2), Wis. Adm. Code, or the limit is relaxed following procedures outlined in ch. NR 207, Wis. Adm. Code. A final TMDL WLA-based effluent limits of **46 lbs/year** will go into effect in accordance with compliance schedule.

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. Monitoring for total nitrogen, nitrite + nitrate nitrogen and TKN is required annually in specific quarters to obtain seasonal variation and are listed below:

- October - December 2024
- April – June 2025
- October - December 2026
- April – June 2027
- October - December 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: 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 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>). 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 required at this time because of the low risk in effluent toxicity.

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	Unknown	Unknown	Unknown	N/A
Does sludge management demonstrate compliance? Yes						
Is additional sludge storage required? No, lagoon system doesn't require storage.						
Is Radium-226 present in the water supply at a level greater than 2 pCi/liter? no						
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? No						
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.						

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	Grab	
Arsenic Dry Wt	Ceiling	75 mg/kg	Once	Grab	
Arsenic Dry Wt	High Quality	41 mg/kg	Once	Grab	
Cadmium Dry Wt	Ceiling	85 mg/kg	Once	Grab	
Cadmium Dry Wt	High Quality	39 mg/kg	Once	Grab	
Copper Dry Wt	Ceiling	4,300 mg/kg	Once	Grab	
Copper Dry Wt	High Quality	1,500 mg/kg	Once	Grab	
Lead Dry Wt	Ceiling	840 mg/kg	Once	Grab	
Lead Dry Wt	High Quality	300 mg/kg	Once	Grab	
Mercury Dry Wt	Ceiling	57 mg/kg	Once	Grab	
Mercury Dry Wt	High Quality	17 mg/kg	Once	Grab	
Molybdenum Dry Wt	Ceiling	75 mg/kg	Once	Grab	
Nickel Dry Wt	Ceiling	420 mg/kg	Once	Grab	
Nickel Dry Wt	High Quality	420 mg/kg	Once	Grab	
Selenium Dry Wt	Ceiling	100 mg/kg	Once	Grab	
Selenium Dry Wt	High Quality	100 mg/kg	Once	Grab	
Zinc Dry Wt	Ceiling	7,500 mg/kg	Once	Grab	
Zinc Dry Wt	High Quality	2,800 mg/kg	Once	Grab	
Nitrogen, Total Kjeldahl		Percent	Per Application	Grab	
Nitrogen, Ammonia (NH3-N) Total		Percent	Per Application	Grab	
Phosphorus, Total		Percent	Per Application	Grab	

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Phosphorus, Water Extractable		% of Tot P	Per Application	Grab	
Potassium, Total Recoverable		Percent	Per Application	Grab	
PFOA + PFOS		ug/kg	Once	Calculated	Report the sum of PFOA and PFOS. See PFAS Permit Sections for more information.
PFAS Dry Wt		ug/kg	Once	Grab	Perfluoroalkyl and Polyfluoroalkyl Substances based on updated DNR PFAS List. See PFAS Permit Sections for more information.

Changes from Previous Permit:

List 2 Nutrient monitoring – Monitoring for list 2 (nutrients) is highly recommended at the same time as the monitoring of List 1 (metals) in year 2 of the permit. Results will assist in the determination of the acres needed for land application of sludge should it be necessary. The number of acres needed is also required for the Land Treatment Management Schedule (see schedules for more information).

Change in form submittal – In prior permit reissuances when it has been noted in the application that sludge would not be removed during the permit term, the department required sampling during the second year of the permit term and the sludge characteristic report (3400-049) would be generated only during that year. Due to moving to electronic submittal of forms via Switchboard, forms 3400-049 (“Characteristics Report”), 3400-052 (“Other Methods of Disposal”) and 3400-055 (“Annual Land Application”) will now be generated by the department and the permittee will be required to submit all three reports each year of the permit term. This change was adopted to provide the permittee flexibility because many lagoon desludging projects can be unexpected, are delayed or staggered over multiple years. Additionally, it is used to officially report that no land application of sludge has occurred, and annual submittal of the forms is required per the standard requirements section.

PFAS sludge sampling has been included pursuant to ss. NR 214.18(5)(b) and NR 204.06(2)(b)9., Wis. Adm. Code to quantitate risk.

PCB sludge sampling has been waived this permit term since the facilities with design flows below 0.25 MGD, have no industrial contributors, and sampled the previous permit term can monitor once every other permit term.

