

Permit Fact Sheet

General Information

Permit Number	WI-0020265-11-0
Permittee Name and Address	Mukwonago Village 440 Rivercrest Crt, Mukwonago, WI 53149
Permitted Facility Name and Address	Mukwonago Wastewater Treatment Plant 1200 Holz Parkway, Mukwonago, WI
Permit Term	July 01, 2026 to June 30, 2031
Discharge Location	West bank of the Fox (IL) River, approximately 150 feet upstream of Interstate 43, and 560 feet downstream of the confluence of the Fox (IL) River and Mukwonago River. (Lat: 42.86103°N, Long: -88.297339°W)
Receiving Water	Fox (IL) River in Mukwonago River Watershed of Fox (IL) River Basin in Waukesha County
Stream Flow (Q _{7,10})	33 cfs
Stream Classification	Warm water Sport Fish (WWSF) community, non-public water supply and recreational use.
Discharge Type	Existing and Continuous
Annual Average Design Flow (MGD)	1.5 MGD
Industrial or Commercial Contributors	Aptar
Plant Classification	Advanced - A1 - Suspended Growth Processes; B - Solids Separation; C - Biological Solids/Sludges; P - Total Phosphorus; D - Disinfection; L - Laboratory; SS - Sanitary Sewage Collection System
Approved Pretreatment Program?	N/A

Facility Description

The Village of Mukwonago Wastewater Treatment Plant (WWTP) serves a population of approximately 8,500 residents from the Village of Mukwonago and Vernon. The WWTP went online in 1981. Processes include mechanical fine screening, grit removal, primary clarification, conventional activated sludge treatment with fine bubble aeration, final clarification, and ultraviolet light for seasonal disinfection. The aeration basins contain an Integrated Fixed Film Activated Sludge (IFAS) system. Polyaluminum chloride is added near the outlet of the aeration basins for phosphorus removal. Effluent is pumped out of a clear well to the Fox (IL) River approximately 5,000 feet east of the WWTP. Waste activated sludge is anaerobically digested and dewatered using polymer and sand drying beds. The dried sludge is either transferred to another permitted facility or land applied on DNR approved sites.

Substantial Compliance Determination

After a desktop review of all discharge monitoring reports, CMARs, land application reports, compliance schedule items, and an onsite compliance inspection on February 26, 2025, this facility has been found to be in substantial compliance with their current permit.

Compliance determination made by Nick Lent, Nick Lent on May 22, 2025.

Sample Point Descriptions

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	0.86 MGD (2025)	INFLUENT: 24-hour flow proportional composite samples shall be collected from the influent pump discharge pipe. Flow is measured with two magnetic flow meters in the headworks pump station. Influent includes recycled flows (drainage from sludge beds and digester supernatant).
001	0.91 MGD (2021-2025)	EFFLUENT: 24-hour flow proportional composite samples shall be collected after disinfection from the effluent clear well. Grab samples shall be collected after disinfection from the final effluent pump tap.
601		In-stream Sampling Point 601: Representative water samples shall be collected from the Fox (IL) River. Sample point 601 is located downstream of the Mukwonago WWTP outfall, 600 feet downstream of the Hwy 43 bridge (Lat: 42.86762 N Long: -88.29117 W). Sample point 601 correlates with the sample location described in the approved Adaptive Management Plan No. AM-2026-02 (May 2026)
003	288 Tons. 144 Land Applied, 144 Hauled Offsite (2025 Permit Application)	Anaerobically digested, Class B, bed dried, cake sludge. Representative sludge samples shall be collected prior to hauling or land applying.

Permit Requirements

1 Influent – Monitoring Requirements

1.1 Sample Point Number: 701- INFLUENT PLANT

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Flow Rate		MGD	Daily	Continuous	
BOD5, Total		mg/L	3/Week	24-Hr Flow Prop Comp	

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
CBOD5		mg/L	3/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total		mg/L	3/Week	24-Hr Flow Prop Comp	

Changes from Previous Permit:

BOD5 has been added for CMAR and design loading purposes per NR 210.07

Explanation of Limits and Monitoring Requirements

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

2 Surface Water - Monitoring and Limitations

2.1 Sample Point Number: 001- EFFLUENT

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
CBOD5	Weekly Avg	40 mg/L	3/Week	24-Hr Comp	
CBOD5	Monthly Avg	25 mg/L	3/Week	24-Hr Comp	
Suspended Solids, Total	Weekly Avg	45 mg/L	3/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total	Monthly Avg	30 mg/L	3/Week	24-Hr Flow Prop Comp	
pH Field	Daily Max	9.0 su	Daily	Grab	
pH Field	Daily Min	6.0 su	Daily	Grab	
Nitrogen, Ammonia (NH3-N) Total	Daily Max	20 mg/L	3/Week	24-Hr Flow Prop Comp	Limit effective November – April. Monitoring only May – October.
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	20 mg/L	3/Week	24-Hr Flow Prop Comp	Limit effective November – April. Monitoring only May – October.
Nitrogen, Ammonia (NH3-N) Total	Monthly Avg	20 mg/L	3/Week	24-Hr Flow Prop Comp	Limit effective November – April. Monitoring only May – October.
E. coli	Geometric Mean -	126 #/100 ml	Weekly	Grab	May-September

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
	Monthly				
E. coli	% Exceedance	10 Percent	Monthly	Calculated	May-September. See the E. coli Percent Limit section. Enter the result in the DMR on the last day of the month.
Chloride		mg/L	Monthly	24-Hr Flow Prop Comp	Monitoring only in 2029
PFOS		ng/L	1/ 2 Months	Grab	Monitoring only. See PFOS/PFOA Minimization Plan Determination of Need schedule.
PFOA		ng/L	1/ 2 Months	Grab	Monitoring only. See PFOS/PFOA Minimization Plan Determination of Need schedule.
Phosphorus, Total	Monthly Avg	1.0 mg/L	3/Week	24-Hr Flow Prop Comp	
Phosphorus, Total	6-Month Avg	0.5 mg/L	3/Week	24-Hr Flow Prop Comp	This is an Adaptive Management interim limit effective upon reissuance and throughout the permit term. See schedules and effluent requirements.
Phosphorus, Total		lbs/day	3/Week	Calculated	Calculate the daily mass discharge of phosphorus in lbs/day on the same days phosphorus sampling occurs.
Nitrogen, Total Kjeldahl		mg/L	Quarterly	24-Hr Flow Prop Comp	
Nitrogen, Nitrite + Nitrate Total		mg/L	Quarterly	24-Hr Flow Prop Comp	
Nitrogen, Total		mg/L	Quarterly	Calculated	Total Nitrogen shall be calculated as the sum of reported values for Total Kjeldahl Nitrogen and Total Nitrite + Nitrate Nitrogen.
Acute WET		TUa	See Listed	24-Hr Flow	Annual in rotating quarters. See Whole Effluent

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
			Qtr(s)	Prop Comp	Toxicity (WET) Testing section.
Chronic WET	Monthly Avg	4.5 TUc	See Listed Qtr(s)	24-Hr Flow Prop Comp	Annual in rotating quarters. See Whole Effluent Toxicity (WET) Testing section.

2.1.1 Changes from Previous Permit

Effluent limitations and monitoring requirements were evaluated for this permit term and the following changes were made from the previous permit.

- **Chloride** – Monitoring in 2029 added
- **PFOS and PFOA** – Monitoring once every two months is included in the permit in accordance with s. NR 106.98(2)(b), Wis. Adm. Code.
- **Phosphorus, Total** – 6-month average limit updated

2.1.2 Explanation of Limits and Monitoring Requirements

Detailed discussions of limits and monitoring requirements can be found in the attached water quality-based effluent limits (WQBEL) memo dated 3/3/2026.

Monitoring Frequencies- The Monitoring Frequencies for Individual Wastewater Permits guidance (April 12, 2021) recommends that standard monitoring frequencies be included in individual wastewater permits based on the size and type of the facility, in order to characterize effluent quality and variability, to detect events of noncompliance, and to ensure consistency in permits issued across the state. Guidance and requirements in administrative code were considered when determining the appropriate monitoring frequencies for pollutants that have final effluent limits in effect during this permit term. The department has considered monitoring frequencies and no changes have been made for this permit reissuance.

