Permit Fact Sheet

General Information

Permit Number:	WI-0026590-10-0	
Permittee Name:	City of Two Rivers	
Mailing Address:	PO Box 87, Two Rivers, WI 54241	
Facility Address:	1401 Lake Street, Two Rivers WI 54241	
Discharge Location:	Two Rivers Wastewater Treatment Facility, 1401 Lake Street, Two Rivers WI 54241 NE ¼, SE ¼ of Section 1, Township 19 North, Range 24 East, City of Two Rivers, Manitowoc County, WI	
Receiving Water:	Mouth of the East and West Twin Rivers and Lake Michigan (Water Body Identification Code number 20) in Manitowoc County and groundwater via land application in Manitowoc County.	
StreamFlow ($Q_{7,10}$):	N/A – A 10:1 dilution factor for a lake discharge is used in deriving effluent limits, where applicable	
Stream Classification:	Coldwater aquatic life community, recreation and public water supply	
Discharge Type:	Existing Continuous Discharge	
Design Flow(s)	Daily Maximum	6.00 MGD
	Weekly Maximum	Not determined
	Monthly Maximum	Not determined
	Annual Average	3.07 MGD
Significant Industrial Loading?	Yes, and includes the following: Classic Coatings, (Metal finishing with powder coating and cleaning of metal parts), Eggers Industries (Manufacturer of wood doors), Riverside Foods (Food processor), Formrite (Metal finishing with powder coating, tube bending, and cleaning of metal parts), and Metalware Corporation (Metal stamping, plastic rotational molding, and plastic injection molding).	
Operator at Proper Grade?	**Facility Subclasses & Classification:** Facility is classified at the advanced level for the following subclasses: A1 (Suspended Growth Processes), B (Solids Separation), C (Biological Solids/Sludges), D (Disinfection), and P (Total Phosphorus); and at the basic level for L (Laboratory) and SS (Sanitary Sewage Collection System). **OIC Subclasses & Grade:** David Casebeer is certified at the advanced level for the following subclasses: A1 (Suspended Growth Processes), B (Solids Separation), C (Biological Solids/Sludges), D (Disinfection), L (Laboratory), and P (Total Phosphorus); and at the OIT level for SS (Sanitary Sewage Collection System).	
Approved Pretreatment Program?	N/A	

Facility Description

The City of Two Rivers owns and operates the Two Rivers Wastewater Treatment Facility that treats residential and commercial domestic wastewater, industrial wastewater, and landfill leachate from the city sanitary sewer collection

system and Village of Mishicot sanitary sewage collection system. Class B sludge generated from the treatment facility is either land applied on department approved sites or hauled to another permitted facility. The paragraphs below describe the liquid and solids treatment train of the Two Rivers Wastewater Treatment Facility.

Liquid Treatment Train: The wastewater from the City of Two Rivers is pumped to the main lift station to the wastewater treatment facility. The wastewater enters an influent channel with a static bar screen. The influent then flows to a wet well where raw wastewater pumps convey the influent to the headworks building into a channel. The influent then passes through a mechanical fine screen. A bypass channel is available with a static bar screen. Flow from the fine screen then enters a grit chamber where the removed grit is sent to a grit classifier. The influent then passes through a Parshall flume with ultrasonic flow meter where influent flow is measured, and composite samples are collected. Ferric chloride is added after the Parshall flume and flow measurement prior to the primary clarifiers. The flow then enters two primary clarifiers operating in parallel. The primary effluent then enters a splitter box where the flow is split between 8 aeration basins operating in a series of two 4 parallel basins. Following the aeration basins, the flow is split between two final clarifiers operating in parallel. The flow then passes through a Parshall flume where effluent flow is measured with magnetic flow meter and composite samples are collected. After effluent sampling and flow monitoring, the wastewater enters an ultraviolet channel where the effluent is disinfected year-round. Lastly, the effluent then flows by gravity to the mouth of the East and West Twin Rivers and Lake Michigan via Outfall 001.

Solids Treatment Train: The solids treatment includes anaerobic digestors, sludge thickeners, screw press (or belt filter press as emergency back-up), and sludge storage structures. The two-stage anaerobic digestors treat primary sludge settled from primary clarifiers and thickened sludge from sludge thickeners receiving sludge from the final clarifiers. The anaerobic digestors are operated in a mesophilic range (85°F to 100°F). The generated gas from the digestors is flared. The generated heat from digestors is recovered to heat the digestors. The supernatant from the digestors is returned to the influent wet well. The facility does have one out of service digestor that is used currently as emergency storage. Two sludge thickener tanks thickening the sludge from the final clarifiers. The facility is looking to achieve approximately 3.5% solids before it is conveyed to the digestors. The supernatant from the sludge thickeners is returned to aeration basins. The facility only operates one sludge thickener at a time. The digested sludge is then processed through a new screw press. The pressed cake sludge then is conveyed to a truck loadout where it hauled to be stored between four on-site sludge storage barns providing 180-day storage capacity. The facility does have an existing belt press available in case the screw press is not available. The cake sludge is then hauled and land applied to department approved sites via Outfall 003. In case of emergency that the screw press or belt press are not available, the permittee has the ability to haul liquid sludge from the anaerobic digestors and land apply the liquid sludge on department approved sites via Outfall 002.

Substantial Compliance Determination

After a desk top review of all discharge monitoring reports, compliance maintenance annual reports, land application reports, compliance schedule items, and a site visit on June 4, 2024, this facility has been found to be in substantial compliance with their current permit.

Compliance determination entered by Trevor Moen, Wastewater Compliance Engineer, on June 4, 2024.

Sample Point Designation		
Sample Point Number	**Discharge Flow, Units, and Averaging Period**	**Sample Point Location, Waste Type/Sample Contents and Treatment Description (as applicable)**
701	Daily Average: 2.40 MGD (January 2018 to April 2024)	INFLUENT - Total combined influent from the City of Two Rivers' sanitary sewage collection system and Village of Mishicot's sanitary sewage collection system. At Sampling Point 701, the permittee shall collect representative samples of the influent from the automatic sampler drawing 24-hour flow proportional composite samples from the forcemain following fine screening and preceding the Parshall flume and primary clarifiers. The permittee shall measure the influent flow rate with a continuous flow recording device prior to the Parshall flume and primary clarifiers.
001	Not required to report the flow rate during the previous permit term.	EFFLUENT - At Sampling Point 001, the permittee shall collect representative samples of effluent from the effluent automatic composite sampler drawing 24-hour flow proportional composite samples from open channel prior to UV disinfection, except that the permittee shall collect grab samples of the effluent from the open channel after UV disinfection for pH, E. coli, mercury, PFOA, and PFOS prior to being discharged to Lake Michigan via Outfall 001. The permittee shall measure the effluent flow rate using a continuous flow recording device prior to the UV disinfection system.
002	This outfall was not used during the previous permit term.	LIQUID SLUDGE - Class B liquid sludge from the treatment of primary and waste activated sludge that is gravity thickened then stabilized in a two-stage anaerobic digester. This outfall has been included for emergency use in case dewatering with screw press or belt press is not available. At Sampling Point 002, the permittee shall collect representative grab and/or composite samples of liquid sludge from the secondary anaerobic digestor prior to being land applied on department approved sites via Outfall 002.
003	Average Annual Sludge Generated: 410 metric tons (2018 to 2023) Average Annual Sludge Land Applied: 207 metric tons (2018 to 2023)	CAKE SLUDGE - Class B cake sludge from the treatment of primary and waste activated sludge that is gravity thickened, anaerobically digested, treated with a screw press (or belt press as emergency back-up), and loaded onto trucks and then stored on-site in sludge storage barns. At Sampling Point 003, the permittee shall collect representative grab and/or composite samples of the cake sludge from the truck loadout or cake storage piles in the on-site sludge storage barns prior to being land applied on department approved sites via Outfall 003.
111	Not applicable	Field Blank - At Sampling Point 111, the permittee shall collect a field blank for each day a mercury sample is collected. The permittee shall report the field blank concentrations when reporting mercury sample results.

1 Influent – Monitoring Requirements

Sample Point Number: 701- 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	5/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total		mg/L	5/Week	24-Hr Flow Prop Comp	
Mercury, Total Recoverable		ng/L	Quarterly	24-Hr Flow Prop Comp	See Mercury Monitoring section in the permit.

Changes from Previous Permit:

- No changes from previous permit.

Explanation of Limits and Monitoring Requirements

Flow Rate, BOD_5, and TSS Monitoring: Influent monitoring is needed to assess loading to the facility and treatment performance. Requirements for flow, BOD, and TSS are established in accordance with s. NR 210.04(2), Wis. Adm. Code. Influent monitoring for flow, BOD5, and TSS remains unchanged from the previous permit.

Mercury Monitoring: Monitoring requirements may be adjusted on a case−by− case basis depending on wastewater characteristics and their potential to degrade water quality pursuant to s. NR 210.04(3), Wis. Adm. Code. The department requires quarterly influent monitoring for mercury to continue to characterize the mercury loading coming into the wastewater treatment facility and better assess mercury reductions. Influent monitoring for total recoverable mercury remains unchanged from the previous permit.

Sampling Frequency: The department shall determine on a case−by−case basis the monitoring frequency to be required for each parameter in a permit pursuant to s. NR 205.066, Wis. Adm. Code. The Monitoring Frequencies for Individual Wastewater Permits guidance (April 12, 2021) recommends that standard monitoring frequencies be included in individual WPDES permits based on the size and type of the facility, in order to characterize influent quality and variability, to detect events of noncompliance, and to ensure fairness and consistency in permits issued across the state. Guidance and requirements in administrative code were considered when determining the appropriate monitoring frequencies for pollutants that have final effluent limits in effect during this permit term. Previously permitted monitoring frequencies for influent flow, BOD5 and TSS are consistent with the standard monitoring frequency outlined in guidance. The sampling frequencies for influent flow, BOD5 and TSS remain unchanged from the previous permit.

Sample Type: The department shall require the use of 24−hour flow proportional samplers for monitoring influent wastewater quality except where the department determines through the permit issuance process that other sample types may adequately characterize the influent quality pursuant to s. NR 210.04(4), Wis. Adm. Code. The 24-hour flow-proportional sampling is the most representative method of collecting wastewater samples for wastewater coming into and being discharged from a wastewater treatment plant on a continuous basis. The sample type for BOD5, TSS, and mercury remains unchanged from the previous permit. For municipal waste at a treatment facility, methods of flow measurement shall include a continuous recording device pursuant to s. NR 218.05(1), Wis. Adm. Code. The sample type of influent flow rate remains unchanged from the previous permit.

2 Inplant - Monitoring and Limitations

Sample Point Number: 111- FIELD BLANK

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Mercury, Total Recoverable		ng/L	Quarterly	Blank	See Mercury Monitoring section in the permit.

Changes from Previous Permit:

- No changes from previous permit.

Explanation of Limits and Monitoring Requirements

Field Blank Monitoring: Collection of a field blank during mercury sampling events is required to satisfy the sampling requirements of s. NR 106.145(9)(c), Wis. Adm. Code.