Explanation of Limits and Monitoring Requirements

Requirements for 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). Requirements for pathogens are specified in s. NR 204.07(6) and in s. NR 204.07 (7) for vector attraction requirements. Limitations for PCBs are addressed in s. NR 204.07(3)(k). Radium requirements are addressed in s. NR 204.07(3)(n).)

PFAS: The presence and fate of PFAS in municipal and industrial sludges is an emerging public health concern. EPA is currently developing a risk assessment to determine future land application rates and expects to release this risk assessment by the end of 2024. In the interim, the department has developed the “Interim Strategy for Land Application of Biosolids and Industrial Sludges Containing PFAS”.

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 the proposed WPDES permit pursuant to ss. NR 214.18(5)(b) and NR 204.06(2)(b)9., Wis. Adm. Code.

4 Schedules

4.1 Total Maximum Daily Load Limits (TMDLs) for Total Phosphorus

The permittee shall comply with the TMDLs for Phosphorus 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 requirement.

Required Action	Due Date
Report on Effluent Discharge: The permittee shall prepare a report on phosphorus effluent discharge and submit it by date due. The report shall evaluate collected effluent data, possible source reduction measures, operational improvements or other minor facility modifications that would enable compliance with the final phosphorus TMDL effluent limit.	03/31/2025
Achieve Compliance: The permittee shall achieve compliance with final phosphorus TMDL. Limit becomes effective April 1, 2026.	03/31/2026

Explanation of Schedules

TMDL Limits for Total Phosphorus:

A compliance schedule is included in the permit to provide time for the permittee to investigate options for meeting phosphorus TMDL effluent limits while coming into compliance with the limits as soon as reasonably possible.

Fact Check Comments:

It was noted that the effluent Nitrogen series monitoring was scheduled during times of no discharge (July – September), and therefore changed to October-December.

Attachments:

Water Quality Based Effluent Limits - February 5, 2024 memo from Ben Hartenbower to Angela Parkhurst titled “Water Quality-Based Effluent Limitations for the Chili Sanitary District Wastewater Treatment Facility WPDES Permit No. WI-0030961”.

Public Notice - Clark County Press, PO Box 149, Neillsville, WI 54456

Expiration Date:

March 31, 2029

Justification Of Any Waivers From Permit Application Requirements

None

Prepared By: Angela Parkhurst Wastewater Specialist

Date: March 12, 2024

CORRESPONDENCE/MEMORANDUM

DATE: February 5, 2024

TO: Angela Parkhurst– WCR/Eau Claire

FROM: Benjamin Hartenbower – WCR/Eau Claire

SUBJECT: Water Quality-Based Effluent Limitations for the Chili Sanitary District Wastewater Treatment Facility
 WPDES Permit No. WI-0030961

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 Chili Sanitary District Wastewater Treatment Facility in Clark County. This municipal wastewater treatment facility (WWTF) discharges to the unnamed tributary of the South Branch of the Yellow River, located in the Upper Yellow River 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 001:

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Annual Total	Footnotes
Flow Rate	0.2 MGD					1
BOD ₅			30 mg/L	20 mg/L		1
TSS				60 mg/L		1,2
pH	9.0 s.u.	6.0 s.u.				1
Dissolved Oxygen		4.0 mg/L				1
Ammonia Nitrogen June – September October – May	Variable Variable			3.7 mg/L		2,4
Copper						1,3
Hardness						1,5
Phosphorus Interim Limit TMDL Limit				2.4 mg/L	46 lbs/yr	6
TKN, Nitrate+Nitrite, and Total Nitrogen						7

Footnotes:

1. No changes from the current permit.
2. Additional limits to comply with the expression of limits requirements in ss. NR 106.07 and NR 205.065(7), Wis. Adm. Codes, are not required due to the non-continuous nature of the discharge.
3. Monitoring only.

- The variable daily maximum ammonia nitrogen limit table corresponding to effluent pH values. These limits apply year-round.