Expression of Limits- In accordance with the federal regulation 40 CFR 122.45(d) and s. NR 205.065, Wis. Adm. Code, limits in this permit are to be expressed as weekly average and monthly average whenever practicable.

Chloride: Available chloride data was evaluated, and it was determined no effluent limits are needed at this time. Monthly chloride monitoring in the year 2029 is added to the current permit to ensure 11 sample results are available at the next permit reissuance to meet the data requirements of s. NR 106.85.

Total Phosphorus – The proposed permit will be Mukwonago’s third permit term under new administrative rules for phosphorus discharges that took effect December 1, 2010. Details regarding the administrative rules for phosphorus discharges may be found at: <https://dnr.wisconsin.gov/topic/Wastewater/Phosphorus>. Phosphorus rules are contained in s. NR 102.06 and ch. NR 217, Subchapter III. A monthly average interim limit of 1 mg/L remains effective upon reissuance. An Adaptive Management Interim limit of 0.5 mg/L expressed as a 6-month average (averaging period of May through October and November through April) becomes effective upon reissuance. The facility has shown ability to meet this Adaptive Management Interim limit from recent facility changes.

Adaptive Management for Total Phosphorus Compliance – Mukwonago requested, and the Department approved a plan to implement a watershed adaptive management approach under s. NR 217.18, Wis. Adm. Code and s. 283.13(7) Wis. Stats. as a means for Mukwonago to achieve compliance with the phosphorus water quality standard in s. NR 102.06, Wis. Adm. Code. The phosphorus limitations and conditions in this permit reflect the approved Adaptive

Management (AM) Plan AM-2026-02 (May 2026). The permittee shall design and implement the actions identified in the approved AM Plan No. in accordance with the goals and measures identified. The goal of the AM plan is to reduce phosphorus loadings within the watershed action area by at a minimum 1,150 lbs/yr by the end of this permit term. In addition, annual progress reports are required. See Schedules section for more details. The Department may terminate the AM option based on the reasons enumerated in NR 217.18(3)(e)2, Wis. Adm. Code.

The permit contains an interim adaptive management phosphorus limit of 0.5 mg/L expressed as a six-month seasonal average. The averaging periods for the six-month average limit are May through October and November through April. Compliance with the 0.5 mg/L six-month interim limit is evaluated at the end of each six-month period on April 30 and October 31 annually. The 1.0 mg/L monthly average phosphorus limit is in effect for the duration of the reissued permit.

Surface water monitoring requirements are included in the proposed permit in support of the goals and measures of the Adaptive Management Plan and are discussed in more detail in following subsections of this fact sheet. Sampling is required monthly as outlined in the approved Adaptive Management Plan.

PFOS and PFOA – 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 municipal dischargers with an average flow rate less than 1 MGD, to be evaluated on a case-by-case basis to determine if monitoring is required pursuant to s. NR 106.98(2)(c), Wis. Adm. Code. The department evaluated the need for PFOS and PFOA monitoring taking into consideration the presence of potential PFOS or PFOA industrial wastes, remediation sites and other potential sources of PFOS or PFOA. Based on information available at the time the proposed permit was drafted, it was identified that the POTW has an indirect discharger(s) that may be a potential source of PFOS/PFOA and that previous PFOS/PFOA sample results were within 1/5 of the PFOS or PFOA standards under s. NR 102.04(8)(d)1, Wis. Adm. Code.

Therefore, monitoring once every two months is included. 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.

2.2 Sample Point Number: 601- Fox River - Downstream

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Flow River		cfs	Monthly	Measure	Provide an estimate of river flow for each day that in-stream phosphorus monitoring is performed May - October annually.
Flow River		cfs	Per Occurrence	Measure	Voluntary river flow estimates for each day that in-stream phosphorus monitoring is performed November - April annually.
Phosphorus, Total		mg/L	Monthly	Grab	Collect samples monthly

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
					May - October annually. See permit sections for sampling and reporting requirements.
Phosphorus, Total		mg/L	Per Occurrence	Grab	Voluntary monitoring November - April annually. See permit sections for sampling and reporting requirements.
Phosphorus, Total		lbs/month	Monthly	Calculated	Calculate and report total monthly phosphorus loads for May-October annually. See permit sections for calculation of total monthly loads.
Phosphorus, Total		lbs/month	Per Occurrence	Calculated	Calculated total phosphorus loads may also be reported for November - April, as data is available. See permit section for calculation of total monthly loads.

Changes from Previous Permit

Effluent limitations and monitoring requirements were evaluated for this permit term and no changes were required in this permit section. Sampling requirements and frequencies are the same as the previous permit.

Explanation of Limits and Monitoring Requirements

As part of the Adaptive Management Plan requirements, downstream monitoring for river flow rate, in-stream phosphorus concentration and total monthly in-stream phosphorus loads is required during the months of May through October. Monitoring these same parameters is voluntary during the months of November through April. When voluntary monitoring is completed, results must be reported on the monthly eDMR. The in-stream phosphorus concentration and river flow rate are used to calculate the total monthly loading of phosphorus in the Fox (IL) River on a monthly basis. This monitoring will allow the permittee to demonstrate reductions in phosphorus loading for each month of the year.

3 Land Application - Monitoring and Limitations

Municipal Sludge Description						
Sample Point	Sludge Class (A or B)	Sludge Type (Liquid or Cake)	Pathogen Reduction Method	Vector Attraction Method	Reuse Option	Amount Reused/Disposed (Dry Tons/Year)
003	B	Cake	Anaerobic Digestion	Incorporation	Land Application	288

Municipal Sludge Description						
Sample Point	Sludge Class (A or B)	Sludge Type (Liquid or Cake)	Pathogen Reduction Method	Vector Attraction Method	Reuse Option	Amount Reused/Disposed (Dry Tons/Year)
					and Hauled Offsite	
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? Yes						
If yes, special monitoring and recycling conditions will be included in the permit to track any potential problems in landapplying sludge from this facility						
Is a priority pollutant scan required? No, flow <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.						

3.1 Sample Point Number: 003- Cake Sludge

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

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Selenium Dry Wt	Ceiling	100 mg/kg	Annual	Composite	
Selenium Dry Wt	High Quality	100 mg/kg	Annual	Composite	
Zinc Dry Wt	Ceiling	7,500 mg/kg	Annual	Composite	
Zinc Dry Wt	High Quality	2,800 mg/kg	Annual	Composite	
Nitrogen, Total Kjeldahl		Percent	Annual	Composite	
Nitrogen, Ammonium (NH4-N) Total		Percent	Annual	Composite	
Phosphorus, Total		Percent	Annual	Composite	
Phosphorus, Water Extractable		% of Tot P	Annual	Composite	
Potassium, Total Recoverable		Percent	Annual	Composite	
Radium 226 Dry Wt		pCi/g	Annual	Composite	
PCB Total Dry Wt	Ceiling	50 mg/kg	Once	Composite	Once in 2027
PCB Total Dry Wt	High Quality	10 mg/kg	Once	Composite	Once in 2027
PFOA + PFOS		ug/kg	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:

Sludge limitations and monitoring requirements were evaluated for this permit term and the following changes were made from the previous permit.

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

Explanation of Limits and Monitoring Requirements

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

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

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

4 Schedules

4.1 Watershed Adaptive Management Option Annual Report Submittals

The permittee shall submit annual reports on the implementation of AM Plan No. AM-2026-02 (May 2026) as specified in the “Phosphorus Limitation(s) and Adaptive Management Requirements” permit section and the following schedule.