3 Surface Water - Monitoring and Limitations

Sample Point Number: 001- EFFLUENT

Monitoring Requirements and Effluent Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Continuous	
BOD_5, Total	Weekly Avg	45 mg/L	5/Week	24-Hr Flow Prop Comp	
BOD_5, Total	Monthly Avg	30 mg/L	5/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total	Weekly Avg	45 mg/L	5/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total	Monthly Avg	30 mg/L	5/Week	24-Hr Flow Prop Comp	
pH Field	Daily Max	9.0 su	5/Week	Grab	
pH Field	Daily Min	6.0 su	5/Week	Grab	
E. coli	Geometric Mean - Monthly	126 #/100 ml	2/Week	Grab	
E. coli	% Exceedance	10 Percent	Monthly	Calculated	See the E. coli Percent Limit section in the permit. Enter the result in the DMR on the last day of the month.
Nitrogen, Ammonia (NH_3-N) Total		mg/L	5/Week	24-Hr Flow Prop Comp	Monitoring only May through October each year. See Ammonia Limit Not Needed - Continue to Optimize Removal of Ammonia section in the standard requirements.
Nitrogen, Ammonia (NH_3-N) Total	Weekly Avg	31 mg/L	5/Week	24-Hr Flow Prop Comp	Limit applies November through April each year.
Nitrogen, Ammonia (NH_3-N) Total	Monthly Avg	31 mg/L	5/Week	24-Hr Flow Prop Comp	Limit applies November through March each year.
Nitrogen, Ammonia (NH_3-N) Total	Monthly Avg	30 mg/L	5/Week	24-Hr Flow Prop Comp	Limit applies April each year.

Monitoring Requirements and Effluent Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Phosphorus, Total	Monthly Avg	1.0 mg/L	5/Week	24-Hr Flow Prop Comp	See the Phosphorus Water Quality-Based Effluent Limitation(s) section in the permit.
Phosphorus, Total	6-Month Avg	0.6 mg/L	5/Week	24-Hr Flow Prop Comp	See the Phosphorus Water Quality-Based Effluent Limitation(s) section in the permit.
Chloride		mg/L	Monthly	24-Hr Flow Prop Comp	Monitoring Only required from January 2027 to December 2027.
Arsenic, Total Recoverable		ug/L	Monthly	24-Hr Flow Prop Comp	Monitoring only required from January 2027 to December 2027. See Total Recoverable Arsenic Monitoring section in the permit.
Mercury, Total Recoverable	Weekly Avg	1.3 ng/L	Quarterly	Grab	See Mercury Monitoring and Mercury – Continued Implementation of Pollutant Minimization Program sections in the permit.
Mercury, Total Recoverable	Monthly Avg	1.3 ng/L	Quarterly	Grab	See Mercury Monitoring and Mercury – Continued Implementation of Pollutant Minimization Program sections in the permit.
Nitrogen, Total Kjeldahl		mg/L	Quarterly	24-Hr Flow Prop Comp	See Nitrogen Series Monitoring section in the permit.
Nitrogen, Nitrite + Nitrate Total		mg/L	Quarterly	24-Hr Flow Prop Comp	See Nitrogen Series Monitoring section in the permit.
Nitrogen, Total		mg/L	Quarterly	Calculated	See Nitrogen Series Monitoring section in the permit. Total Nitrogen = Total Kjeldahl Nitrogen (mg/L) + Total (Nitrite + Nitrate)

Monitoring Requirements and Effluent Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
PFOS		ng/L	1/ 2 Months	Grab	Monitoring only. See PFOS/PFOA Sampling and Reporting Requirements section below and PFOS/PFOA Minimization Plan Determination of Need section and compliance schedule in the permit.
PFOA		ng/L	1/ 2 Months	Grab	Monitoring only. See PFOS/PFOA Sampling and Reporting Requirements section below and PFOS/PFOA Minimization Plan Determination of Need section and compliance schedule in the permit.
Acute WET		TU_a	See Listed Qtr(s)	24-Hr Flow Prop Comp	See the Whole Effluent Toxicity Testing section in the permit.
Chronic WET	Monthly Avg	11 TUc	See Listed Qtr(s)	24-Hr Flow Prop Comp	See the Whole Effluent Toxicity Testing section in the permit.

Changes from Previous Permit

- The permit requires effluent flow rate monitoring.
- Fecal coliform monitoring and limits have been replaced with Escherichia coli (E. coli) monitoring and limits. E. coli limits year-round.
- The sampling frequency for E. coli has been increased to 2/week.
- Monthly chloride monitoring for 2027 has been added to the permit.
- Monthly total recoverable arsenic monitoring for 2027 has been added to the permit.
- Weekly average and monthly average limits have been added for total recoverable mercury.
- Quarterly nitrogen series monitoring has been added to the permit.
- Bimonthly PFOA and PFOS monitoring has been added to the permit.

Explanation of Limits and Monitoring Requirements

More information and explanation about the proposed water quality-based effluent limits (WQBELs) is found in the "Water Quality-Based Effluent Limitations for Two Rivers Wastewater Treatment Facility WPDES Permit No. WI-0026590-10-0" memo dated May 24, 2024.

Flow Rate Monitoring: For municipal waste at a treatment facility, methods of flow measurement shall include a continuous recording device pursuant to s. NR 218.05(1), Wis. Adm. Code. The permittee already has an effluent flow meter installed so no schedule is necessary to install one.

Secondary Treatment Limits for BOD_5, TSS, and pH: Publicly owned treatment works with a discharge to a surface water classified as a fish and aquatic life water shall meet the secondary treatment effluent limits specified for BOD_5, TSS, and pH in s. NR 210.05(1), Wis. Adm. Code. The permittee discharges to Lake Michigan which is classified as a fish and aquatic life water. Therefore, effluent limitations in s. NR 210.05(1), Wis. Adm. Code apply. The limits for BOD_5, TSS, and pH remain unchanged from the previous permit.

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

The permittee discharges to Lake Michigan which is classified as a public drinking water supply and the discharge is in proximity to a public drinking water supply intake. Permits for publicly and privately owned sewage treatment works that discharge to public drinking water supply waters are required to disinfect year-round pursuant to s. NR 210.06(1)(b), Wis. Adm. Code. 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 in order to protect recreation season (May to September): The geometric mean of E. coli bacteria in effluent samples collected in any calendar month cannot exceed 126 counts/100 mL. No more than 10% of E. coli bacteria samples collected in any calendar month can exceed 410 counts/100 mL. Fecal coliform limits and monitoring are no longer required for recreational protection. Additionally, if a facility is required to disinfect to protect public drinking water supplies outside of the recreation period, the facility may either continue to meet the E. coli limits specified year−round, or the geometric mean of the fecal coliform bacteria for effluent samples collected in a period of 30 consecutive days may not exceed 400 counts/100 mL pursuant to s. NR 210.06(2)(a)2., Wis. Adm. Code. The facility selected to meet the E. coli limits year-round.

The permittee had monitored effluent E. coli weekly from May to September each year with a total of 130 results. The facility had an average concentration of 44#/100 mL, The geometric mean monthly limit of 126 #/100 mL was not exceeded during this period with a maximum monthly geometric mean of 79 #/100 mL. Effluent data did exceed the maximum limit of 410 #/100 mL but only once during the previous permit term. The maximum reported value was 444 #/100 mL. Based on the effluent E. coli monitoring data, the permittee has demonstrated that the final E. coli limits can be met immediately with the existing disinfection system.

Ammonia Nitrogen: Ammonia limits were calculated using 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 WQBELs for ammonia. The weekly average and monthly average limits have not changed from the previous permit.

Total Phosphorus: Phosphorus requirements are based on the Phosphorus Rules as detailed in ch. NR 102 (water quality standards) and NR 217, Wis. Adm. Code (effluent standards and limitations for phosphorus). Chapter NR 217 of the Wis. Adm. Code addresses point source dischargers of phosphorus to surface waters. Currently, there are three types of limit calculations used to determine if a phosphorus limit is needed: a technology based effluent limit (TBEL), a WQBEL determined from water quality criteria and an effluent limit based on a total maximum daily load (TMDL) allocation.

- A TBEL of 1.0 mg/L is needed if a facility discharges more than the threshold of 150 pounds per month (s. NR 217.04(1)(a)1., Wis. Adm. Code). The data demonstrates that the monthly average phosphorus loading is more than 150 lbs/month. The TBEL of 1.0 mg/L remains unchanged from the previous permit.

- Section NR 102.06(5)(b), Wis. Adm. Code, specifies that a total phosphorus criterion of 7 µg/L (0.007 mg/L) applies for the open and nearshore water of Lake Michigan. For direct discharges to Lake Michigan such as Manitowoc, s. NR 217.13(4), Wis. Adm. Code, states that the department shall set effluent limits consistent with nearshore or whole lake models approved by the department. In the absence of an approved model, a WQBEL of 0.6 mg/L as a six-month average is recommended. This six-month average limit has also been set for other municipal wastewater treatment facilities that discharge to Lake Michigan. The interim six-month average limit of 0.6 mg/L remains in effect and unchanged from the previous permit.
- The discharge is directly to Lake Michigan. There is no approved TMDL effective for Lake Michigan. Therefore, an effluent limit based on a TMDL allocation is not applicable.

Chloride: Effluent chloride concentrations are below the calculated WQBELs; therefore, limits are not required. However, monthly monitoring is required in 2027 to ensure that 11 sample results are available at the next permit reissuance to meet the reasonable potential data requirements of s. NR 106.85, Wis. Adm. Code.

Arsenic: The sample that was collected for the permit reissuance application had a limit of detection (LOD) of 0.85 µg/L which is greater than the most stringent calculated limit of 0.2 µg/L based on the human cancer criteria. Because the LODs are greater than the most stringent calculated limit, reasonable potential cannot be determined at this time. Monthly monitoring is required in 2027 to ensure that 11 sample results are available at the next permit reissuance to meet the reasonable potential data requirements of s. NR 106.85, Wis. Adm. Code. The arsenic test method shall be sensitive enough so that the LOD is below 0.2 µg/L and reasonable potential can be determined for the next permit reissuance. To demonstrate that Two Rivers does not contribute additional mass of arsenic at the point of discharge, the permittee may perform monthly monitoring of arsenic from the untreated drinking water supply intake (water supply from Lake Michigan).

Mercury: The WQBEL for total recoverable mercury is set equal to the most stringent criterion of 1.3 ng/L, according to s. NR 106.06(6), Wis. Adm. Code, because the background concentration in the receiving water and similar inland streams is known to exceed 1.3 ng/L. A review of data from 01/09/2018 – 01/30/2024 indicates the 30-day P_{99} is 2.34 ng/L,, which is above the wildlife criterion of 1.3 ng/L. Therefore, a mercury effluent limit is required for Two Rivers WWTF. Two Rivers currently has an alternative mercury effluent limit of 13 ng/L based on their 1-day P_{99} from the previous WQBEL evaluation. They had requested an exception to the mixing zone phase-out for mercury per 40 CFR, Part 132, Appendix F, Procedure 3 C. 6. Over the current permit term, Two Rivers has decreased their effluent mercury through source reduction measures and no longer need an alternative mercury effluent limit, so the daily maximum limit of 13 ng/L is recommended to be removed. The facility over the last 11 quarters has demonstrated the ability to meet the final effluent limitations for mercury. Therefore, the department included weekly average and monthly average limits of 1.3 ng/L for mercury. Nevertheless, the permittee shall continue to implement the mercury pollutant minimization measures as a part of the pollutant minimization program to ensure effluent quality is maintained at or below the final effluent limits.