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	76	7.0 < pH ≤ 7.1	46	8.0 < pH ≤ 8.1	10
6.1 < pH ≤ 6.2	74	7.1 < pH ≤ 7.2	41	8.1 < pH ≤ 8.2	8.0
6.2 < pH ≤ 6.3	73	7.2 < pH ≤ 7.3	37	8.2 < pH ≤ 8.3	6.6
6.3 < pH ≤ 6.4	71	7.3 < pH ≤ 7.4	32	8.3 < pH ≤ 8.4	5.4
6.4 < pH ≤ 6.5	68	7.4 < pH ≤ 7.5	28	8.4 < pH ≤ 8.5	4.5
6.5 < pH ≤ 6.6	66	7.5 < pH ≤ 7.6	24	8.5 < pH ≤ 8.6	3.7
6.6 < pH ≤ 6.7	62	7.6 < pH ≤ 7.7	20	8.6 < pH ≤ 8.7	3.1
6.7 < pH ≤ 6.8	59	7.7 < pH ≤ 7.8	17	8.7 < pH ≤ 8.8	2.6
6.8 < pH ≤ 6.9	55	7.8 < pH ≤ 7.9	14	8.8 < pH ≤ 8.9	2.2
6.9 < pH ≤ 7.0	50	7.9 < pH ≤ 8.0	12	8.9 < pH ≤ 9.0	1.8

- Hardness monitoring is recommended because of the relationship between hardness and daily maximum limits based on acute toxicity criteria.
- 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.
- 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 (NO₃), nitrite (NO₂), 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 (3) – Narrative, Thermal Table & Map

PREPARED BY: _____ Date: _____

Benjamin Hartenbower, PE,
Water Resources Engineer

E-cc:

Jenna Monahan, Wastewater Engineer – WCR/Eau Claire
Geisa Thielen, Regional Wastewater Supervisor – WCR/Eau Claire
Diane Figiel, Water Resources Engineer – WY/3
Chris Willger, Water Quality Biologist – WCR/Eau Claire
Nate Willis, Wastewater Engineer – WY/3

**Water Quality-Based Effluent Limitations for
the Chili Sanitary District Wastewater Treatment Facility
WPDES Permit No. WI-0030961**

Prepared by: Benjamin P. Hartenbower

PART 1 – BACKGROUND INFORMATION

Facility Description:

The Chili Sanitary District owns and operates a 2-cell non-aerated lagoon system. The discharge is to a wetland that flows to an unnamed tributary of the South Branch of the Yellow River

Attachment #3 is a map of the area showing the approximate location of Outfall 001.

Existing Permit Limitations

The current permit, expiring on March 31, 2024, includes the following effluent limitations and monitoring requirements.

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Flow Rate	0.2 MGD					1
BOD ₅			30 mg/L	20 mg/L		1
TSS				60 mg/L		1
pH	9.0 s.u.	6.0 s.u.				1
Dissolved Oxygen		4.0 mg/L				1
Ammonia Nitrogen	Variable					2
Copper						3
Hardness						3
Phosphorus Final				0.225 mg/L	0.075 mg/L, 0.13 lbs/day	4

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. Variable daily maximum limits for ammonia:

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	76	7.0 < pH ≤ 7.1	46	8.0 < pH ≤ 8.1	10
6.1 < pH ≤ 6.2	75	7.1 < pH ≤ 7.2	42	8.1 < pH ≤ 8.2	8.1
6.2 < pH ≤ 6.3	73	7.2 < pH ≤ 7.3	37	8.2 < pH ≤ 8.3	6.6
6.3 < pH ≤ 6.4	71	7.3 < pH ≤ 7.4	32	8.3 < pH ≤ 8.4	5.5
6.4 < pH ≤ 6.5	69	7.4 < pH ≤ 7.5	28	8.4 < pH ≤ 8.5	4.5
6.5 < pH ≤ 6.6	66	7.5 < pH ≤ 7.6	24	8.5 < pH ≤ 8.6	3.7
6.6 < pH ≤ 6.7	63	7.6 < pH ≤ 7.7	20	8.6 < pH ≤ 8.7	3.1
6.7 < pH ≤ 6.8	59	7.7 < pH ≤ 7.8	17	8.7 < pH ≤ 8.8	2.6
6.8 < pH ≤ 6.9	55	7.8 < pH ≤ 7.9	14	8.8 < pH ≤ 8.9	2.2
6.9 < pH ≤ 7.0	51	7.9 < pH ≤ 8.0	12	8.9 < pH ≤ 9.0	1.8

3. Monitoring only.

4. A compliance schedule is in the current permit to meet the final WQBEL by March 31, 2026.

Receiving Water Information

- Name: The unnamed tributary of the South Branch of the Yellow River
- Waterbody Identification Code (WBIC): 1372800
- Classification used in accordance with chs. NR 102 and 104, Wis. Adm. Code: Limited Aquatic Life (LAL), non-public water supply at the point of discharge. About 1.17 miles downstream, the tributary meets the South Branch of the Yellow River, which is classified default warm water sport fish (WWSF) community, non-public water supply.
- Low Flow: Low flow values at the point of discharge are zero. The following 7-Q10 and 7-Q2 values for the South Branch of the Yellow River at the tributary’s confluence come from regression equations created by USGS for the Upper Wisconsin River Basin.
 7-Q10 = 0.14 cfs (cubic feet per second)
 7-Q2 = 0.33 cfs
- Hardness = 79 mg/L as CaCO₃. 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: None
- Impaired water status: This discharge is located within the WI River TMDL for phosphorus.