Required Action	Due Date
<p>Annual Adaptive Management Report: Submit an annual adaptive management report. The annual adaptive management report shall:</p> <ul style="list-style-type: none"> o Identify those actions from Section 5 and 6 of the approved adaptive management plan that were completed during the previous calendar year and those actions that are in progress; o Evaluate collected monitoring data; o Document progress in achieving the goals and measures identified in the approved adaptive management plan; o Describe the outreach and education efforts that occurred during the past calendar year; o Identify any corrections or adjustments to the adaptive management plan that are needed to achieve compliance with the phosphorus water quality standards specified in s. NR 102.06, Wis. Adm. Code; o Describe any updates needed to Mukwonago’s approved phosphorus optimization plan; <p>and</p> <ul style="list-style-type: none"> o Submit results from all sample points outlined in AM plan No. AM-2026-02 (May 2026) to the Department using the Department’s Laboratory Data Entry System (LDES) 	03/31/2027
<p>Annual Adaptive Management Report #8: Submit an Adaptive Management report with the required information described in this section (see above).</p>	03/31/2028
<p>Annual Adaptive Management Report #9: Submit an Adaptive Management report with the required information described in this section (see above)</p>	03/31/2029
<p>Annual Adaptive Management Report #10: Submit an Adaptive Management report with the required information described in this section (see above)</p>	03/31/2030
<p>Final Adaptive Management Report for 2nd Permit Term: Submit the final Adaptive Management (AM) report documenting progress made during the second permit term under AM in meeting the watershed phosphorus reduction target of 2,270 lbs/yr, as well as the anticipated future reductions in phosphorus sources and phosphorus effluent concentrations, which shall be measured in accordance with the AM Plan protocols. The report shall summarize AM activities that have been implemented during the current permit term and state which, if any, actions from the approved AM plan No. AM-2026-02 (May 2026) were not pursued and why. The report shall include an analysis of trends on both a monthly and six-month average basis for concentrations and mass effluent</p>	03/31/2031

discharged. Additionally, there shall be an analysis of any improvements to the quality of surface waters in the Adaptive Management Action Area focusing on phosphorus and flow results collected during the permit term. The surface water analysis shall evaluate how the in-stream loadings have changed over the permit term in comparison to implemented AM actions.	
Renewal of Adaptive Management Plan for Permit Reissuance: If the permittee intends to seek renewal of AM plan No. AM-2026-02 (May 2026) per s. NR 217.18, Wis. Adm. Code, for the reissued permit term, proposed AM goals and actions based on an updated AM plan shall be submitted to the Department for review and approval. The permittee may propose to adjust load reductions required by AM plan No. AM-2026-02 (May 2026) either up or down at the beginning of each WPDES permit term to reflect changes in loads associated with point and non-point sources. This schedule may be modified to incorporate any changes in AM goals and actions, removed if the AM program is terminated per the “Adaptive Management Reopener Clause” permit section, or removed if the adaptive management plan has achieved water quality standards as determined by the Department within the AM action area.	01/01/2031
Annual Adaptive Management Report #12: Submit an Adaptive Management report with the required information described in this section (see above)	03/31/2032
Annual Adaptive Management Report #13: Submit an Adaptive Management report with the required information described in this section (see above)	03/31/2033
Annual Adaptive Management Report #14: Submit an Adaptive Management report with the required information described in this section (see above)	03/31/2034
Annual Adaptive Management Report #15: Submit an Adaptive Management report with the required information described in this section (see above)	03/31/2035
Final Adaptive Management Report: Submit the final Adaptive Management (AM) report documenting progress made throughout the AM project in meeting the watershed phosphorus reduction target of 4,540 lbs/yr, and in stream water quality standards specified in s. NR 102.06, Wis. Adm. Code. The report shall summarize AM activities that have been implemented during the current permit term and state which, if any, actions from the approved AM plan No. AM-2026-02 (May 2026) were not pursued and why. The report shall include an analysis of trends on both a monthly and six-month average basis for concentrations and mass effluent discharged. Additionally, there should be an analysis of any improvements to the quality of surface waters in the Adaptive Management Action Area focusing on phosphorus and flow results collected during the permit term. The surface water analysis shall evaluate how the in-stream loadings have changed over the permit term in comparison to implemented AM actions.	03/31/2036
Achieve Water Quality Standards and Adaptive Management Plan Success: All the receiving waters identified within the AM plan AM-2026-02 (May 2026) shall comply with water quality standards specified in s. NR 102.06, Wis. Adm. Code. The permittee shall continue to comply with applicable effluent limits (required under s. 217.18(3)(e)3. expressed as a 6-month avg and 1.0 mg/L monthly avg) and continue monitoring surface waters per AM-2026-02 (May 2026) at a minimum of monthly May through October for total phosphorus.	06/30/2036

Explanation of Schedule

This compliance schedule requires the permittee to submit annual adaptive management (AM) annual reports that show progress towards meeting the goals and measures contained in the approved AM plan. The final AM Report for this permit term must document the success of meeting the watershed phosphorus minimum reduction target of 1,150 lbs/yr. The compliance schedule may be modified at permit reissuance, should changes in AM goals and measures or timing necessitate different dates for schedule items.

Pursuant to s. NR 217.18(1) Wis. Adm. Code., phosphorus water quality criteria must be achieved “as soon as possible”. The duration for this adaptative management schedule is 15 years. This timeframe is consistent with the approved adaptive management plan, and represents the shortest possible duration based upon the following factors that influence time required for the water body to achieve the phosphorus criterion:

- Magnitude of point and/or nonpoint source phosphorus reductions required
- Costs associated with point and/or nonpoint source phosphorus reductions
- For nonpoint source reductions, the time required to contact landowners and receive adequate participation to implement practices
- Physical characteristics of the watershed and receiving water, including landuse, soil properties, slopes, channel gradient, and level of legacy sediment/phosphorus currently in the system

4.2 PFOS/PFOA Minimization Plan Determination of Need

Required Action	Due Date
<p>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.</p> <p>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.</p>	06/30/2027
<p>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.</p> <p>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.</p> <p>The permittee shall also submit a request to the department to evaluate the need for a PFOS/PFOA minimization plan.</p> <p>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.</p> <p>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.</p>	06/30/2028

Explanation of Schedule

As stated above, ch. NR 106 Subchapter VIII – Permit Requirements for PFOS and PFOA Dischargers became effective on August 1, 2022. Section 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.

4.3 Land Application Management Plan

A management plan is required for the land application system.

Required Action	Due Date
<p>Land Application Management Plan Submittal: Submit an update to the management plan to optimize the land application system performance and demonstrate compliance with ch. NR 204, Wis. Adm. Code, by the Due Date. This management plan shall 1) specify information on pretreatment processes (if any); 2) identify land application sites; 3) describe site limitations; 4) address vegetative cover management and removal; 5) specify availability of storage; 6) describe the type of transporting and spreading vehicle(s); 7) specify monitoring procedures; 8) track site loading; 9) address contingency plans for adverse weather and odor/nuisance abatement; and 10) include any other pertinent information. Once approved, all landspreading activities shall be conducted in accordance with the plan. Any changes to the plan must be approved by the Department prior to implementing the changes.</p>	06/30/2027

Explanation of Schedule

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

Attachments

Water Quality Based Effluent Limits (WQBEL) Dated 3/03/2026

Adaptive Management Conditional Approval Letter Dated 5/01/2026

Adaptive Management Plan Dated 4/16/2026

Justification Of Any Waivers From Permit Application Requirements

No waivers requested or granted as part of this permit reissuance

Prepared By: Marissa Fleege Wastewater Specialist

Date: 4/14/2026

Amended Post Internal Review: 5/4/2026

Amended Post Fact Check: 5/12/2026

Amended Post Public Notice:

CORRESPONDENCE/MEMORANDUM

DATE: 03/03/2026

TO: Marissa Fleege – SER

FROM: Nicole Krueger – SER *Nicole Krueger*

SUBJECT: Water Quality-Based Effluent Limitations for Mukwonago Wastewater Treatment Plant
WPDES Permit No. WI-0020265-11

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 Mukwonago Wastewater Treatment Plant in Waukesha County. This municipal wastewater treatment facility (WWTF) discharges to the Fox (IL) River, located in the Upper Fox (IL) River Watershed in the Fox (IL) River Basin.

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
CBOD ₅			40 mg/L	25 mg/L		1
TSS			45 mg/L	30 mg/L		1,2
pH	9.0 s.u.	6.0 s.u.				1
Ammonia Nitrogen November – April	20 mg/L		20 mg/L	20 mg/L		1,3,4
<i>E. coli</i> May – September				126 #/100 mL geometric mean		1,5
Chloride						6
PFOS and PFOA						7
Phosphorus AM Interim Limits				1.0 mg/L	0.5 mg/L	2,8
TKN, Nitrite+Nitrate, and Total Nitrogen						9
Acute WET						1,10,11
Chronic WET				4.5 TU _c		1,10,11

Footnotes:

1. No changes from the current permit.
2. A Total Maximum Daily Load (TMDL) is being developed for the Fox (IL) River Basin to address phosphorus water quality impairments within the TMDL area. This TMDL will likely result in limitations for phosphorus and TSS that must be included in WPDES permits, which may be different than those calculated for this reissuance. TMDL-derived limits may be included in lieu of or in addition to the calculated limits upon permit reissuance or modification once the TMDL has been approved by U.S. EPA, according to s. NR 217.16, Wis. Adm. Code.
3. Monitoring only for May – October.
4. 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.
5. Additional limit: No more than 10 percent of *E. coli* bacteria samples collected in any calendar month may exceed 410 count/100 mL.
6. Monitoring is recommended to ensure that 11 sample results are available at the next permit issuance.