Nitrogen Series Monitoring (NO2+NO3, TKN and Total N): The department has included monthly effluent monitoring for total nitrogen since the permittee is a major discharge (>1 MGD) in the permit through the authority under s. 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. 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.

PFOA and PFOS: NR 106 Subchapter VIII – Permit Requirements for PFOS and PFOA Dischargers became effective on August 1, 2022. At the first reissuance of a WPDES permit after August 1, 2022, the new rule requires WPDES permits for major municipal dischargers with an average flow rate greater than 1 MGD but less than 5 MGD, at a minimum sample effluent once every two-months for PFOS and PFOA pursuant s. NR 106.98(2)(b), Wis. Adm. Code. A sample frequency of 1/2 months means one sample is taken during any two-month period. Examples of 1/2 month sample would be every other month (Jan, March, May, etc.) or back-to-back months with a break in between (February & March, May & June, Aug & Sept, etc.). DMR Short Forms will be generated for the following time periods: January-February, March-April, May-June, July-August, September-October, and November-December. At a minimum one sample result

will be present on each form. The initial determination of the need for sampling shall be conducted for up to two years in order to determine if the permitted discharge has the reasonable potential to cause or contribute to an exceedance of the PFOS or PFOA standards under s. NR 102.04(8)(d)1, Wis. Adm. Code.

Whole Effluent Toxicity Testing: Whole effluent toxicity (WET) testing requirements and limits 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.wisconsin.gov/topic/wastewater/wet.html). Additionally, major municipal discharger with a design flow greater than 1.0 MGD and/or with approved pretreatment program must at a minimum perform annual WET testing pursuant to 40 CFR Part 122.21(j)(5). After consideration of the guidance provided in the Department's WET Program Guidance Document (2019) and other information described above, 1 x yearly acute and chronic WET tests were recommended in the reissued permit. Tests should be done in rotating quarters to collect seasonal information about this discharge. WET testing should continue after the permit expiration date (until the permit is reissued). The department has determined that the current Chronic WET limit of 11.0 TUc expressed as a monthly average remains unchanged from the previous permit.

Sampling Frequency: The department shall determine on a case−by−case basis the monitoring frequency to be required for each parameter in a permit pursuant to s. NR 205.066, Wis. Adm. Code. The Monitoring Frequencies for Individual Wastewater Permits guidance (April 12, 2021) recommends that standard monitoring frequencies be included in individual WPDES permits based on the size and type of the facility, in order to characterize effluent quality and variability, to detect events of noncompliance, and to ensure fairness and consistency in permits issued across the state. Guidance and requirements in administrative code were considered when determining the appropriate monitoring frequencies for pollutants that have final effluent limits in effect during this permit term.

Previously permitted monitoring frequencies for all parameters are consistent with the standard monitoring frequency outlined in the guidance. These sampling frequencies remain unchanged from the previous permit except for E. coli. If performance levels begin to vary during the permitted term, the department may re-evaluate current sampling frequencies and implement more frequent monitoring via permit modification or at permit reissuance. The E. coli monitoring frequency has increased to 2/week to match the monitoring frequency of fecal coliform in the previous permit.

Sample Type: The department shall require the use of 24−hour flow proportional samplers for monitoring effluent wastewater quality except where the department determines through the permit issuance process that other sample types may adequately characterize the effluent quality pursuant to s. NR 210.04(4), Wis. Adm. Code. The 24-hour flow-proportional sampling is the most representative method of collecting wastewater samples for wastewater coming into and being discharged from a wastewater treatment plant on a continuous basis. Grab samples for pH and E. coli are required as compositing and holding such samples would change the test results and is noncompliant with maximum holding times specified in ch. NR 219, Wis. Adm. Code. The sample type for all parameters remains unchanged from the previous permit.

4 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**
002	B	Liquid	Fecal Coliform	Volatile Solids Reduction	Land Application	Not Used
003	B	Cake	Fecal Coliform	Volatile Solids Reduction	Land Application	207 Metric Tons (2018 to 2023)
Does sludge management demonstrate compliance? Yes						
Is additional sludge storage required? No						
Is Radium-226 present in the water supply at a level greater than 2 pCi/liter? No.						
Is a priority pollutant scan required? No, the annual average design flow rate is less than 5 MGD. 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- LIQUID SLUDGE

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Solids, Total		Percent	Quarterly	Composite	Monitoring required only when liquid sludge is land applied.
Arsenic Dry Wt	Ceiling	75 mg/kg	Quarterly	Composite	Monitoring required and limits applicable only when liquid sludge is land applied.
Arsenic Dry Wt	High Quality	41 mg/kg	Quarterly	Composite	
Cadmium Dry Wt	Ceiling	85 mg/kg	Quarterly	Composite	
Cadmium Dry Wt	High Quality	39 mg/kg	Quarterly	Composite	
Copper Dry Wt	Ceiling	4,300 mg/kg	Quarterly	Composite	
Copper Dry Wt	High Quality	1,500 mg/kg	Quarterly	Composite	
Lead Dry Wt	Ceiling	840 mg/kg	Quarterly	Composite	
Lead Dry Wt	High Quality	300 mg/kg	Quarterly	Composite	
Nitrogen, Total Kjeldahl	Ceiling	57 mg/kg	Quarterly	Composite	
Nitrogen, Total Kjeldahl	High Quality	17 mg/kg	Quarterly	Composite	

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Molybdenum Dry Wt	Ceiling	75 mg/kg	Quarterly	Composite	
Nickel Dry Wt	Ceiling	420 mg/kg	Quarterly	Composite	
Nickel Dry Wt	High Quality	420 mg/kg	Quarterly	Composite	
Selenium Dry Wt	Ceiling	100 mg/kg	Quarterly	Composite	
Selenium Dry Wt	High Quality	100 mg/kg	Quarterly	Composite	
Zinc Dry Wt	Ceiling	7,500 mg/kg	Quarterly	Composite	
Zinc Dry Wt	High Quality	2,800 mg/kg	Quarterly	Composite	
Nitrogen, Total Kjeldahl		Percent	Quarterly	Composite	Monitoring required only when liquid sludge is land applied.
Nitrogen, Ammonium (NH4-N) Total		Percent	Quarterly	Composite	
Phosphorus, Total		Percent	Quarterly	Composite	
Phosphorus, Water Extractable		% of Tot P	Quarterly	Composite	
Potassium, Total Recoverable		Percent	Quarterly	Composite	
PCB Total Dry Wt	Ceiling	50 mg/kg	Once	Composite	Monitoring required once only when liquid sludge is land applied.
PCB Total Dry Wt	High Quality	10 mg/kg	Once	Composite	
PFOA + PFOS		ug/kg	Annual	Calculated	Monitoring required only when liquid sludge is land applied. Report the sum of PFOA and PFOS. See PFAS Permit Sections for more information.
PFAS Dry Wt			Annual	Grab	Monitoring required only when liquid sludge is land applied. Perfluoroalkyl and Polyfluoroalkyl Substances based on updated DNR PFAS List. See PFAS Permit Sections for more information.

Sample Point Number: 003- CAKE SLUDGE

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Solids, Total		Percent	Quarterly	Composite	
Arsenic Dry Wt	Ceiling	75 mg/kg	Quarterly	Composite	
Arsenic Dry Wt	High Quality	41 mg/kg	Quarterly	Composite	
Cadmium Dry Wt	Ceiling	85 mg/kg	Quarterly	Composite	
Cadmium Dry Wt	High Quality	39 mg/kg	Quarterly	Composite	
Copper Dry Wt	Ceiling	4,300 mg/kg	Quarterly	Composite	
Copper Dry Wt	High Quality	1,500 mg/kg	Quarterly	Composite	
Lead Dry Wt	Ceiling	840 mg/kg	Quarterly	Composite	
Lead Dry Wt	High Quality	300 mg/kg	Quarterly	Composite	
Nitrogen, Total Kjeldahl	Ceiling	57 mg/kg	Quarterly	Composite	
Nitrogen, Total Kjeldahl	High Quality	17 mg/kg	Quarterly	Composite	
Molybdenum Dry Wt	Ceiling	75 mg/kg	Quarterly	Composite	
Nickel Dry Wt	Ceiling	420 mg/kg	Quarterly	Composite	
Nickel Dry Wt	High Quality	420 mg/kg	Quarterly	Composite	
Selenium Dry Wt	Ceiling	100 mg/kg	Quarterly	Composite	
Selenium Dry Wt	High Quality	100 mg/kg	Quarterly	Composite	
Zinc Dry Wt	Ceiling	7,500 mg/kg	Quarterly	Composite	
Zinc Dry Wt	High Quality	2,800 mg/kg	Quarterly	Composite	
Nitrogen, Total Kjeldahl		Percent	Quarterly	Composite	
Nitrogen, Ammonium (NH4-N) Total		Percent	Quarterly	Composite	
Phosphorus, Total		Percent	Quarterly	Composite	
Phosphorus, Water Extractable		% of Tot P	Quarterly	Composite	
Potassium, Total Recoverable		Percent	Quarterly	Composite	
PCB Total Dry Wt	Ceiling	50 mg/kg	Once	Composite	Monitoring required once in 2026.
PCB Total Dry Wt	High Quality	10 mg/kg	Once	Composite	

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
PFOA + PFOS		ug/kg	Annual	Calculated	Report the sum of PFOA and PFOS. See PFAS Permit Sections for more information.
PFAS Dry Wt			Annual	Grab	Perfluoroalkyl and Polyfluoroalkyl Substances based on updated DNR PFAS List. See PFAS Permit Sections for more information.

Changes from Previous Permit:

- The sludge sampling frequency has been increased to quarterly for each sludge outfall.
- Annual PFAS monitoring has been added to the permit for each sludge outfall.

Explanation of Limits and Monitoring Requirements

Outfall 002: Outfall 002 remains in the permit as an emergency Outfall in case producing cake sludge is not available. The permittee will have the ability to land apply the liquid sludge from the anaerobic digesters to department approved sites. If a permittee generates more than one type of sludge, each sludge type shall be sampled and analyzed in accordance with the WPDES permit pursuant to s. NR 204.06(2)(a), Wis. Adm. Code.

Metals, Nutrients, Pathogen Control, Vector Attraction Reduction: The parameters to be analyzed in the sludge were determined pursuant to s. NR 204.06(2)(b), Wis. Adm. Code. The ceiling and high-quality limits for metals in sludge are specified in s. NR 204.07(5), Wis. Adm. Code. Requirements for pathogen control are specified in s. NR 204.07(6), Wis. Adm. Code and in s. NR 204.07(7), Wis. Adm. Code for vector attraction reduction requirements. Nutrients are required to be analyzed to track that nutrient recommendations for the crop are not exceeded. Specifically, the amount of available nitrogen from sludge and other nitrogen sources applied per growing season may not exceed the nitrogen requirement of the crop pursuant to s. NR 204.07(8)(a), Wis. Adm. Code.