Effluent Information:

- Flow Rates(s):
Daily Maximum Limit = 0.200 MGD (Million Gallons per Day)
For reference, the actual average flow from October 2018 to November 2023 during discharge occurrences was 0.128 MGD.
- Hardness = 79 mg/L as CaCO₃. This value represents the geometric mean of 14 effluent samples collected from 10/11/2018 to 10/02/2023.
- 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 wells
- Additives: Ferric Chloride
- Total Phosphorus Wasteload Allocation: 46 lbs/year
- 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 Chloride. The permit-required monitoring for Ammonia, Copper, Hardness, and Phosphorus from October 2018 to November 2023 is used in this evaluation.

Chemical Specific Effluent Data at Outfall 001

	Copper µg/L
1-day P ₉₉	8.18
4-day P ₉₉	5.23
30-day P ₉₉	3.02
Mean	2.06
Std	1.68
Sample size	17
Range	<0.718 - 7.2

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

Chemical Specific Effluent Data at Outfall 001

Sample Date	Chloride mg/L
06/01/2023	106
06/05/2023	109
06/08/2023	116
06/13/2023	122
10/25/2023	105
10/31/2023	102
11/06/2023	98
11/13/2023	98
11/27/2023	117
11/30/2023	115
12/04/2023	117
1-day P ₉₉	130
4-day P ₉₉	120

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 001 from October 2018 to November 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	Average Mass Discharged
BOD ₅	8 mg/L*	
TSS	11 mg/L*	
pH	7.48 s.u.	
Dissolved Oxygen	6.9 mg/L	
Ammonia Nitrogen	3.01 mg/L	
Phosphorus	1.78 mg/L	0.512 lbs/day

*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 P₉₉) 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-Q₁₀

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-Q₁₀ 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.

$$\text{Limitation} = \frac{(\text{WQC}) (Q_s + (1-f) Q_e) - (Q_s - f Q_e) (C_s)}{Q_e}$$

Attachment #1

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 Q₁₀)
 if the 1-day Q₁₀ flow data is not available = 80% of the average minimum 7-day flow which occurs once in 10 years (7-day Q₁₀).

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-Q₁₀ 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 Chili Sanitary District 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-Q₁₀ (estimated as 80% of 7-Q₁₀)), 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	67.96	<0.989		
Cadmium	79	21.95		22	4.4	<25		
Chromium	79	1482.97		1483	296.6	<38		
Copper	79	12.39		12.4			8.2	7.2
Lead	79	84.91		84.9	17	<50		
Nickel	79	383.41		383.4	76.7	<37		
Zinc	79	97.7		97.7	19.5	<20		
Chloride		757		757	151		130	122

** Per the changes to s. NR 106.07(3), Wis. Adm. Code, effective 09/01/2016 consideration of ambient concentrations and 1-Q₁₀ flow rates yields a more restrictive limit than the 2 × ATC method of limit calculation.

Attachment #1

Weekly Average Limits based on Chronic Toxicity Criteria (CTC)

RECEIVING WATER FLOW = 0.00 cfs (1/4 of the 7-Q₁₀), 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	79	2.04		2	0.4	<25	
Chromium	79	108.66		108.7	21.7	<38	
Copper	79	8.44		8.4			5.2
Lead	79	22.24		22.2	4.4	<50	
Nickel	79	60.01		60	12	<37	
Zinc	79	97.7		97.7	19.5	<20	
Chloride		395		395			120

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 (1/4 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	<25
Chromium	8400000		8400000	1680000	<38
Lead	2240		2240	448	<50
Nickel	110000		110000	22000	<37

Monthly Average Limits based on Human Cancer Criteria (HCC)

RECEIVING WATER FLOW = 0.00 cfs (1/4 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 toxics substances.

Copper – Monthly monitoring is recommended to continue to meet the data requirements of s. NR 106.05, Wis. Adm. Code at next permit reissuance.