7. PFOS and PFOA monitoring is recommended at a frequency of once every two months in accordance with s. NR 106.98(2), Wis. Adm. Code.
8. Under the phosphorus Adaptive Management (AM) Plan, the interim limits (and technology-based limit (TBL)) of 1.0 mg/L, monthly average and 0.5 mg/L, six-month average should be effective upon permit reissuance. The final water quality-based effluent limits are 0.30 mg/L as a monthly average, 0.10 mg/L and 1.25 lbs/day as six-month averages.
9. 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. Sections 283.37(5) and 283.55(1)(e), Wis. Stats, and ss. NR 200.065(1)(g) and NR 200.065(1)(h), Wis. Adm. Codes, provide the authority to request this monitoring during the permit term. Total Nitrogen is the sum of nitrate (NO₃), nitrite (NO₂), and total Kjeldahl nitrogen (TKN) (all expressed as N).
10. Annual acute and chronic WET tests are recommended. The Instream Waste Concentration (IWC) to assess chronic test results is 22%. 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%. The primary control water used in chronic WET tests conducted on Outfall 001 shall be a grab sample collected from the Fox River.
11. 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. Testing should continue after the permit expiration date (until the permit is reissued).

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: Nick Lent, Wastewater Engineer – SER
Susan Eichelkraut, Acting Regional Wastewater Supervisor – SER
Diane Figiel, Water Resources Engineer – WY/3
Nate Willis, Wastewater Engineer – WY/3

Attachment #1
**Water Quality-Based Effluent Limitations for
Mukwonago Wastewater Treatment Plant**

WPDES Permit No. WI-0020265-11

Prepared by: Nicole Krueger

PART 1 – BACKGROUND INFORMATION

Facility Description

The Village of Mukwonago wastewater treatment plant (WWTP) serves a population of 7300 and has no significant industries. The facility is a conventional activated sludge WWTF that went online in 1981 with substantial improvements in 2006 and 2007. Processes include mechanical fine screening, grit removal, primary clarification, aeration with fine bubble aeration tanks, final clarification, and Ultraviolet light for seasonal disinfection. The aeration basins contain an Integrated Fixed Film Activated Sludge (IFAS) system for the improvement of the biological process. Polyaluminum chloride is used to remove phosphorus. Effluent is pumped out of a clear well to the Fox (IL) River approximately 5,000 ft east of the WWTP.

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

Existing Permit Limitations

The current permit, expiring on December 31, 2025, includes the following effluent limitations and monitoring requirements.

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
CBOD ₅			40 mg/L	25 mg/L		1,2,3
TSS			45 mg/L	30 mg/L		1,2
pH	9.0 s.u.	6.0 s.u.				1
Ammonia Nitrogen November – April	20 mg/L		20 mg/L	20 mg/L		4
<i>E. coli</i> May – September				126 #/100 mL geometric mean		5
Phosphorus AM Interim Limits				1.0 mg/L	0.6 mg/L	6
TKN, Nitrite+Nitrate, and Total Nitrogen						7
Acute WET						8
Chronic WET				4.5 TU _c		8

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. This facility meets the conditions as described in s. NR 210.07(4), Wis. Adm. Code for CBOD₅ limits.

Attachment #1

3. These limits are based on the Warm Water Sport Fish (WWSF) community of the immediate receiving water as described in s. NR 210.05(1), Wis. Adm. Code.
4. 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.
5. No more than 10 percent of *E. coli* bacteria samples collected in any calendar month may exceed 410 count/100 mL.
6. These are interim limits under the phosphorus Adaptive Management plan. The monthly average limit is also a technology-based limit.
7. Monitoring only.
8. Annual acute and chronic WET testing is required in the current permit. The IWC for chronic WET was 22%.

Receiving Water Information

- Name: Fox (IL) River
- Waterbody Identification Code (WBIC): 742500
- Classification used in accordance with chs. NR 102 and 104, Wis. Adm. Code: Warm Water Sport Fish (WWSF) community, non-public water supply and recreational use.
- Low flows used in accordance with chs. NR 106 and 217, Wis. Adm. Code: The following 7-Q₁₀ and 7-Q₂ values are from USGS for Station 05544304 (December 2019), where Outfall 001 is located.
 - 7-Q₁₀ = 33 cfs (cubic feet per second)
 - 7-Q₂ = 57 cfs
 - 90-Q₁₀ = 48.5 cfs
 - Harmonic Mean Flow = 98.1 cfs

The Harmonic Mean has been estimated based on average flow and the 7-Q₁₀ using an equation from U.S. EPA's *Technical Support Document for Water Quality-Based Toxics Control* (March 1991, EPA/505/2-90-001, pgs. 88-89).

Monthly Low Flows

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
7-Q₁₀ (cfs)	63	66	92	120	85	52	39	42	43	50	72	67
7-Q₂ (cfs)	105	119	191	207	156	115	83	76	72	84	109	118

- Hardness = 272 mg/L as CaCO₃. This value represents the geometric mean of data from 09/13/2022 – 03/04/2025 from chronic WET testing.
- % of low flow used to calculate limits in accordance with s. NR 106.06(4)(c)5., Wis. Adm. Code: 25%
- Source of background concentration data: Metals and chloride data from Fox (IL) River at the CTH I Bridge (SWIMS Station ID: 683096) is used for this evaluation. 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 and phosphorus are described later.
- Multiple dischargers: There are several other dischargers to the Fox (IL) River; 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: The Fox (IL) River is 303(d) listed as impaired for PCBs and total phosphorus at the point of discharge. A TMDL is being development to address the total phosphorus impairment which will result in additional phosphorus and TSS limits.

Effluent Information

- Design flow rate(s):
 - Annual average = 1.5 million gallons per day (MGD)
 - Peak daily = 2.84 MGD
 - Peak weekly = 2.23 MGD
 - Peak monthly = 1.85 MGD
- For reference, the actual average flow from 01/01/2021 – 10/31/2025 was 0.91 MGD.
- Hardness = 399 mg/L as CaCO₃. This value represents the geometric mean of four samples collected in March and April 2025 which were reported on the permit application.
- Acute dilution factor used in accordance with s. NR 106.06(3)(c), Wis. Adm. Code: Not applicable – this facility does not have an approved Zone of Initial Dilution (ZID).
- Wastewater source: Domestic wastewater with 1 industrial contributor (Aptar)
- Water supply: Municipality waterworks and private wells.
- Additives: Mukwonago has included 1 additive in the permit application that has the potential to be present in Outfall 001. This additive is listed below:
 - Chemtrade Hyper+Ion 5800 – Phosphorus removal
 - An additive review is not necessary for any additives where either the toxicity is well documented and understood, can be controlled by a WQBEL, or are not believed to be present in the discharge. This is the case upon initial review of the listed additives. Therefore, an additive review is not needed at this time.
- 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 ammonia and phosphorus is used in this evaluation.
- Effluent data for substances for which a single sample was analyzed is shown in the tables in Part 2, in the column titled “MEAN EFFL. CONC.”. Otherwise, substances with multiple effluent data are shown in the tables below or in their respective parts in this evaluation.

Copper Effluent Data

Sample Date	Copper (µg/L)
03/13/2025	4.6
03/19/2025	9.1
03/27/2025	<3.2
04/02/2025	3.9
Average	4.4

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

Chloride Effluent Data

Sample Date	Chloride (mg/L)
03/13/2025	590
03/27/2025	570
04/02/2025	490
06/12/2025	590
Average	558

The following table presents the average concentrations and loadings at Outfall 001 from 01/01/2021 – 10/30/2025 for all parameters with limits in the current permit to meet the requirements of s. NR 201.03(6), Wis. Adm. Code:

Parameters with Effluent Limits	
	Average Measurement
CBOD ₅	2.27 mg/L*
TSS	10.2 mg/L
pH field	7.36 s.u.
Ammonia Nitrogen	2.02 mg/L
<i>E. coli</i>	4.14 #/100 mL**
Phosphorus	0.41 mg/L

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

** The average measurement for bacteria is calculated as a geometric mean. Values reported below the LOD are replaced with a value of 1 for the calculation of the geometric mean.