Water extractable phosphorus (WEP) is the coefficient for determining plant available phosphorus from measured total phosphorus. In Wisconsin, the Penn State Method is utilized and is expressed in percent. While a total P may be significant, the WEP may show that only a small percentage of the P is available to plants because of factors such as treatment processes and chemical addition that “tie-up” phosphorus limiting the amount of phosphorus that is plant available. As part of the Wisconsin’s nutrient management plan (NMP) requirements, the accounting of all fertilizers must be included over the NMP cycle. The fertilizer value of the waste needs to be communicated to the farmer and accounted for in the NMP.

The metals and nutrients monitoring, pathogen control, and vector attraction reduction requirements are unchanged from the previous permit.

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 s. NR 204.06(2)(b)9., Wis. Adm. Code.

Sample Frequency: The frequency of monitoring for metals, nutrients, pathogen control, and vector attraction reduction requirements of the sludge is based on the amount of sludge land applied each year pursuant to s. NR 204.06(2)(c)3., Wis. Adm. Code. The facility land applied on annual average of 207 dry metric tons each year (2018 to 2023). This result is less than 290 dry metric tons of sludge each year based on Table A in s. NR 204.06(2)(c)3., Wis. Adm. Code which results in a sampling frequency of once per year. However, the facility currently requested that the sludge sampling frequency be increased to quarterly to match the current sampling plan.

5 Schedules

5.1 PFOS/PFOA Minimization Plan Determination of Need

Required Action	Due Date
Report on Effluent Discharge: Submit a report on effluent PFOS and PFOA concentrations and include an analysis of trends in monthly and annual average PFOS and PFOA concentrations. This analysis should also include a comparison to the applicable narrative standard in s. NR 102.04(8)(d), Wis. Adm. Code. This report shall include all additional PFOS and PFOA data that may be collected including any influent, intake, in-plant, collection system sampling, and blank sample results.	07/31/2025
Report on Effluent Discharge and Evaluation of Need: Submit a final report on effluent PFOS and PFOA concentrations and include an analysis of trends in monthly and annual average PFOS and PFOA concentrations of data collected over the last 24 months. The report shall also provide a comparison on the likelihood of the facility needing to develop a PFOS/PFOA minimization plan. This report shall include all additional PFOS and PFOA data that may be collected including any influent, intake, in-plant, collection system sampling, and blank sample results. The permittee shall also submit a request to the department to evaluate the need for a PFOS/PFOA minimization plan. If the Department determines a PFOS/PFOA minimization plan is needed based on a reasonable potential evaluation, the permittee will be required to develop a minimization plan for Department approval no later than 90 days after written notification was sent from the Department. The Department will modify or revoke and reissue the permit to include PFOS/PFOA minimization plan reporting requirements along with a schedule of compliance to meet WQBELs. Effluent monitoring of PFOS and PFOA shall continue as specified in the permit until the modified permit is issued. If, however, the Department determines there is no reasonable potential for the facility to discharge PFOS or PFOA above the narrative standard in s. NR 102.04(8)(d), Wis. Adm. Code, no further action is required and effluent monitoring of PFOS and PFOA shall continue as specified in the permit.	07/31/2026

5.2 Sludge Management Plan

A management plan is required for the permittee's sludge management program.

Required Action	Due Date
Sludge Management Plan Submittal: Submit a sludge management plan to optimize the land application system performance and demonstrate compliance with ch. NR 204, Wis. Adm. Code, by the Due Date. This management plan shall 1) specify information on pretreatment processes (if any); 2) identify land application sites; 3) describe site limitations; 4) address vegetative cover management and removal; 5) specify availability of storage; 6) describe the type of transporting and spreading vehicle(s); 7) specify monitoring procedures; 8) track site loading; 9) address contingency plans for adverse weather and odor/nuisance abatement; and 10) include any other pertinent information. Once approved, all sludge management activities shall be conducted in accordance with the plan. Any changes to the plan must be approved by the Department prior to implementing the changes.	12/31/2024

5.3 Capacity, Management, Operation, and Maintenance (CMOM) Program

The permittee shall have written documentation of the CMOM program components in accordance with s. NR 210.23(4), Wis. Adm. Code.

Required Action	Due Date
Revised CMOM Program: Review and revise the Capacity, Management, Operation and Maintenance (CMOM) Program to meet the requirements of s. NR 210.23, Wis. Adm. Code. A revised copy of the program shall be submitted to the department by the due date.	10/31/2024

5.4 SS (Sanitary Sewage Collection System) Subclass

The permittee is required to have a designated collection system operator−in−charge (OIC) for the sanitary sewage collection system. The designated OIC shall have passed and be certified in the SS (Sanitary Sewage Collection System) subclass pursuant to s. NR 114.53(2), Wis. Adm. Code.

Required Action	Due Date
Operator Certification: The permittee shall designate one person to be the operator-in-charge (OIC) for the sanitary sewage collection system and obtain the SS (Sanitary Sewage Collection System) subclass at the basic level. The designated OIC will have 12 months to pass the exam for the SS (Sanitary Sewage Collection System) subclass and submit the operator experience form for one year of subclass specific experience to be certified at the basic level pursuant to s. NR 114.53(4), Wis. Adm. Code.	07/31/2025

Explanation of Schedules

PFOS/PFOA Minimization Plan Determination of Need: As stated above, NR 106 Subchapter VIII – Permit Requirements for PFOS and PFOA Dischargers became effective on August 1, 2022. S. NR 106.98, Wis. Adm. Code, specifies steps to generate data in order to determine the need for reducing PFOS and PFOA in the discharge. Data generated per the effluent monitoring requirements will be used to determine the need for developing a PFOS/PFOA minimization plan. As part of the schedule, the permittee is required to submit two annual Reports on Effluent Discharge. If the department determines that a minimization plan is needed, the permit will be modified or revoked/reissued to include additional requirements.

Sludge Management Plan: Per s. NR 204.11(1), Wis. Adm. Code, the department may require the permittee to develop a sludge management plan, submit the plan to the department for approval and operate in compliance with the approved plan. The plan shall include a description of the facility's sludge management program and how the permittee plans to operate the facility in compliance with the requirements of the permit and ch. NR 204, Wis. Adm. Code. The sludge management plan shall be submitted to the department for approval by the due date in the permit.

Revised CMOM Program: The permittee shall have written documentation of the CMOM program components in accordance with s. NR 210.23(4), Wis. Adm. Code. The department reviewed the CMOM program as a part of inspection performed on June 4, 2024. As part of this inspection, the department identified some deficiencies in the CMOM Program and requested the facility revise the CMOM Program. This schedule serves as a reminder to submit a revised CMOM program to the department by the due date.

SS (Sanitary Sewage Collection System) Subclass: The permittee is required to have a designated collection system operator−in−charge (OIC) for the sanitary sewage collection system. The designated OIC shall have passed and be certified in the SS (Sanitary Sewage Collection System) subclass pursuant to s. NR 114.53(2), Wis. Adm. Code. The OIC will have 12 months to pass the exam for the SS (Sanitary Sewage Collection System) subclass and submit the one year of subclass specific experience to be certified at the basic level pursuant to s. NR 114.53(4), Wis. Adm. Code. This schedule serves as a reminder of the operator certification requirements.

6 Standard Requirements

Changes from Previous Permit:

The Standard Requirements section contains conditions and requirements that are, for the most part, applicable to all municipal permittees consistent with ss. NR 205.07(1) and NR 205.07(2), Wis. Adm. Code. Other standard requirements may be added as reminders. Changes to the standard requirements section include:

- Section 6.1.4: The limit of quantitation was updated for TSS for purposes of calculating NR 101 fees. A reminder was added about the reporting requirements when there is no discharge through a permitted outfall for flow related parameters.
- Section 6.4.7: The department has added a reminder about the expression of the E. coli limits and to enter a value of 1 for a result of 0 when calculating the geometric mean. This has replaced fecal coliform from the previous permit.
- Section 6.4.9: The department has updated the year-round disinfection requirements to reflect the changes in the disinfection rules.
- Section 6.4.11: The department has added the laboratory certification requirements for PFOA and PFOS testing.
- Section 6.5.6: The department has revised the monitoring and calculation requirements for PCB Concentrations in Sludge.
- Sections 6.5.12 to 6.5.16: The department has revised or added all applicable sludge treatment process and vector control requirements that may be applicable to the permittee.

7 Summary of Reports Due

A summary of reports due has been added for informational purposes for the permittee to keep track of the due dates of reports and schedule items.

Other Comments/Changes from Previous Permit:

- None

Justification Of Any Waivers from Permit Application Requirements

- No waivers were requested from permit application requirements.

Attachments:

“Water Quality-Based Effluent Limitations for Two Rivers Wastewater Treatment Facility WPDES Permit No. WI-0026590-10-0” memo dated May 24, 2024.

Expiration Date:

July 31, 2029

Prepared By:

Trevor Moen
Wastewater Engineer

Date: 05/13/2024

Post Fact Check #1 Revision Date: 05/24/2024

Post Fact Check #2 Revision Date: 06/05/2024

Post Public Notice Revision Date:

CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: 05/24/2024

TO: Trevor Moen – NER

FROM: Nicole Krueger – SER Nicole Krueger

SUBJECT: Water Quality-Based Effluent Limitations for Two Rivers Wastewater Treatment Facility WPDES Permit No. WI-0026590-10

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 Two Rivers Wastewater Treatment Facility in Manitowoc County. This municipal wastewater treatment facility (WWTF) discharges to Lake Michigan, located in the West Twin River Watershed in the Lakeshore Basin. The evaluation of the permit recommendations is discussed in more detail in the attached report.

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

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
BOD_5			45 mg/L	30 mg/L		1
TSS			45 mg/L	30 mg/L		1
pH	9.0 s.u.	6.0 s.u.				1
Bacteria						2
E. coli				126 #/100 mL geometric mean		
Ammonia Nitrogen November – March April			 31 mg/L 31 mg/L	 **31 mg/L** 30 mg/L		3
PFOS and PFOA						4
Phosphorus				1.0 mg/L	0.6 mg/L	1
Mercury			**1.3 ng/L**	1.3 ng/L		3
Acute WET						5,6
Chronic WET				11 TUc		5,6
Arsenic						7
TKN, Nitrate + Nitrite, and Total Nitrogen						8

Footnotes:

1. No changes from the current permit.
2. E. coli limits apply year round. Additional final limit: No more than 10 percent of *E. coli* bacteria samples collected in any calendar month may exceed 410 count/100 mL.
3. Additional limits to comply with the expression of limits requirements in ss. NR 106.07 and NR 205.065(7), Wis. Adm. Codes, are included in bold.
4. Monitoring is required once every two months in accordance with s. NR 106.98(2), Wis. Adm. Code.
5. Annual acute and chronic WET testing is recommended. The Instream Waste Concentration (IWC) to assess chronic test results is 9%. According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), chronic testing shall

be performed using a dilution series of 100%, 30%, 10%, 3% & 1% and the dilution water used in WET tests conducted on Outfall 001 shall be a grab sample collected from Lake Michigan.