Monthly hardness monitoring is also recommended because of the relationship between hardness and daily maximum limits based on acute toxicity criteria.

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 Chili Sanitary District 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). 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 average concentration in the sludge from 2021 was 2.80 mg/kg, with a maximum reported concentration of 2.80 mg/kg. Therefore, no mercury monitoring is recommended at Outfall 001.

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 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 = 0.633 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 361 sample results were reported from October 2018 to October 2023. The maximum reported value was 8.90 s.u. (Standard pH Units). The effluent pH was 8.84 s.u. or less 99% of the time. The 1-day P₉₉, calculated in accordance with s. NR 106.05(5), Wis. Adm. Code, is 8.58 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 8.53 s.u. Therefore, a value of 8.84 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 8.84 s.u. into the equation above yields an ATC = 2.65 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-Q₁₀ 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-Q₁₀ (estimated as 80 % of 7-Q₁₀) and the 2×ATC approach are shown below.

Daily Maximum Ammonia Nitrogen Determination

	Ammonia Nitrogen Limit mg/L
2×ATC (LAL)	5.31
1-Q ₁₀ (LAL)	2.65
2×ATC (WWSF)	3.44
1-Q ₁₀ (WWSF)	2.30

The 1-Q₁₀ method calculated for downstream protection of the WWSF classification change yields the most stringent limits for the Chili Sanitary District Wastewater Treatment Facility.

Attachment #1

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.

Daily Maximum Ammonia Nitrogen Limits – WWSF

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	74	7.0 < pH ≤ 7.1	45	8.0 < pH ≤ 8.1	9.4
6.1 < pH ≤ 6.2	72	7.1 < pH ≤ 7.2	40	8.1 < pH ≤ 8.2	7.8
6.2 < pH ≤ 6.3	71	7.2 < pH ≤ 7.3	36	8.2 < pH ≤ 8.3	6.4
6.3 < pH ≤ 6.4	69	7.3 < pH ≤ 7.4	31	8.3 < pH ≤ 8.4	5.3
6.4 < pH ≤ 6.5	66	7.4 < pH ≤ 7.5	27	8.4 < pH ≤ 8.5	4.3
6.5 < pH ≤ 6.6	64	7.5 < pH ≤ 7.6	23	8.5 < pH ≤ 8.6	3.6
6.6 < pH ≤ 6.7	61	7.6 < pH ≤ 7.7	20	8.6 < pH ≤ 8.7	3.0
6.7 < pH ≤ 6.8	57	7.7 < pH ≤ 7.8	17	8.7 < pH ≤ 8.8	2.5
6.8 < pH ≤ 6.9	53	7.8 < pH ≤ 7.9	14	8.8 < pH ≤ 8.9	2.1
6.9 < pH ≤ 7.0	49	7.9 < pH ≤ 8.0	11	8.9 < pH ≤ 9.0	1.8

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 (°C) of the receiving water $\times 10^{(0.028 \times (25 - T))}$

Attachment #1

The 30-day chronic toxicity criterion (CTC) for ammonia in waters classified as a Warm Water Sport Fish Community 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 = 0.854,

C = the minimum of 2.85 or $1.45 \times 10^{(0.028 \times (25 - T))}$ – (Early Life Stages Present), or

C = $1.45 \times 10^{(0.028 \times (25 - T))}$ – (Early Life Stages Absent), and

T = the temperature (°C) of the receiving water – (Early Life Stages Present), or

T = the maximum of the actual temperature (°C) and 7 - (Early Life Stages Absent)

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-Q₁₀ (4-Q₃, if available) to derive weekly average limitations. And the 30-day criteria are used with the 30-Q₅ (estimated as 85% of the 7-Q₂ if the 30-Q₅ 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 °C, 25% of the flow is used if the Temperature < 11 °C, and 50% of the flow is used if the Temperature ≥ 11 °C but < 16 °C.

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 the unnamed tributary of the South Branch of the Yellow River. These values are shown in the table below, with the resulting criteria and effluent limitations.