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

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

1. The maximum effluent concentration exceeds the calculated limit (s. NR 106.05(3), Wis. Adm. Code)
2. If 11 or more detected results are available in the effluent, the upper 99th percentile (or P₉₉) value exceeds the comparable calculated limit (s. NR 106.05(4), Wis. Adm. Code)
3. If fewer than 11 detected results are available, the mean effluent concentration exceeds 1/5 of the calculated limit (s. NR 106.05(6), Wis. Adm. Code)

Acute Limits based on 1-Q₁₀

Daily maximum effluent limitations for toxic substances are based on the acute toxicity criteria (ATC), listed in ch. NR 105, Wis. Adm. Code. Previously daily maximum limits for toxic substances were calculated as two times the ATC. However, changes to ch. NR 106, Wis. Adm. Code, (September 1, 2016) require the Department to calculate acute limitations using the same mass balance equation as used for other limits along with the 1-Q₁₀ receiving water low flow to determine if more restrictive effluent limitations are needed to protect the receiving stream from discharges which may cause or contribute to an exceedance of the acute water quality standards. The mass balance equation is provided below.

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

Where:

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

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

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

Attachment #1

f = Fraction of the effluent flow that is withdrawn from the receiving water, and
 Cs = Background concentration of the substance (in units of mass per unit volume) as specified in s. NR 106.06(4)(e), Wis. Adm. Code.

If the receiving water is effluent dominated under low stream flow conditions, the 1-Q₁₀ method of limit calculation produces the most stringent daily maximum limitations and should be used while making reasonable potential determinations. This is not the case for Mukwonago, and the limits are set based on two times the acute toxicity criteria.

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

Daily Maximum Limits based on Acute Toxicity Criteria (ATC)

RECEIVING WATER FLOW = 26.4 cfs, (1-Q₁₀ (estimated as 80% of 7-Q₁₀)), as specified in s. NR 106.06(3)(bm), Wis. Adm. Code.

SUBSTANCE	REF. HARD.* mg/L	ATC	MAX. EFFL. LIMIT**	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Arsenic		340	680	136	<1.1
Cadmium	399	50.4	101	20.2	<0.17
Chromium	301	4446	8892	1778	<1.5
Copper	399	57.3	115	22.9	4.4
Lead	356	365	729	146	<5.4
Mercury (ng/L)		830	1660	332	0.64
Nickel	268	1080	2161	432	<4.7
Zinc	333	345	689	138	44
Chloride (mg/L)		757	1514	303	558

* 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-Q₁₀ flow rates per the changes to s. NR 106.07(3), Wis. Adm. Code, effective 09/01/2016.

Weekly Average Limits based on Chronic Toxicity Criteria (CTC)

RECEIVING WATER FLOW = 8.25 cfs (¼ of the 7-Q₁₀), as specified in s. NR 106.06(4)(c), Wis. Adm. Code

SUBSTANCE	REF. HARD.* mg/L	CTC	MEAN BACK-GRD.	WEEKLY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Arsenic		152	9.63	659	132	<1.1
Cadmium	175	3.82	0.21	16.7	3.3	<0.17
Chromium	272	300	4.72	1349	270	<1.5
Copper	272	24.4	8.37	81.2	16.2	4.4
Lead	272	73.6	4.74	319	63.7	<5.4
Mercury (ng/L)		440	0.20	2003	401	0.64
Nickel	268	120	3.96	533	107	<4.7
Zinc	272	289	9.95	1280	256	44

Attachment #1

SUBSTANCE	REF. HARD.* mg/L	CTC	MEAN BACK-GRD.	WEEKLY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Chloride (mg/L)		395	155	1249	250	558

* 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)

RECEIVING WATER FLOW = 12.11 cfs (¼ of the 90-Q₁₀), as specified in s. NR 106.06(4), Wis. Adm. Code

SUBSTANCE	WC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Mercury (ng/L)	1.3	0.20	7.02	1.40	0.64

Monthly Average Limits based on Human Threshold Criteria (HTC)

RECEIVING WATER FLOW = 25.3 cfs (¼ of Harmonic Mean), as specified in s. NR 106.06(4), Wis. Adm. Code.

SUBSTANCE	HTC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Cadmium	370	0.21	4395	879	<0.17
Chromium	3818000	4.72	45377921	9075584	<1.5
Lead	140	4.74	1612	322	<5.4
Mercury (ng/L)	1.5	0.20	15.6	3.12	0.64
Nickel	43000	3.96	511024	102205	<4.7

Monthly Average Limits based on Human Cancer Criteria (HCC)

RECEIVING WATER FLOW = 25.3 cfs (¼ of Harmonic Mean), as specified in s. NR 106.06(4), Wis. Adm. Code.

SUBSTANCE	HCC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Arsenic	13.3	9.63	53.3	10.66	<1.1

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 not required for toxic parameters. Limits and/or monitoring recommendations are made in the paragraphs below:

Chloride – Considering available effluent data from the permit reissuance application, the average chloride data is 558 mg/L which is greater than 1/5th of the calculated limit based on ATC and CTC. Older chloride data is used in this evaluation to have at least 11 data points to calculate P₉₉'s to directly

compare to the calculated limits:

Effluent Chloride Data

Sample Date	Chloride mg/L	Sample Date	Chloride mg/L	Sample Date	Chloride mg/L
05/07/2019	480	06/18/2019	480	07/11/2019	510
05/10/2019	370	06/24/2019	510	03/13/2025	590
05/13/2019	470	06/27/2019	480	03/27/2025	570
05/16/2019	490	07/02/2019	420	04/02/2025	490
06/13/2019	430	07/08/2019	450	06/12/2025	590
1-day P ₉₉ = 648 mg/L					
4-day P ₉₉ = 564 mg/L					

These 1-day and 4-day P₉₉ 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.**

PFOS and PFOA – The need for PFOS and PFOA monitoring is evaluated in accordance with s. NR 106.98(2), Wis. Adm. Code.

Available monitoring sample data from the Mukwonago Waterworks (PWS ID: 26802094) is provided in the table below:

Water Supply PFAS Data

Sample Date	Sample ID	Well #	PFOS (ng/L)	PFOA (ng/L)
05/25/2023	WB03070-01	WO237	6.8	11
06/26/2023	WB03805-01	WO237	5.1	9
09/20/2023	WB06028-01	WO237	8.6	21
10/18/2023	WB06774-01	WO237	10	20
03/07/2024	WC01386-04	WO237	9.3	21
06/18/2024	WC03687-01	WO237	15	23
09/18/2024	WC06134-01	WO237	12	19
11/06/2024	WC07406-01	WO237	12	18
03/13/2025	WD01604-05	WO237	12	20
06/10/2025	WD03666-01	WO237	12	21
07/23/2025	WD04753-03	WO237	14	25
Average =			10.6	18.9

The limited data above shows the municipal water supply is above or equal to 1/5th of the applicable PFOS and PFOA criteria.

Previous monitoring produced a PFOS result of 1.77 ng/L and a PFOA result of 9.46 ng/L. The PFOS result is greater than one fifth of the criteria of 8 ng/L. Based on the types of indirect dischargers contributing to the collection system, the available PFOS/PFOA monitoring data and available source water monitoring data, **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 daily maximum, weekly average and monthly average limits. These limits are re-evaluated at this time due to the following changes:

- Subchapter IV of ch. NR 106, Wis. Adm. Code allows limits based on available dilution instead of limits set to twice the acute criteria.
- Section NR 106.07(3), Wis. Adm. Code requires weekly and monthly average limits for municipal treatment plants.
- The maximum expected effluent pH has changed

Daily Maximum Limits based on Acute Toxicity Criteria (ATC)

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

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

Where:

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

The effluent pH data was examined as part of this evaluation. A total of 1765 sample results were reported from 01/02/2021 – 10/31/2025. The maximum reported value was 8.1 s.u. (Standard pH Units). The effluent pH was 7.6 s.u. or less 99% of the time. The 1-day P₉₉, calculated in accordance with s. NR 106.05(5), Wis. Adm. Code, is 7.6 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 7.6 s.u. Therefore, a value of 7.6 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 7.6 s.u. into the equation above yields an ATC = 17 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-Q₁₀ receiving water low flow if it is determined that the previous method of acute ammonia limit calculation (2×ATC) is not sufficiently protective of the fish and aquatic life. The more restrictive calculated limits shall apply.