6. Sampling WET concurrently with any chemical-specific toxic substances is recommended. Tests should be done in rotating quarters, to collect seasonal information about this discharge and should continue after the permit expiration date (until the permit is reissued).
7. Raw water intake water and effluent monitoring for arsenic is recommended. The LOD shall be at least as stringent as 0.2 µg/L.
8. As recommended in the Department's October 1, 2019 Guidance for Total Nitrogen Monitoring in Wastewater Permits, quarterly total nitrogen monitoring is recommended for all municipal major 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 Nicole Krueger at Nicole.Krueger@wisconsin.gov or Diane Figiel at Diane.Figiel@wisconsin.gov.

Attachments (3) – Narrative, Outfall Map, & Thermal Table

PREPARED BY: Nicole Krueger, Water Resources Engineer – SER

E-cc: Trevor Moen, Wastewater Engineer – NER
Heidi Schmitt Marquez, Regional Wastewater Supervisor – NER
Diane Figiel, Water Resources Engineer – WY/3
Kari Fleming, Environmental Toxicologist – WY/3
Michael Polkinghorn, Water Resources Engineer – NOR/Rhinelander Service Center
Nate Willis, Wastewater Engineer – WY/3

Attachment #1

Water Quality-Based Effluent Limitations for
Two Rivers Wastewater Treatment Facility

WPDES Permit No. WI-0026590-10

Prepared by: Nicole Krueger

PART 1 – BACKGROUND INFORMATION

Facility Description

The City of Two Rivers owns and operates an advanced secondary wastewater treatment facility (WWTF). The WWTF includes preliminary screening, primary clarification, secondary, biological treatment with an activated sludge system operating in the extended aeration mode, phosphorus removal by chemical precipitation, final clarification, and effluent disinfection with ultraviolet system. Generated solids are stabilized by anaerobic digestion, then dewatered with a belt press before storage and disposal on agricultural lands or in a landfill. Treated effluent is discharged to Lake Michigan at the Two River Harbor.

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

Existing Permit Limitations

The current permit, which expired on 12/31/2022, includes the following effluent limitations and monitoring requirements.

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
BOD_5			45 mg/L	30 mg/L		1,2
TSS			45 mg/L	30 mg/L		1,2
pH	9.0 s.u.	6.0 s.u.				1
Fecal Coliform			**780#/100 mL geometric mean**	400#/100 mL geometric mean		3
E. coli						4
Ammonia Nitrogen November – March April			 31 mg/L 31 mg/L	 **31 mg/L** 30 mg/L		3
Phosphorus				1.0 mg/L	0.6 mg/L	
Mercury	13 ng/L					5
Acute WET						6
Chronic WET				11 TUc		6

Footnotes:

1. These limitations are not being evaluated as part of this review. Because the water quality criteria (WQC), reference effluent flow rates, and receiving water characteristics have not changed, limitations for these water quality characteristics do not need to be re-evaluated at this time.
2. These limits are based on s. NR 210.05, Wis. Adm. Code for a full fish and aquatic life classification.
3. Additional limits to comply with the expression of limits requirements in ss. NR 106.07 and NR 205.065(7), Wis. Adm. Code, are included in bold.

4. Monitoring only.
5. This is an alternative limit because a mixing zone phase out exception for mercury was granted.
6. Annual acute and chronic WET testing is required in the current permit. The IWC for chronic WET was 9%.

Receiving Water Information

- Name: Lake Michigan
- Waterbody Identification Code (WBIC): 20
- Classification used in accordance with chs. NR 102 and 104, Wis. Adm. Code: Coldwater community, public water supply.
- Flow: A ten-to-one dilution ratio will be used for calculating effluent limitations based on chronic or long-term impacts, in accordance with s. NR 106.06(4)(b)2, Wis. Adm. Code, because the receiving water does not exhibit a unidirectional flow at the point of discharge.
- Hardness = 263 mg/L as $CaCO_3$. This value represents the geometric mean of data from chronic WET tests from 08/10/2021 – 01/23/2024.
- Source of background concentration data: Metals data from Lake Michigan 7 miles off Milwaukee from the "Water Quality Rules Implementation" (1995) is used for this evaluation. Background arsenic and mercury data was collected by WI Power and Light Edgewater Generating Station near Sheboygan from 01/04/2021 – 01/02/2024. The numerical values are shown in the tables below. If no data is available, the background concentration is assumed to be negligible and a value of zero is used in the computations. Background data for calculating effluent limitations for ammonia nitrogen are described later.
- Multiple dischargers: There are several other dischargers to Lake Michigan; 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: Lake Michigan is 303(d) listed as impaired for mercury and PCBs.

Effluent Information

- Design flow rate(s):
  Annual average = 3.07 MGD (Million Gallons per Day)
  For reference, the actual average flow from 01/01/2018 – 01/31/2024 was 2.41 MGD. This was collected from Outfall 701 because effluent flow is not currently monitored at Outfall 001.
- Hardness = 237 mg/L as $CaCO_3$. This value represents the geometric mean of data from permit application monitoring from 10/05/2021 – 12/03/2021.
- 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 Lake Michigan with industrial sources from three industrial facilities: Eggers Industries, Formrite, Metalware Corporation, Classic Coatings, and Riverside Seafoods.
- Additives: Ferric chloride is used for phosphorus removal.
- Effluent characterization: This facility is categorized as a major municipal, so the permit application required effluent sample analyses for all the "priority pollutants" except for the Dioxins and Furans as specified in s. NR 200.065, Table 1, Wis. Adm. Code. The permit-required monitoring for mercury is used in this evaluation.
- 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.". Otherwise, substances with multiple effluent data are shown in the tables below or in their respective parts in this evaluation.

Attachment #1

Effluent Copper Data

Sample Date	Copper µg/L	Sample Date	Copper µg/L	Sample Date	Copper µg/L
10/05/2021	3.0	10/17/2021	6.6	10/29/2021	7.1
10/08/2021	9.1	10/20/2021	8.2	11/01/2021	7.8
10/11/2021	8.2	10/23/2021	7.8	11/04/2021	9.2
10/14/2021	6.7	10/26/2021	7.2		
1-day P_{99} = 12 µg/L					
4-day P_{99} = 9.5 µg/L					

Effluent Mercury Data

	Mercury ng/L 01/09/2018 – 04/08/2024	Mercury ng/L 10/18/2021 – 04/08/2024
1-day P_{99}	6.85	1.81
4-day P_{99}	3.85	1.42
30-day P_{99}	2.30	1.20
Mean	1.63	1.09
Std	1.37	0.25
Sample size	26	11
Range	0.64 - 7.6	0.44 - 1.3

Effluent Chloride Data

Sample Date	Chloride mg/L
10/05/2021	100
10/23/2021	110
10/26/2021	110
10/29/2021	110
Average	108

The following table presents the average concentrations and loadings at Outfall 001 from 01/01/2018 – 01/31/2024 for all parameters with limits in the current permit to meet the requirements of s. NR 201.03(6), Wis. Adm. Code:

Parameter Averages with Limits

	Average Measurement
BOD_5	9.1 mg/L
TSS	7.3 mg/L
pH field	7.0 s.u.
Phosphorus	0.34 mg/L
Ammonia Nitrogen	0.48 mg/L
Mercury	1.7
Fecal Coliform	36.3 #/100 mL

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

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

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

Acute Limits based on 1-Q_{10}

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

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

Where:

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

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

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

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

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

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

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

Daily Maximum Limits based on Acute Toxicity Criteria (ATC)

10:1 dilution

Attachment #1

SUBSTANCE	REF. HARD.* mg/L	ATC	MEAN BACK-GRD.	MAX. EFFL. LIMIT**	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	1-day P_{99}	1-day MAX. CONC.
Arsenic		340	0.86	680	136	<0.85		
Cadmium	237	11.7	0.01	23.4	4.7	<0.19		
Chromium	237	3655	0.49	7311	1462	<0.99		
Copper	237	35.0	0.44	70.0			12	9.2
Lead	237	246	0.05	492	98.5	<4.3		
Mercury		830	0.27	1660	332		6.9	7.6
Nickel	237	974		1947	389	<3.5		
Zinc	237	256	0.39	512	102	8.9		
Chloride (mg/L)		757		1514	303	108		

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

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

Weekly Average Limits based on Chronic Toxicity Criteria (CTC)

10:1 dilution

SUBSTANCE	REF. HARD.* mg/L	CTC	MEAN BACK-GRD.	WEEKLY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	4-day P_{99}
Arsenic		148	0.86	1619	324	<0.85	
Cadmium	175	3.82	0.01	41.9	8.4	<0.19	
Chromium	263	190	0.49	2089	418	<0.99	
Copper	263	23.7	0.44	256			9.5
Lead	263	71.3	0.05	784	157	<4.3	
Mercury		440	0.27	440	88		3.9
Nickel	263	118		1301	260	<3.5	
Zinc	263	280	0.39	3081	616	8.9	
Chloride (mg/L)		395		4345	869	108	

* 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)

10:1 dilution

SUBSTANCE	WC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	30-day P_{99}
Mercury (ng/L)	1.3	0.27	1.3			**2.3**

Attachment #1

Monthly Average Limits based on Human Threshold Criteria (HTC)

10:1 dilution

SUBSTANCE	HTC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	30-day P_{99}
Cadmium	4.4	0.01	48	10	<0.19	
Chromium (+3)	100	0.49	1095	219	<0.99	
Lead	10	0.05	109	21.9	<4.3	
Mercury	1.5	0.27	1.5			**2.3**
Nickel	100		1100	220	<3.5	

Monthly Average Limits based on Human Cancer Criteria (HCC)

10:1 dilution

SUBSTANCE	HCC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Arsenic	0.2	0.86	0.2	0.04	<0.85
Chloroform	53		583	117	0.49