Weekly and Monthly Ammonia Nitrogen Limits – LAL

		Spring	Summer	Winter
		April & May	June – Sept.	Oct. - March
Effluent Flow	Q _e (MGD)	0.200	0.200	0.200
Background Information	7-Q ₁₀ (cfs)	0.00	0.00	0.00
	7-Q ₂ (cfs)	0.00	0.00	0.00
	Ammonia (mg/L)	N/A	N/A	N/A
	Temperature (°C)	13.3	17.8	9.4
	pH (s.u.)	6.81	6.75	7.17
	% of Flow used	25	100	25
	Reference Weekly Flow (cfs)	0.000	0.000	0.000
	Reference Monthly Flow (cfs)	0.000	0.000	0.000
Criteria mg/L	4-day Chronic	110.68	84.39	124.31
	30-day Chronic	44.27	33.76	49.72
Effluent Limits mg/L	Weekly Average	110.68	84.39	124.31
	Monthly Average	44.27	33.76	49.72

Downstream Protection

The seasonal averages of temperature and pH data from the South Branch of the Yellow River in 2011 stored in the SWIMS database are used in this evaluation. Since minimal ambient ammonia concentration data is available, the “default” basin assumed values are used. Background values are shown in the table below, with the resulting criteria and effluent limitations.

Section NR 106.32 (3), Wis. Adm. Code, provides a mechanism for less stringent weekly average and monthly average effluent limitations when early life stages (ELS) of critical organisms are absent from the receiving water. This applies only when the water temperature is less than 14.5 °C, during the winter and spring months. Burbot, an early spawning species, are not believed to be present in the South Branch of the Yellow River. So “ELS Absent” criteria apply from October through March, and “ELS Present” criteria will apply from April through September for a WWSF classification.

Weekly and Monthly Ammonia Nitrogen Limits – WWSF (1.17 miles downstream)

		Spring	Summer	Winter
		April & May	June – Sept.	Oct. - March
Effluent Flow	Qe (MGD)			
Background Information	7-Q ₁₀ (cfs)	0.14	0.14	0.14
	7-Q ₂ (cfs)	0.33	0.33	0.33
	Ammonia (mg/L)	0.07	0.04	0.14
	Temperature (°C)	15	27	7
	pH (s.u.)	7.56	7.56	7.81
	% of Flow used	25	100	25
	Reference Weekly Flow (cfs)	0.070	0.14	0.035
	Reference Monthly Flow (cfs)	25	100	25
Criteria mg/L	4-day Chronic			
	Early Life Stages Present	10.3	4.65	7.86
	Early Life Stages Absent	10.3	4.65	12.6
	30-day Chronic			
	Early Life Stages Present	4.12	1.86	3.14
	Early Life Stages Absent	4.12	1.86	5.04
Effluent Limitations mg/L	Weekly Average			
	Early Life Stages Present	12.6	6.74	8.73
	Early Life Stages Absent	12.6	6.74	14.0
	Monthly Average			
	Early Life Stages Present	5.95	3.51	3.82
	Early Life Stages Absent	5.95	3.51	6.15

Ammonia Decay

The Department must establish limits to protect downstream uses, according to s. NR 106.32(1)(b), Wis. Adm. Code. Ammonia decay may be considered when determining limits at the outfall to protect the downstream classification, according to s. NR 106.32(4)(c), Wis. Adm. Code. Where the calculated limits are more restrictive based on downstream uses, ammonia decay can be considered to determine if these more restrictive limits are needed or if the ammonia will decay before it reaches the point of the classification change.

Attachment #1

Ammonia decay rates are dependent on temperature with in-stream nitrification essentially non-existent in the winter. In-stream decay is expected so a first order decay model should be used. Based on the available literature, a decay rate of 0.25 day⁻¹ at 20°C has been suggested as a default rate. A temperature correction factor of $\theta = 1.08$ is ($k_t = k_{20} \theta^{(T-20)}$). The ammonia nitrogen decay equation is provided below.

$$N_{\text{Limit}} = \left(\frac{N_{\text{down}}}{\text{EXP}(-k_t T)} \right)$$

- Where: N_{Limit} = Ammonia limit needed to protect downstream use (mg/L)
 N_{down} = Ammonia limit calculated based on downstream classification and flow (mg/L)
 $-k_t$ = Ammonia decay rate at background stream temperature (day⁻¹)
 T = Travel time from outfall to downstream use (day)

The velocity of receiving water is assumed to be 5 miles per day and the distance from the point of discharge to the classification change is approximately 1.17 miles for a travel time of 0.23 days. After decay, the limits are increased as shown in the following table.