The calculated daily maximum ammonia nitrogen effluent limits using the mass balance approach with the 1-Q₁₀ (estimated as 80 % of 7-Q₁₀) and the 2×ATC approach are shown below.

Daily Maximum Ammonia Nitrogen Determination

	Ammonia Nitrogen Limit mg/L
2×ATC	34
1-Q ₁₀	88

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

This limit is greater than the current daily maximum limit of 20 mg/L. To increase the daily maximum ammonia limit, an assessment of the effluent data consistent with the requirements of ss. NR 207.04(1)(a) and (c), Wis. Adm. Code, must be provided. This evaluation is on a parameter by parameter basis and includes consideration of operations, maintenance and temporary upsets. 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. 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 the highest reported concentration was 19.6 mg/L during the previous permit term. **No changes are recommended for any of the permit limits for ammonia.**

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

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

The 30-day chronic toxicity criterion (CTC) for ammonia in waters classified as a Warm Water Sport Fish Community is calculated by the following equation, according to subchapter IV of NR 106, Wis. Adm. Code.

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

Where:

pH = the pH (s.u.) of the receiving water,

E = 0.854,

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

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

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

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

The 4-day criterion is equal to the 30-day criterion multiplied by 2.5. The 4-day criteria are used in a mass-balance equation with the 7-Q₁₀ (4-Q₃, if available) to derive weekly average limitations. And the 30-day criteria are used with the 30-Q₅ (estimated as 85% of the 7-Q₂ if the 30-Q₅ is not available) to derive monthly average limitations. The stream flow value is further adjusted to temperature; 100% of the flow is used if the Temperature ≥ 16 °C, 25% of the flow is used if the Temperature < 11 °C, and 50% of the flow is used if the Temperature ≥ 11 °C but < 16 °C.

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

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.

Weekly and Monthly Ammonia Nitrogen Limits – WWSF

		April & May	June – Sept.	October – March
Effluent Flow	Qe (MGD)	1.5	1.5	1.5
Background Information	7-Q ₁₀ (cfs)	33	33	33
	7-Q ₂ (cfs)	57	57	57
	Ammonia (mg/L)	0.09	0.07	0.17
	Average Temperature (°C)	12	19	4
	Maximum Temperature (°C)	14	21	10
	pH (s.u.)	7.81	7.88	7.84
	% of Flow used	50	100	25
	Reference Weekly Flow (cfs)	16.5	33	8.25
	Reference Monthly Flow (cfs)	24.2	48.5	12.1
Criteria mg/L	4-day Chronic			
	Early Life Stages Present	7.88	4.88	
	Early Life Stages Absent			10.2
	30-day Chronic			
	Early Life Stages Present	3.15	1.95	
	Early Life Stages Absent			4.07
Effluent Limitations mg/L	Weekly Average			
	Early Life Stages Present	63.3	73.3	
	Early Life Stages Absent			45.8
	Monthly Average			
	Early Life Stages Present	35.1	41.3	
	Early Life Stages Absent			24.4

Effluent Data

The following table evaluates the statistics based upon ammonia data reported from 01/04/2021 – 10/30/2025.

Ammonia Nitrogen Effluent Data

Ammonia Nitrogen mg/L	April - May	June - September	October - March
1-day P ₉₉	15.0	12.6	9.64
4-day P ₉₉	8.20	6.91	5.26
30-day P ₉₉	4.52	3.22	2.89
Mean	2.98	1.72	1.90
Std	3.08	2.75	1.97
Sample size	167	338	463
Range	0.01 - 15.49	0.03 - 19.61	0.07 - 17.25

Reasonable Potential

The need to include ammonia limits in Mukwonago’s permit is determined by calculating 99th upper percentile (or P₉₉) values for ammonia and comparing those to the calculated limits. Based on this comparison, there is no reasonable potential for the discharge to exceed any of the calculated ammonia nitrogen limits. However, **since the permit currently has weekly and monthly average limits for November – April, 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.

The daily maximum, weekly average and monthly average limit of 20 mg/L for November – April are recommended to continue 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. Limits to meet the requirements in s. NR 106.07, Wis. Adm Code, are denoted in bold text.

Final Ammonia Nitrogen Limits

	Daily Maximum mg/L	Weekly Average mg/L	Monthly Average mg/L
November – April	20	20	20

Monitoring only for May – October is recommended to continue as well.

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 Mukwonago currently has a monthly average 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(3)(a), Wis. Adm. Code, specifically names river segments for which a phosphorus criterion of 0.100 mg/L applies. For other stream segments that are not specified in s. NR 102.06(3)(a), Wis. Adm. Code, s. NR 102.06(3)(b), Wis. Adm. Code, specifies a phosphorus criterion of 0.075 mg/L. The phosphorus criterion of 0.10 mg/L applies for the Fox (IL) River.

The conservation of mass equation is described in s. NR 217.13(2)(a), Wis. Adm. Code, for phosphorus WQBELs and includes variables of water quality criterion (WQC), receiving water flow rate (Qs), effluent flow rate (Qe), and upstream phosphorus concentrations (Cs) provided below.

$$\text{Limitation} = [(WQC)(Qs + (1-f) Qe) - (Qs - f Qe) (Cs)] / Qe$$

Where:

WQC = 0.10 mg/L for the Fox (IL) River

Qs = 100% of the 7-Q₂ of 57 cfs

Cs = background concentration of phosphorus in the receiving water pursuant to s. NR 217.13(2)(d), Wis. Adm. Code

Qe = effluent flow rate = 1.5 MGD = 2.32 cfs

f = the fraction of effluent withdrawn from the receiving water = 0

Section NR 217.13(2)(d), Wis. Adm. Code, specifies that the background phosphorus concentration used in the limit calculation formula shall be calculated as a median using the procedures specified in s. NR 102.07(1)(b) to (c), Wis. Adm. Code. All representative data from the most recent 5 years shall be used, but data from the most recent 10 years may be used if representative of current conditions.

A previous evaluation resulted in a WQBEL of 0.10 mg/L using a background concentration of 0.132 mg/L from the Fox (IL) River at Highway ES (SWIMS Station ID: #10046937). Section NR 217.13(2)(d), Wis. Adm. Code, states that the determination of upstream concentrations shall be evaluated at each permit reissuance.

A review of all available in stream total phosphorus data from 05/24/2016 – 06/12/2024 (n=95) stored in the Surface Water Integrated Monitoring System database indicates the median background total phosphorus concentration in the Fox (IL) River at CTH ES (SWIMS station ID 10046937) is 0.11 mg/L, upstream from the point of discharge.

Substituting a background concentration above criteria into the limit calculation equation above would result in a calculated limit that is less than the applicable criterion of 0.10 mg/L. However, s. NR 217.13(7), Wis. Adm. Code, specifies that “if the WQBEL calculated pursuant to the procedures in this section is less than the phosphorus criterion specified in s. NR 102.06, Wis. Adm. Code, for the water body, the effluent limit shall be set equal to the criterion.”

Effluent Data

The following table summarizes effluent total phosphorus monitoring data from 01/04/2021 – 10/30/2025.

Total Phosphorus Effluent Data

	Concentration mg/L	Mass lbs/day
1-day P ₉₉	1.06	9.35
4-day P ₉₉	0.69	5.82
30-day P ₉₉	0.50	4.03
Mean	0.41	3.21
Std	0.20	1.78
Sample size	968	968
Range	0.07 - 2.7	0.43 - 20.18

Reasonable Potential Determination

The calculated WQBEL of 0.10 mg/L is less than the current technology-based limit of 1.0 mg/L, so the WQBEL must be included in the permit per s. NR 217.15(2), Wis. Adm. Code.