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

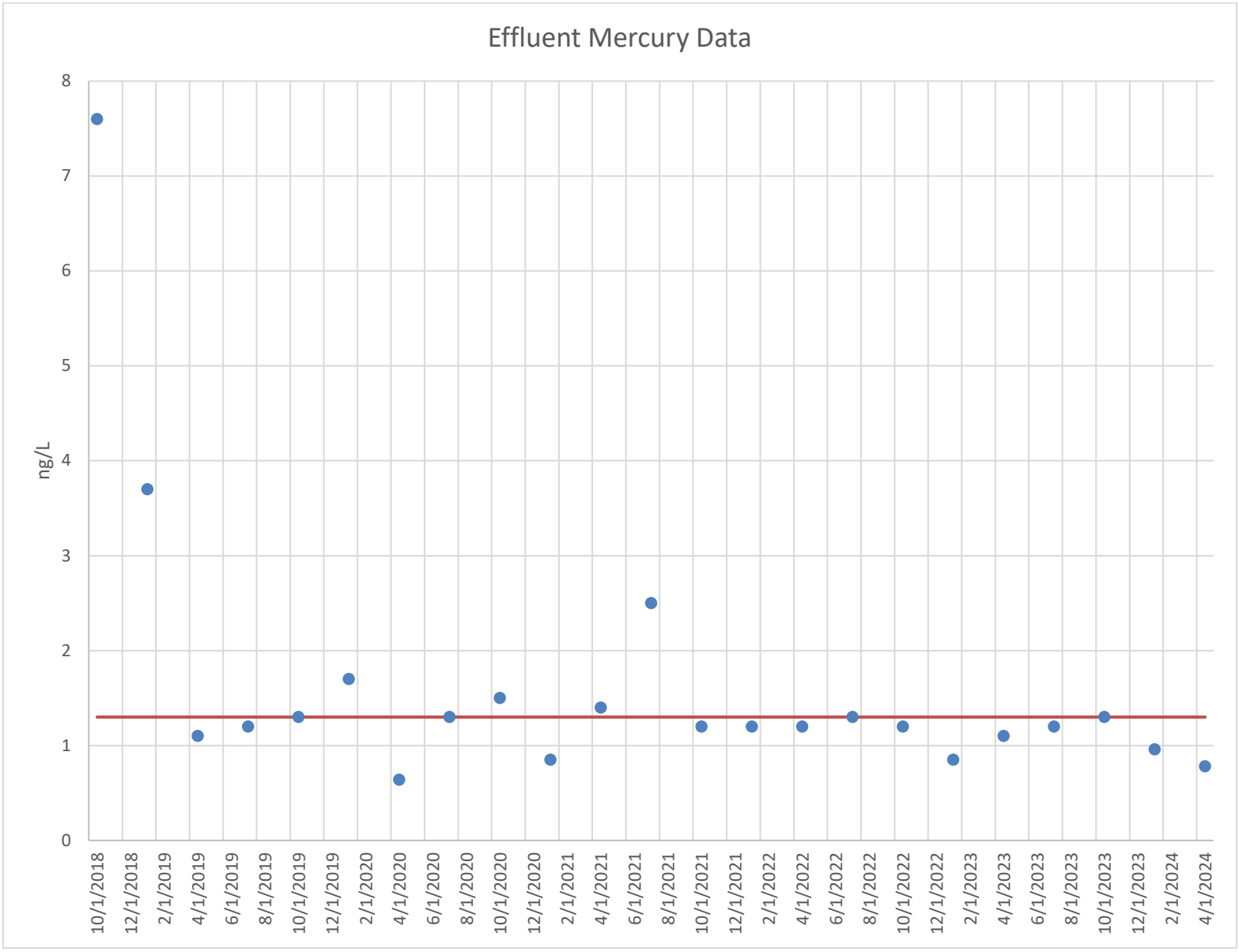
Based on a comparison of the effluent data and calculated effluent limitations, effluent limitations are required for mercury.

Chloride **–** Considering available effluent data from the permit reissuance application, the average data of 108 mg/L is less than 1/5th of the calculated limits based on ATC and CTC. Therefore, no chloride limits are recommended in the reissued permit.

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

Mercury – A review of data from 01/09/2018 – 01/30/2024 indicates the 30-day P_{99} is 2.34 ng/L, which is above the calculated monthly average limit based on wildlife criterion of 1.3 ng/L. The graph belows shows effluent mercury concentrations compared to the WQBEL of 1.3 ng/L:

Attachment #1



Two Rivers currently has an alternative mercury effluent limit of 13 ng/L based on their 1-day P_{99} from the previous WQBEL evaluation. They had requested an exception to the mixing zone phase-out for mercury per 40 CFR, Part 132, Appendix F, Procedure 3 C. 6. Over the current permit term, Two Rivers has decreased their effluent mercury through source reduction measures and no longer need an alternative mercury effluent limit, so the daily maximum limit of 13 ng/L is recommended to be removed.

Because the 30-day P_{99} is greater than the calculated monthly average WQBEL based on WC, **a monthly average limit of 1.3 ng/L is recommended in the reissued permit.** Since October 2021, Two Rivers has substantially reduced their mercury concentrations and the 30-day P_{99} since then is 1.2 ng/L. However, several samples were 1.3 ng/L which represents the monthly average since the monitoring frequency is quarterly. Because the monthly average effluent data is equal to the calculated monthly average effluent data, a monthly average WQBEL is still necessary in the reissued permit.

Sections NR 106.07(3) and NR 205.067(7), Wis. Adm. Code require WPDES permits contain weekly average and monthly average limitations for municipal dischargers whenever practicable and necessary to protect water quality. **Therefore, a weekly average limit of 1.3 ng/L is required** to meet expression of limits requirements in addition to the monthly average limit, with the calculation described below:

Weekly Average Limitation = (Monthly Average Limitation × MF)

Where:

MF= Multiplication factor as defined in Table 1

CV= coefficient of variation (CV) as calculated in s. NR 106.07(5m), Wis. Adm. Code.

n= the number of samples per month required in the permit

s. NR 106.07(3)(e)4, Table 1, Wis. Adm. Code — Multiplication Factor (for CV = 0.8)

CV	**n=1**	n=2	n=3	n=4	n=8	n=12	n=16	n=20	n=24	n=30
0.8	**1.00**	1.35	1.59	1.76	2.19	2.42	2.58	2.70	2.79	2.89

Note: This methodology is based on the *Technical Support Document for Water Quality-based Toxics Control* (March 1991). PB91-127415.

Weekly Average	Monthly Average	Multiplication Factor (CV)	Assumed Monitoring Frequency (n)
1.3 ng/L	1.3 ng/L	1.00 (0.8)	1

Although monitoring frequency is quarterly, an n of 1 is used which results in the lowest weekly average limit based on the monthly average WQBEL.

Arsenic – The sample that was collected for the permit reissuance application had a limit of detection (LOD) of 0.85 µg/L which is greater than the most stringent calculated limit of 0.2 µg/L based on the human cancer criteria. Because the LOD is greater than the most stringent calculated limit, reasonable potential can't be determined at this time. **Monitoring is recommended in the reissued permit.** The arsenic test shall be sensitive enough so that the LOD is below 0.2 µg/L and reasonable potential can be determined.

Section NR 106.06(6), Wis. Adm. Code, allows a facility to demonstrate that a pollutant present in intake water, which is passed through the facility and discharged does not cause, have the reasonable potential to cause, or contribute to the excursion of water quality criteria in the receiving water. The demonstration has five conditions, all of which must be met:

1. The permittee withdraws 100 percent of its intake water containing the substance from the same body of water into which the discharge is made;
2. The permittee does not contribute any additional mass of the substance to the wastewater;
3. The permittee does not alter the substance chemically or physically in a manner that would cause adverse water quality impacts to occur that would not occur if the pollutants were left in-stream;
4. The permittee does not increase the concentration at the edge of the mixing zone, or at the point of discharge if a mixing zone is not allowed, as compared to the concentration in the intake water, unless the increased concentration does not cause or contribute to an excursion above an applicable water quality standard; and

5. The timing and location of the discharge would not cause adverse water quality impacts to occur that would not occur if the identified intake pollutant were left instream.

Monitoring of the untreated drinking water intake (water supply from Lake Michigan) so the conditions above can be demonstrated. **The LOD for the monitoring should be at least as stringent as the most stringent limit of 0.2 µg/L in order to accurately determine reasonable potential in the next reissuance.**

PFOS and PFOA – The need for PFOS and PFOA monitoring is evaluated in accordance with s. NR 106.98(2), Wis. Adm. Code. Previous monitoring produced a PFOS result of 2.65 ng/L and a PFOA result of 114 ng/L. These results are greater than one fifth of the respective criteria for each substance. Based on the effluent flow rate, the types of indirect dischargers contributing to the collection system, the available PFOS/PFOA monitoring data, and known levels of PFOS/PFOA in the source water, **PFOS and PFOA monitoring is recommended at a once every two months frequency.**

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.
- 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 = 0.275 and B = 39.0 for a Cold-Water Category 1 fishery, and
pH (s.u.) = that characteristic of the effluent.

The effluent pH data was examined as part of this evaluation. A total of 1588 sample results were reported from 01/02/2018 – 01/31/2024. The maximum reported value was 7.5 s.u. (Standard pH Units). The effluent pH was 7.2 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 7.3 s.u. The mean plus the standard deviation multiplied by a factor of 2.33, an estimate of the upper ninety ninth percentile for a normally distributed dataset, is 7.3 s.u. Therefore, a value of 7.3 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 7.3 s.u. into the equation above yields an ATC = 18 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 the 1-Q_{10} receiving water low flow if it is determined that the previous method of acute ammonia limit calculation (2×ATC) is not sufficiently protective of the fish and aquatic life. The more restrictive calculated limits shall apply.

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

Daily Maximum Ammonia Nitrogen Determination

	Ammonia Nitrogen Limit mg/L
2×ATC	35
10:1 dilution	192

The 2×ATC method yields the most stringent limits for Two Rivers.

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, because 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 for a Cold-Water 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 $1.45 \times 10^{(0.028 \times (25 - T))}$,

T = the temperature (ºC) of the receiving water

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-Q_3, 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 4-day criterion is equal to the 30-day criterion multiplied by 2.5. The 4-day criteria are used to derive weekly average limitations, and the 30-day criteria are used to derive monthly average limitations, both by a mass-balance using a ten-to-one dilution ratio.

The “default” basin assumed values are used for Temperature, pH and background ammonia concentrations, because minimum ambient data is available. These values are shown in the table below, with the resulting criteria and effluent limitations.

Attachment #1

Weekly and Monthly Ammonia Nitrogen Limits – CW

		Spring	Summer	Winter
		April & May	June – Sept.	Oct. - March
Effluent Flow	Qe (MGD)	3.07	3.07	3.07
Background Information	Ammonia (mg/L)	0.04	0.03	0.08
	Average Temperature (°C)	12	19	4
	Maximum Temperature (°C)	14	21	10
	pH (s.u.)	7.9	7.9	7.8
	% of Flow used	10	10	10
Criteria mg/L	4-day Chronic	7.0	4.7	8.0
	30-day Chronic	2.8	1.9	3.2
Effluent Limits mg/L	Weekly Average	77	52	87
	Monthly Average	30	21	34

Effluent Data

The following table evaluates the statistics based upon ammonia data reported from 01/01/2018 – 01/31/2024 with those results being compared to the calculated limits to determine the need to include ammonia limits in Two River's permit for the respective month ranges. That need is determined by calculating 99th upper percentile (or P_{99}) values for ammonia during each of the month ranges and comparing the daily maximum values to the daily maximum limit.

Ammonia Nitrogen Effluent Data

Ammonia Nitrogen mg/L	November – March	April	May – October
1-day P_{99}	5.3	5.9	2.8
4-day P_{99}	3.0	3.2	1.6
30-day P_{99}	1.32	1.57	0.70
Mean	0.62	0.89	0.30
Std	1.24	1.27	0.68
Sample size	670	128	788
Range	0.01 - 9.99	0.01 - 5.31	0.02 - 6.54

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 and monthly average limits for November – April. 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.

Antidegradation

The calculated weekly average and monthly average limits of 87 mg/L and 34 mg/L for November – March are less restrictive than the current limits. The calculated weekly average limit of 77 mg/L for April is less restrictive than the current limit. Without a demonstration of need for a higher limit in

accordance with s. NR 207.04, Wis. Adm. Code, the current limits must be continued in the reissued permit.