Ammonia Nitrogen Decay Limits Comparison

Months Applicable	LAL		WWSF		After decay	
	Weekly Average mg/L	Monthly Average mg/L	Weekly Average mg/L	Monthly Average mg/L	Weekly Average mg/L	Monthly Average mg/L
April & May	111	44	12.6	5.95	13	6.15
June – Sept.	84	34	6.74	3.51	7.1	3.70
Oct. - March	124	50	14.0	6.15	14.3	6.28

Daily Maximum Ammonia Nitrogen Limits – WWSF (after decay)

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	76	7.0 < pH ≤ 7.1	46	8.0 < pH ≤ 8.1	10
6.1 < pH ≤ 6.2	74	7.1 < pH ≤ 7.2	41	8.1 < pH ≤ 8.2	8.0
6.2 < pH ≤ 6.3	73	7.2 < pH ≤ 7.3	37	8.2 < pH ≤ 8.3	6.6
6.3 < pH ≤ 6.4	71	7.3 < pH ≤ 7.4	32	8.3 < pH ≤ 8.4	5.4
6.4 < pH ≤ 6.5	68	7.4 < pH ≤ 7.5	28	8.4 < pH ≤ 8.5	4.5
6.5 < pH ≤ 6.6	66	7.5 < pH ≤ 7.6	24	8.5 < pH ≤ 8.6	3.7
6.6 < pH ≤ 6.7	62	7.6 < pH ≤ 7.7	20	8.6 < pH ≤ 8.7	3.1
6.7 < pH ≤ 6.8	59	7.7 < pH ≤ 7.8	17	8.7 < pH ≤ 8.8	2.6
6.8 < pH ≤ 6.9	55	7.8 < pH ≤ 7.9	14	8.8 < pH ≤ 8.9	2.2
6.9 < pH ≤ 7.0	50	7.9 < pH ≤ 8.0	12	8.9 < pH ≤ 9.0	1.8

Effluent Data

The following table evaluates the statistics based upon ammonia data reported from October 2018 to October 2023, with those results being compared to the calculated limits to determine the need to include ammonia limits in the Chili Sanitary District Wastewater Treatment Facility permit for the respective month ranges.

Ammonia Nitrogen Effluent Data

Ammonia Nitrogen mg/L	
1-day P ₉₉	11.73
4-day P ₉₉	6.70
30-day P ₉₉	4.13
Mean	3.01
Std	2.33
Sample size	42
Range	0.37 - 9.43

Based on this comparison, monthly average limits are required June through September and daily limits are required year-round.

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	Monthly Average mg/L
June – September	Variable	3.7
October - May	Variable	

PART 4 – 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 Chili Sanitary District 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.
Aug 2019	1.88	3.37	52.78
Oct 2019	1.78	2.60	38.64
Nov 2019	1.77	2.84	41.98
May 2020	2.15	4.03	72.08
Oct 2020	1.53	2.50	31.79
May 2021	2.13	5.01	88.84
Oct 2021	1.81	3.28	49.54
Jun 2022	2.16	3.61	64.85
Oct 2022	1.76	2.41	35.39
Jun 2023	1.02	4.66	39.52
Oct 2023	1.75	4.11	59.96
Average =			52.31

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.

Total Phosphorus Wasteload Allocation: 46 lbs/year (see Appendix K of the TMDL document)

Interim Limit – Phosphorus

An interim limit is needed when a compliance schedule is included in the permit to meet the TMDL limits. This limit should reflect a value which the facility is able to currently meet; however, it should also consider the receiving water quality, keeping the water from further impairment. It’s recommended that the interim limit be set equal to 2.4 mg/L, expressed as a monthly average. This value reflects the 4-day P₉₉ concentration of 2.35 mg/L. The following table lists the statistics for effluent phosphorus levels from August 2019 to October 2023 for informational purposes. In the cases where reporting the mass discharge is not required in the current permit, the mass is calculated using the reported phosphorus concentration and the effluent flow rate for that day.

Total Phosphorus Statistics

	Concentration (mg/L)	Mass Discharge (lbs/day)
1-day P ₉₉	3.03	4.77
4-day P ₉₉	2.35	3.18
30-day P ₉₉	1.97	2.36
Mean	1.78	1.96
Std	0.44	0.86
Sample Size	39	39
Range	0.85 - 2.59	0.02 - 3.62

Conclusions:

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

- Monthly average Total Phosphorus limit of 2.4 mg/L
- Annual Total Phosphorus mass limit of 46 lbs/year

**PART 5 – 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.

Limits also must be calculated for protection of the downstream warm water sport fish uses. In accordance with s. NR 106.53(2)(b), the highest daily maximum flow rate for a calendar month is used to determine the acute (daily maximum) effluent limitation. In accordance with s. NR 106.53(2)(c), the highest 7-day rolling average flow rate for a calendar month is used to determine the sub-lethal (weekly

Attachment #1

average) effluent limitation. These values were based off actual flow reported from October 2018 to November 2023.