In accordance with s. NR 217.15(1), Wis. Adm. Code, there is reasonable potential for the discharge to cause or contribute to an exceedance of the water quality criteria. The data suggest that a compliance schedule will be necessary for the facility to meet the given phosphorus limits.

Limit Expression

According to s. NR 217.14(2), Wis. Adm. Code, because the calculated QBEL is less than or equal to 0.3 mg/L, the effluent limit of 0.10 mg/L may be expressed as a six-month average. If a concentration limitation expressed as a six-month average is included in the permit, a monthly average concentration limitation of 0.30 mg/L, equal to three times the QBEL calculated under s. NR 217.13, Wis. Adm. Code shall also be included in the permit. The six-month average should be averaged during the months of May – October and November – April.

Mass Limits

A mass limit is also required, pursuant to s. NR 217.14(1)(a), Wis. Adm. Code, because the discharge is to a surface water that is to or upstream of a phosphorus impaired water. **This final mass limit shall be 0.10 mg/L × 8.34 × 1.5 MGD = 1.25 lbs/day expressed as a six-month average.**

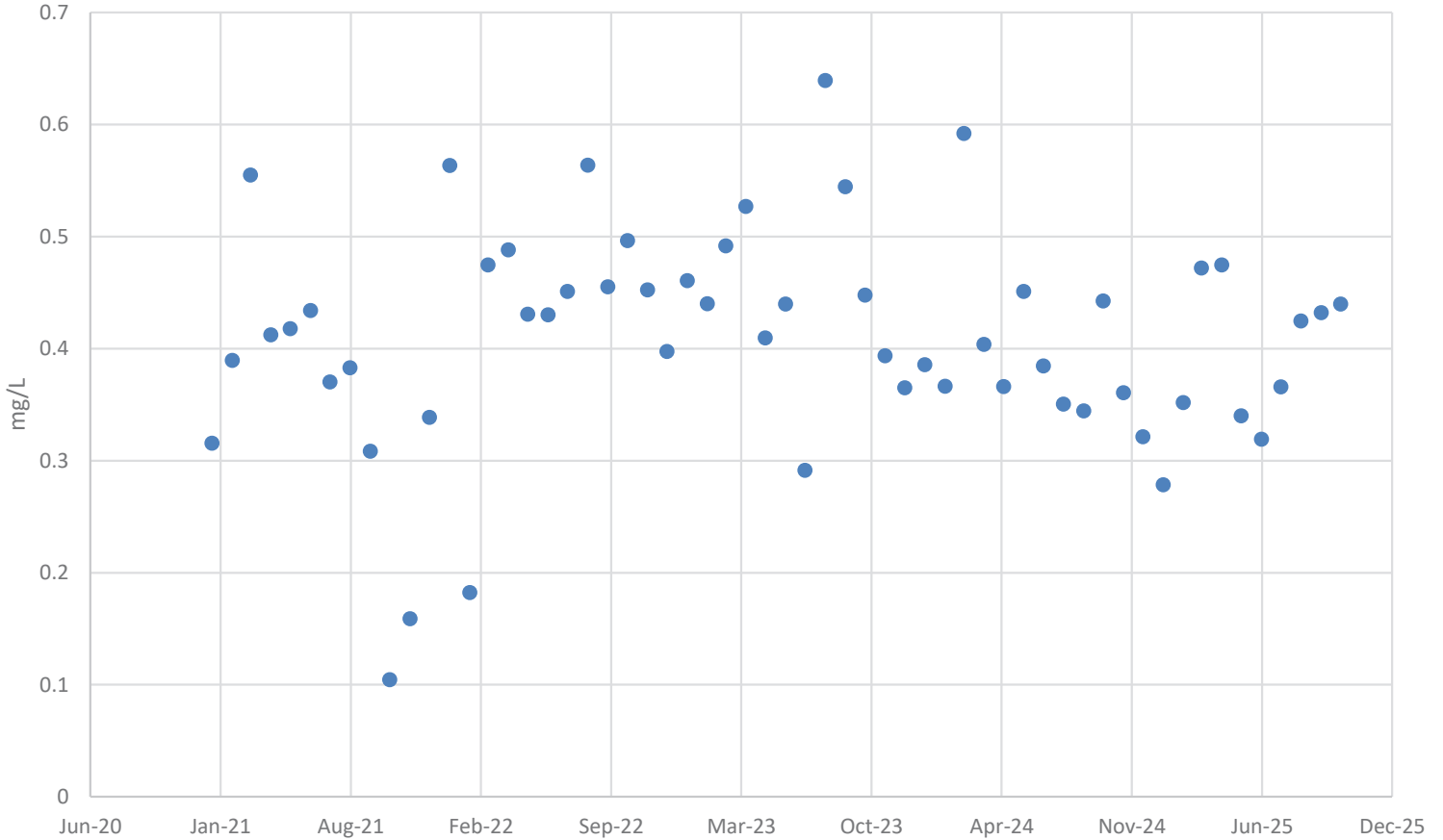
Adaptive Management Interim Limit

Mukwonago intends to pursue adaptive management (AM) to comply with the phosphorus QBELs. Since this is the second permit term in which AM is being pursued, the required interim limit is 0.5 mg/L, expressed as a 6-month average and 1.0 mg/L as a monthly average per s. NR 217.18(3)(e)3., Wis. Adm. Code.

Based on data reported from April 2024 forward, Mukwonago can meet the AM interim limit of 0.5 mg/L as a 6-month average. Therefore, no compliance schedule is recommended in the reissued permit, and the six-month average limit of 0.5 mg/L shall be effective immediately upon reissuance.

The monthly average phosphorus concentrations from the current permit term are shown below:

Monthly Average Phosphorus Concentrations



TMDL Under Development

A Total Maximum Daily Load (TMDL) is being developed for the Fox (IL) River Basin for phosphorus. The TMDL will address phosphorus water quality impairments within the basins and provide waste load allocations (WLA) required to meet water quality standards. This TMDL will likely result in phosphorus and TSS limitations that must be included in WPDES permits, which may be different than those calculated in this WQBEL memo. TMDL-derived phosphorus limits may be included in lieu of or in addition to the calculated limits upon permit reissuance or modification once the TMDL has been approved by U.S. EPA, according to s. NR 217.16, Wis. Adm. Code.

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.

In accordance with s. NR 106.53(2)(b), Wis. Adm. Code, the highest daily maximum flow rate for a calendar month is used to determine the acute (daily maximum) effluent limitation. In accordance with s. NR 106.53(2)(c), Wis. Adm. Code, the highest 7-day rolling average flow rate for a calendar month is used to determine the sub-lethal (weekly average) effluent limitation. These values were based off actual flow reported from 01/01/2021 – 10/31/2025.

The table below summarizes the maximum temperatures reported during monitoring from the previous permit term (12/01/2013 – 11/30/2019).

Monthly Temperature Effluent Data & Limits

Month	Representative Highest Monthly Effluent Temperature		Calculated Effluent Limit	
	Weekly Maximum	Daily Maximum	Weekly Average Effluent Limitation	Daily Maximum Effluent Limitation
	(°F)	(°F)	(°F)*	(°F)
JAN	55	68	113	120
FEB	50	53	114	120
MAR	51	63	103	120
APR	54	55	74	120
MAY	58	59	92	120
JUN	63	64	110	120
JUL	66	68	NA	120
AUG	68	69	NA	120
SEP	68	68	NA	120
OCT	65	67	NA	120
NOV	59	60	100	120
DEC	54	56	118	120

* NA denotes “not applicable” when the calculated weekly average limit is greater than or equal to 120 °F.

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 or monitoring are recommended for temperature.** The complete thermal table used for the limit calculation is attached.

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 LC₅₀ (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 IC₂₅ (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 22%**, 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:

$$\text{IWC (as \%)} = Q_e \div \{(1 - f) Q_e + Q_s\} \times 100$$

Where:

Q_e = annual average flow = 1.5 MGD = 2.32 cfs

f = fraction of the Q_e withdrawn from the receiving water = 0

Q_s = $\frac{1}{4}$ of the 7- Q_{10} = 33 cfs \div 4 = 8.25 cfs

- 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

Attachment #1

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 collected before July 1, 2005 is excluded in this evaluation.