Conclusions and Recommendations
In summary, after rounding to two significant figures, the following ammonia nitrogen limitations are recommended. No mass limitations are recommended in accordance with s. NR 106.32(5), Wis. Adm Code. Additional limits to meet the requirements in s. NR 106.07, Wis. Adm Code, are shown in bold below.

Final Ammonia Nitrogen Limits

	Weekly Average mg/L	Monthly Average mg/L
November – March	31	**31**
April	31	30

Monitoring only should also be continued for May – October.

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 Two Rivers' permit requires 2/weekly 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.

The current permit requires Two Rivers to disinfect year-round for protection of the public water supply which is sourced from Lake Michigan. Because the *E. coli* limits listed in NR 210.06(2)(a)1, Wis. Adm. Code, are set for protection of recreational uses and not drinking water supply, these *E. coli* limits do not necessarily need to be applied year-round. However, either *E. coli* or fecal coliform bacteria limits are needed year-round in order to ensure that there is no reduction from the current level of disinfection needed to protect the public drinking water source.

In accordance with s. NR 210.06(2)(a)2, Wis. Adm. Code, outside of the recreational season, bacteria limits may either be set equal to the previous fecal coliform limits or the listed *E. coli* limits. Therefore, the facility can select one of the two possible sets of permit limits:

- *E. coli* limits as listed above during the recreation period of May through September and a fecal coliform limit of 400 counts/100 mL as a monthly geometric mean in November through April.

Any fecal coliform weekly geometric mean limit which was included in the previous permit for expression of limits purposes does not need to be included in the reissued permit.

- *E. coli* limits as listed above apply year-round.

Effluent Data

Two Rivers has monitored effluent *E. coli* from 05/01/2018 – 09/27/2023 and a total of 130 results are available. A geometric mean of 126 counts/100 mL was not exceeded during the permit term, with a maximum monthly geometric mean of 79 counts/100 mL. Effluent data has exceeded 410 counts/100 mL once. The maximum reported value was 444 counts/100 mL (07/21/2021). 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 Two Rivers currently has a limit of 1.0 mg/L, this limit should be included in the reissued permit. This limit remains applicable unless a more stringent WQBEL is given.

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

Water Quality-Based Effluent Limits (WQBEL)

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

Section NR 102.06(5)(b) specifies that a total phosphorus criterion of 7 µg/L (0.007 mg/L) applies for the open and nearshore water of Lake Michigan. For direct discharges to Lake Michigan such as Two Rivers, s. NR 217.13(4), Wis. Adm. Code, states that the Department shall set effluent limits consistent with nearshore or whole lake models approved by the Department. In the absence of an approved model, a **WQBEL of 0.6 mg/L as a six-month average is recommended.**

Effluent Data

The following table summarizes effluent total phosphorus monitoring data from 01/01/2018 – 01/29/2024.

Total Phosphorus Effluent Data

	Phosphorus mg/L
1-day P_{99}	1.11
4-day P_{99}	0.67
30-day P_{99}	0.44
Mean	0.34
Std	0.21
Sample size	1586

	Phosphorus mg/L
Range	0.09 - 3.19

PART 6 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR THERMAL

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

Due to the amount of upstream flow available for dilution in the limit calculation (Qs:Qe >20:1), the lowest calculated limitation is 120° F (s. NR 106.55(6)(a), Wis. Adm. Code).

The table below summarizes the maximum temperatures reported during monitoring from 07/01/2011 – 06/30/2012.

Monthly Temperature Effluent Data & Limits

Month	Representative Highest Monthly Effluent Temperature		Calculated Effluent Limit	
	Weekly Maximum (°F)	Daily Maximum (°F)	Weekly Average Effluent Limitation (°F)	Daily Maximum Effluent Limitation (°F)
JAN	48	50	NA	120
FEB	46	48	NA	120
MAR	50	52	NA	120
APR	52	53	NA	120
MAY	57	59	NA	120
JUN	63	64	NA	120
JUL	63	66	NA	120
AUG	66	68	NA	120
SEP	67	68	NA	120
OCT	64	64	NA	120
NOV	57	58	NA	120
DEC	52	53	NA	120

Reasonable Potential

Permit limits for temperature are recommended based on the procedures in s. NR 106.56, Wis. Adm. Code.

- An acute limit for temperature is recommended for each month in which the representative daily maximum effluent temperature for that month exceeds the acute WQBEL. The representative daily maximum effluent temperature is the greater of the following:

(a) The highest recorded representative daily maximum effluent temperature
(b) The projected 99th percentile of all representative daily maximum effluent temperatures

- A sub−lethal limitation for temperature is recommended for each month in which the representative weekly average effluent temperature for that month exceeds the weekly average WQBEL. The representative weekly average effluent temperature is the greater of the following:
  (a) The highest weekly average effluent temperature for the month.
  (b) The projected 99th percentile of all representative weekly average effluent temperatures for the month

Based on the available effluent data no effluent limits are recommended for temperature. The complete thermal table used for the limit calculation is attached. **Monitoring is not recommended in the reissued permit.**

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).*

- Acute tests predict the concentration that causes lethality of aquatic organisms during a 48 to 96-hour exposure. To assure that a discharge is not acutely toxic to organisms in the receiving water, WET tests must produce a statistically valid LC_{50} (Lethal Concentration to 50% of the test organisms) greater than 100% effluent, according to s. NR 106.09(2)(b), Wis. Adm Code.

- Chronic tests predict the concentration that interferes with the growth or reproduction of test organisms during a seven-day exposure. To assure that a discharge is not chronically toxic to organisms in the receiving water, WET tests must produce a statistically valid IC_{25} (Inhibition Concentration) greater than the instream waste concentration (IWC), according to s. NR 106.09(3)(b), Wis. Adm Code. The IWC is an estimate of the proportion of effluent to total volume of water (receiving water + effluent). The IWC of **9%** shown in the WET Checklist summary below was calculated according to the following equation, as specified in s. NR 106.03(6), Wis. Adm Code:

  The IWC is 9% based on dilution of 10 parts lake water to 1-part effluent, as specified in s. NR 106.06(4)(b)2, Wis. Adm. Code, or a factor of 1 in 11 to calculate the IWC.

- According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), a synthetic (standard) laboratory water may be used as the dilution water and primary control in acute WET tests, unless the use of different dilution water is approved by the Department prior to use. The primary control water must be specified in the WPDES permit.

- According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), receiving water must be used as the dilution water and primary control in chronic WET tests, unless the use of different dilution water is approved by the Department prior to use. The dilution water used in WET tests conducted on Outfall 001 shall be a grab sample collected from

the receiving water location, upstream and out of the influence of the mixing zone and any other known discharge. The specific receiving water location must be specified in the WPDES permit.

- Shown below is a tabulation of all available WET data for Outfall 001. Efforts are made to ensure that decisions about WET monitoring and limits are made based on representative data, as specified in s. NR 106.08(3), Wis. Adm Code. Data which is not believed to be representative of the discharge was not included in reasonable potential calculations. The table below differentiates between tests used and not used when making WET determinations. Significant changes were made to WET test methods in 2004 and these changes were assumed to be fully implemented by certified labs by no later than June 2005. Data before July 1, 2005 is excluded from this evaluation.

WET Data History

Date Test Initiated	Acute Results LC_{50} %				Chronic Results IC_{25} %					Footnotes or Comments
	C. dubia	Fathead minnow	Pass or Fail?	Used in RP?	*C. dubia*	Fathead Minnow	Algae	Pass or Fail?	Use in RP?	
10/18/2005	>100	>100	Pass	Yes	>100	>100		Pass	Yes	
07/25/2006	>100	>100	Pass	Yes	95.08	>100		Pass	Yes	
05/08/2007	>100	>100	Pass	Yes	>100	>100		Pass	Yes	
01/15/2008	>100	>100	Pass	Yes	>100	>100		Pass	Yes	
07/21/2009	>100	>100	Pass	No	91.12	83.21		Pass	No	1
01/15/2013	>100	>100	Pass	Yes	45.1	>100		Pass	Yes	
11/12/2013	>100	>100	Pass	Yes	>100	>100	>100	Pass	Yes	2
02/25/2014	>100	>100	Pass	Yes	>100	>100		Pass	Yes	
09/16/2014	>100	>100	Pass	Yes	>100	>100		Pass	Yes	
06/09/2015	>100	>100	Pass	Yes	>100	>100		Pass	Yes	
10/11/2016	>100	>100	Pass	Yes	>100	>100		Pass	Yes	
04/03/2018	>100	>100	Pass	Yes	>100	>100		Pass	Yes	
01/08/2019	>100	>100	Pass	Yes	>100	>100		Pass	Yes	
11/10/2020	>100	>100	Pass	Yes	>100	>100		Pass	Yes	
08/10/2021	>100	>100	Pass	Yes	>100	>100		Pass	Yes	
07/26/2022	>100	>100	Pass	Yes	>100	>100		Pass	Yes	
05/16/2023	>100	>100	Pass	Yes	>100	>100		Pass	Yes	
01/23/2024	>100	>100	Pass	Yes	>100	>100		Pass	Yes	

Footnotes:

1. *Tests done by S-F Analytical, July 2008 – March 2011*. The DNR has reason to believe that WET tests completed by SF Analytical Labs from July 2008 through March 31, 2011 were not performed using proper test methods. Therefore, WET data from this lab during this period has been disqualified and was not included in the analysis.
2. *Split Samples.* Tests were conducted concurrently on the same effluent samples by two different labs, as a check on lab performance or sampling procedures. Split samples cannot be double counted.

- According to s. NR 106.08, Wis. Adm. Code, WET reasonable potential is determined by multiplying the highest toxicity value that has been measured in the effluent by a safety factor, to predict the likelihood (95% probability) of toxicity occurring in the effluent above the applicable WET limit. The safety factor used in the equation changes based on the number of toxicity detects in the dataset. The fewer detects present, the higher the safety factor, because there is more uncertainty surrounding the predicted value. **WET limits must be given, according to s. NR 106.08(6), Wis. Adm. Code, whenever the applicable Reasonable Potential equation results in a value greater than 1.0.**

Acute Reasonable Potential = [(TUa effluent) (B)(AMZ)]
Chronic Reasonable Potential = [(TUc effluent) (B)(IWC)]

According to s. NR 106.08(6)(d), Wis. Adm. Code, TUa and TUc effluent values are equal to zero whenever toxicity is not detected (i.e. when the LC_{50}, IC_{25} or $IC_{50} \geq 100\%$).

Acute Reasonable Potential = 0 < 1.0, reasonable potential is not shown, and a limit is not required.

Chronic Reasonable Potential = [(TU_c effluent) (B)(IWC)]

Chronic WET Limit Parameters

TUc (maximum) $100/IC_{25}$	**B** (multiplication factor from s. NR 106.08(6)(c), Wis. Adm. Code, Table 4)	IWC
100/45.1 = 2.2	3.8 Based on 2 detects	9%

[(TUc effluent) (B)(IWC)] = 0.8 < 1.0

Therefore, no reasonable potential is shown for chronic WET limits using the procedures in s. NR 106.08(6) and representative data from 10/18/2005 – 01/23/2024.