Because the discharge travels 1.17 mi downstream before reaching the WWSF water, a heat loss equation is used to adjust the calculated limit based upon the length of the tributary before discharge to the South Branch of the Yellow River. The discharge from permit Outfall 001 travels through at least 5800 feet before reaching a WWSF waterbody. Under s. NR 106.55(5), Wis. Adm. Code, the default cooling rate is estimated as 1° F for every 400 feet the effluent travels. The adjusted limits are shown in the table. The table below summarizes the maximum temperatures reported during monitoring from May 2013 to November 2018. Temperature limits are calculated for each month of the year when a discharge occurs. Comparing the representative highest effluent temperature to the calculated effluent limits determines the reasonable potential of exceeding the effluent limits. Although effluent temperature data is missing for some months, temperature data from other months of the year with similar ambient temperatures indicates that there is not reasonable to exceed limits in these months. **Based on this comparison, no temperature limits are recommended.** The complete thermal table used for calculation is attached.

Monthly Temperature Effluent Data & Limits

Month	Representative Highest Monthly Effluent Temperature		Calculated Effluent Limit (LAL)		Calculated Effluent Limit WWSF w/heatloss	
	Weekly Maximum	Weekly Average	Weekly Average Effluent Limitation	Daily Maximum Effluent Limitation	Weekly Average Effluent Limitation	Daily Maximum Effluent Limitation
	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)
JAN			-	120		
FEB			-	120	89	120
MAR			-	120		
APR			-	120	73	102
MAY	71	77	-	120	80	98
JUN	78	81	-	120	92	101
JUL	81	83	-	120	99	101
AUG			-	120	97	101
SEP	69	69	-	120	100	113
OCT	67	68	-	120	77	98
NOV	61	61	-	120	65	96
DEC	38	39	-	120	72	108

PART 6 – 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.

Temperature limits for receiving waters with unidirectional flow

(calculation using default ambient temperature data)

Facility:	Chili Sanitary District WWTF	7-Q₁₀:	0.14	cfs	Temp Dates	05/26/13	10/10/18
Outfall(s):	001	Dilution:	25%		Start:	05/26/13	10/10/18
Date Prepared:	01/11/2024	f:	0		End:	11/20/18	11/30/23
Design Flow (Q_e):	0.200 MGD	Stream type:	Small warm water sport or forage fish community				
Storm Sewer Dist.	5808 ft	Q_s:Q_e ratio:	0.1	:1			
		Calculation Needed?	YES				

Month	Water Quality Criteria			Receiving Water Flow Rate (Q _s) (cfs)	Representative Highest Effluent Flow Rate (Q _e)		f	Representative Highest Monthly Effluent Temperature		Calculated Effluent Limit		Adjusted Thermal Limits	
	T _a (default) (°F)	Sub-Lethal WQC (°F)	Acute WQC (°F)		7-day Rolling Average (Q _{esl}) (MGD)	Daily Maximum Flow Rate (Q _{ea}) (MGD)		Weekly Average (°F)	Daily Maximum (°F)	Weekly Average Effluent Limitation (°F)	Daily Maximum Effluent Limitation (°F)	Weekly Average (°F)	Daily Maximum (°F)
JAN	33	49	76	0.04	0.000	0.000	0						
FEB	34	50	76	0.04	0.015	0.016	0			75	120	89	120
MAR	38	52	77	0.04	0.000	0.000	0						
APR	48	55	79	0.04	0.045	0.083	0			59	87	73	102
MAY	58	65	82	0.04	0.183	0.428	0	71	77	66	83	80	98
JUN	66	76	84	0.04	0.183	0.183	0	78	81	77	86	92	101
JUL	69	81	85	0.04	0.068	0.232	0	81	83	85	87	99	101
AUG	67	81	84	0.04	0.177	0.183	0			83	86	97	101
SEP	60	73	82	0.04	0.024	0.031	0	69	69	85	98	100	113
OCT	50	61	80	0.04	0.183	0.183	0	67	68	62	84	77	98
NOV	40	49	77	0.04	0.150	0.183	0	61	61	50	82	65	96
DEC	35	49	76	0.04	0.037	0.052	0	38	39	57	94	72	108