The current permit has a chronic WET limit of 11 TU_c. If Two Rivers would like to request a removal of the existing permit limits an assessment of their effluent data consistent with the requirements of ss. NR 207.04(1)(a) and (c), Wis. Adm. Code, must be provided. Without a demonstration of need for a higher limit in accordance with s. NR 207.04, Wis. Adm. Code, the current limit of 11 TU_c and the current IWC of 9% must be continued in the reissued permit. The Department would be unable to increase the limit due to the lack of need as shown via the antidegradation rule (ch. NR 207, Wis. Adm. Code) because Two Rivers has not exceeded this limit.

Expression of WET limits
Chronic WET limit = [100/IWC] TU_c = 11 TU_c expressed as a monthly average

The WET checklist was developed to help DNR staff make recommendations regarding WET limits, monitoring, and other related permit conditions. The checklist indicates whether acute and chronic WET limits are needed, based on requirements specified in s. NR 106.08, Wis. Adm. Code. The checklist steps the user through a series of questions, assesses points based on the potential for effluent toxicity, and suggests monitoring frequencies based on points accumulated during the checklist analysis. As toxicity potential increases, more points accumulate, and more monitoring is recommended to ensure that toxicity is not occurring. A summary of the WET checklist analysis completed for this permittee is shown in the table below. Staff recommendations based on best professional judgment are provided below the summary table. For guidance related to reasonable potential and the WET checklist, see Chapter 1.3 of the WET Guidance Document: https://dnr.wisconsin.gov/topic/Wastewater/WET.html.

WET Checklist Summary

	Acute	**Chronic**
AMZ/IWC	Not Applicable.	IWC = 9 %.

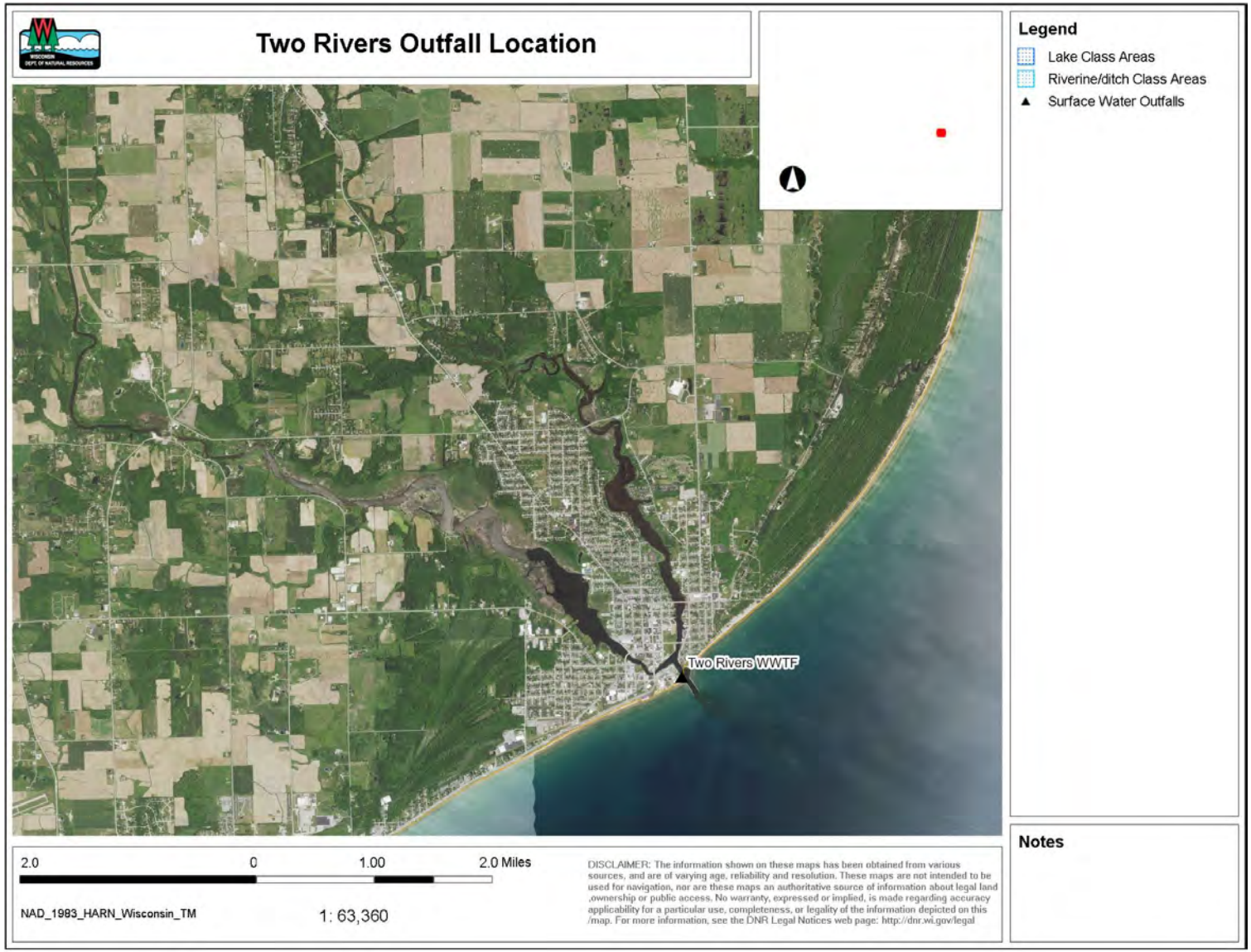
Attachment #1

	Acute	Chronic
	0 Points	**0 Points**
Historical Data	17 tests used to calculate RP. No tests failed. **0 Points**	17 tests used to calculate RP. No tests failed. **0 Points**
Effluent Variability	Little variability, no violations or upsets, consistent WWTF operations. **0 Points**	Same as Acute. **0 Points**
Receiving Water Classification	Coldwater classification. **5 Points**	Same as Acute. **5 Points**
Chemical-Specific Data	Reasonable potential for limits for no parameters based on ATC; Ammonia, copper, mercury, zinc, and chloride detected. Additional Compounds of Concern: None. **3 Points**	Reasonable potential for limits for no parameters based on CTC; Ammonia nitrogen limit carried over from the current permit. Ammonia, copper, mercury, zinc, and chloride detected. Additional Compounds of Concern: None. **3 Points**
Additives	1 Water Quality Conditioner added. Permittee has proper P chemical SOPs in place: No **16 Points**	All additives used more than once per 4 days. **16 Points**
Discharge Category	5 Industrial Contributors: Eggers Industries, Classic Coatings, Formite, Metalware Corporation, and Riverside Seafoods. **9 Points**	Same as Acute. **9 Points**
Wastewater Treatment	Secondary or better. **0 Points**	Same as Acute. **0 Points**
Downstream Impacts	No impacts known. **0 Points**	Same as Acute. **0 Points**
Total Checklist Points:	**33 Points**	**33 Points**
Recommended Monitoring Frequency (from Checklist):	1x yearly	1x yearly
Limit Required?	No	Yes Limit = 11 TU_c
TRE Recommended? (from Checklist)	No	No

- After consideration of the guidance provided in the Department's WET Program Guidance Document (2022) and other information described above, 1x yearly acute and chronic WET tests are recommended in the reissued permit. Tests should be done in rotating quarters to collect seasonal information about this discharge. WET testing should continue after the permit expiration date (until the permit is reissued).
- According to the requirements specified in s. NR 106.08, Wis. Adm. Code, a chronic WET limit is

required. The chronic WET limit shall be expressed as 11 TUc as a monthly average in the effluent limits table of the permit.

- A minimum of annual chronic monitoring is required because a chronic WET limit is required. Federal regulations in 40 CFR Part 122.44(i) require that monitoring occur at least once per year when a limit is present.
- A minimum of annual acute and chronic monitoring is recommended because Two Rivers is a major municipal discharger with a design flow greater than 1.0 MGD. Federal regulations at 40 CFR Part 122.21(j) require at least 4 acute and chronic WET tests with each permit application on samples collected since the previous reissuance. Therefore, annual monitoring is recommended in the permit term, so that data will be available for the next permit application.


Two Rivers Outfall Location
Legend
Lake Class Areas
Riverine/ditch Class Areas
Surface Water Outfalls
Two Rivers WWTF
Notes
2.0
0
1.00
2.0 Miles
NAD_1983_HARN_Wisconsin_TM
1: 63,360
DISCLAIMER: The information shown on these maps has been obtained from various sources, and are of varying age, reliability and resolution. These maps are not intended to be used for navigation, nor are these maps an authoritative source of information about legal land ,ownership or public access. No warranty, expressed or implied, is made regarding accuracy applicability for a particular use, completeness, or legality of the information depicted on this /map. For more information, see the DNR Legal Notices web page: http://dnr.wi.gov/legal

Attachment #3

Temperature limits for receiving waters without unidirectional flow

(calculation using default ambient temperature data)

Facility: Two Rivers Wastewater Treatment

Outfall(s): 001

Date Prepared: 3/26/2024

Design Flow (Qe): 3.07 MGD

Lake Type: Lake Michigan waters - Sout

Discharge Type: Great Lakes shore discharge

Maximum area of mixing zone allowed (coefficient "A"): 3,125,000 ft^2

Month	Water Quality Criteria			Representative Highest Effluent Flow Rate (Qe)					Representative Highest Monthly Effluent Temperature		**Calculated Effluent Limit**	
	Ta (default)	Sub-Lethal WQC	Acute WQC	7-day Rolling Average (Qesl)	Daily Maximum Flow Rate (Qea)	B	e^{-a} (for SL-WQBEL)	e^{-a} (for A-WQBEL)	Weekly Average	Daily Maximum	**Weekly Average Effluent Limitation**	**Daily Maximum Effluent Limitation**
	(°F)	(°F)	(°F)	(MGD)	(MGD)				(°F)	(°F)	(°F)	(°F)
JAN	35	43	69	3.38	3.69	0.405	0.000	0.000	48	50	NA	120
FEB	34	46	69	2.47	2.56	0.405	0.000	0.000	46	48	NA	120
MAR	37	52	70	3.90	4.69	0.405	0.000	0.000	50	52	NA	120
APR	43	59	70	4.02	4.57	0.405	0.000	0.000	52	53	NA	120
MAY	48	65	72	7.59	10.65	0.405	0.003	0.017	57	59	NA	120
JUN	54	70	73	3.85	4.11	0.405	0.000	0.000	63	64	NA	120
JUL	59	71	74	4.91	8.98	0.405	0.000	0.008	63	66	NA	120
AUG	63	70	76	4.77	7.56	0.555	0.000	0.001	66	68	NA	120
SEP	60	64	74	3.80	4.40	0.555	0.000	0.000	67	68	NA	120
OCT	53	57	73	4.31	5.00	0.405	0.000	0.000	64	64	NA	120
NOV	45	49	71	3.29	3.70	0.405	0.000	0.000	57	58	NA	120
DEC	38	44	70	4.02	4.69	0.405	0.000	0.000	52	53	NA	120