WET Data History

Date Test Initiated	Acute Results LC ₅₀ %				Chronic Results IC ₂₅ %				Footnotes or Comments
	<i>C. dubia</i>	Fathead minnow	Pass or Fail?	Used in RP?	<i>C. dubia</i>	Fathead Minnow	Pass or Fail?	Use in RP?	
07/28/2005	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
05/24/2006	>100	>100	Pass	Yes					
02/01/2007	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
08/06/2008	>100	>100	Pass	No					1
01/31/2012	>100	>100	Pass	Yes					
02/12/2019	>100	>100	Pass	Yes	40.1	>100	Pass	Yes	
04/16/2019	>100	>100	Pass	Yes	61.2	>100	Pass	Yes	
06/11/2019	>100	>100	Pass	Yes	45.6	>100	Pass	Yes	
08/06/2019	>100	>100	Pass	Yes	59	68.4	Pass	Yes	
04/13/2021	>100	>100	Pass	Yes	37.9	>100	Pass	Yes	
09/13/2022	>100	>100	Pass	Yes	46.9	27.7	Pass	Yes	
10/10/2023	>100	>100	Pass	Yes	32.6	44.1	Pass	Yes	
04/16/2024	>100	>100	Pass	Yes	57.9	>100	Pass	Yes	
03/04/2025	>100	>100	Pass	Yes	62.8	>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.
- 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.**

$$\text{Acute Reasonable Potential} = [(TU_a \text{ effluent}) (B)(AMZ)]$$

$$\text{Chronic Reasonable Potential} = [(TU_c \text{ effluent}) (B)(IWC)]$$

According to s. NR 106.08(6)(d), Wis. Adm. Code, TU_a and TU_c effluent values are equal to zero whenever toxicity is not detected (i.e. when the LC₅₀, IC₂₅ or IC₅₀ ≥ 100%).

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

$$\text{Chronic Reasonable Potential} = [(TU_c \text{ effluent}) (B)(IWC)]$$

Chronic WET Limit Parameters

TU_c (maximum) 100/IC ₂₅	B (multiplication factor from s. NR 106.08(6)(c), Wis. Adm. Code, Table 4)	IWC
100/27.7 = 3.61	1.8 Based on 9 detects	22%

$$[(TU_c \text{ effluent}) (B)(IWC)] = 1.43 > 1.0$$

Therefore, reasonable potential is shown for chronic WET limits using the procedures in s. NR 106.08(6), Wis. Adm. Code, and representative data from 07/28/2005 – 03/04/2025.

Expression of WET limits

Chronic WET limit = $[100/IWC] TU_c = 4.5 TU_c$ 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>.

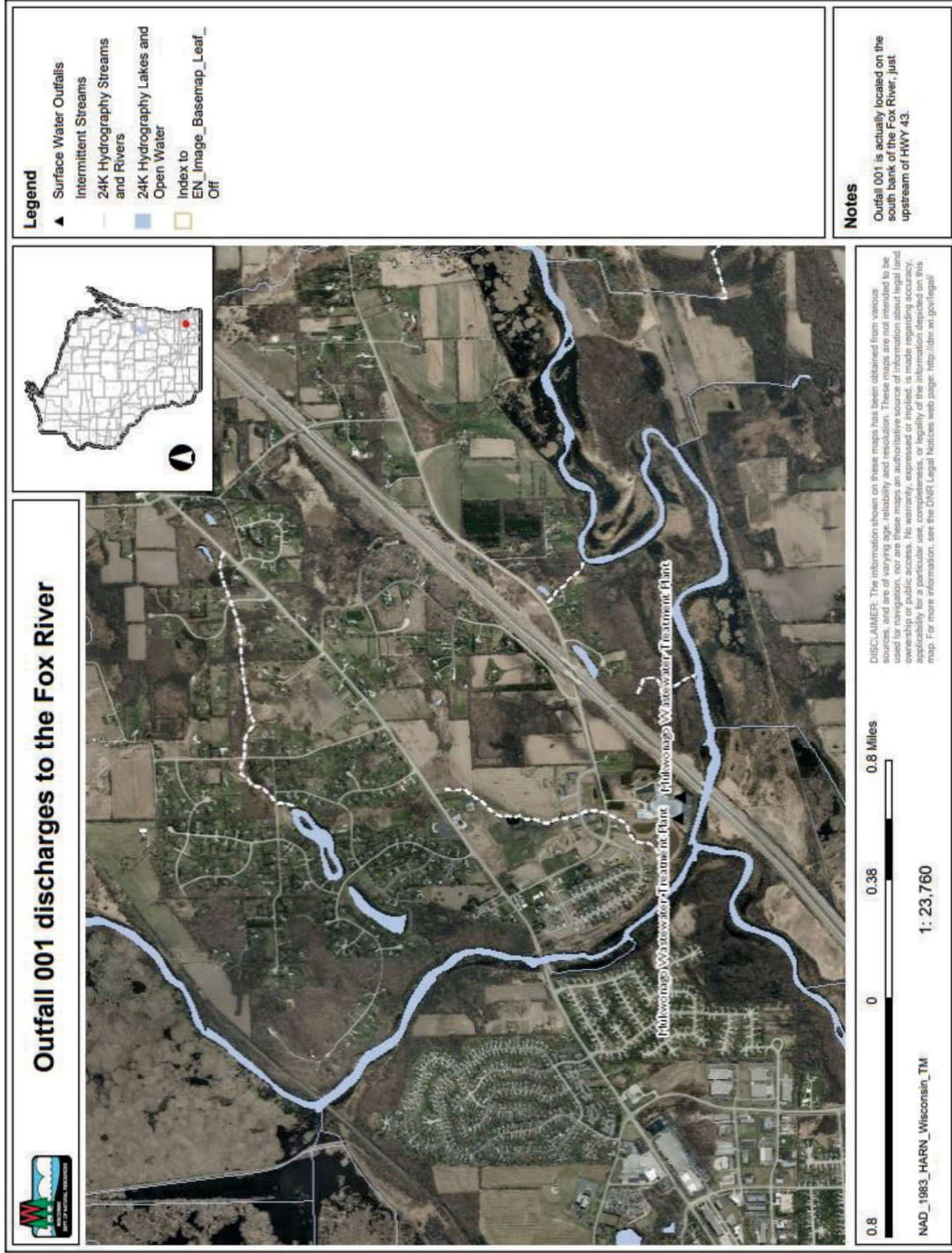
WET Checklist Summary

	Acute	Chronic
AMZ/IWC	Not Applicable. 0 Points	IWC = 22%. 0 Points
Historical Data	13 tests used to calculate RP. No tests failed. 0 Points	11 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	Warmwater sport fish 5 Points	Same as Acute. 5 Points
Chemical-Specific Data	No reasonable potential for any limits based on ATC; Ammonia nitrogen limit carried over from the current permit. Ammonia, copper, zinc, chloride, and mercury detected. Additional Compounds of Concern: None. 3 Points	No reasonable potential for limits based on CTC; Ammonia nitrogen limit carried over from the current permit. Ammonia, copper, zinc, chloride, and mercury detected. Additional Compounds of Concern: None. 3 Points

Attachment #1

	Acute	Chronic
Additives	1 Water Quality Conditioner added. Permittee has proper P chemical SOPs in place. 1 Point	The additive is used more than once per 4 days. 1 Point
Discharge Category	1 Industrial Contributor. 5 Points	Same as Acute. 5 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:	14 Points	14 Points
Recommended Monitoring Frequency (from Checklist):	1x yearly	1x yearly
Limit Required?	No	Yes Limit = 4.5 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, annual acute and chronic WET tests are recommended in the reissued permit. 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. 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 4.5 TU_c 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 Mukwonago 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.



Temperature limits for receiving waters with unidirectional flow

(calculation using default ambient temperature data)

Facility:	Mukwonago WWTF	7-Q₁₀:	33 cfs	Temp Dates	Flow Dates
Outfall(s):	001	Dilution:	25%	Start:	12/01/13
Date Prepared:	12/17/2025	f:	0	End:	11/30/19
Design Flow (Qe):	1.50 MGD	Stream type: Small warm water sport or forage fish co			
Storm Sewer Dist.	0 ft	Qs:Qe ratio:	3.6 :1		

Calculation Needed? YES

Month	Water Quality Criteria		Receiving Water Flow Rate (Qs) (cfs)	Representative Highest Effluent Flow Rate (Qe)		Representative Highest Monthly Effluent Temperature		Calculated Effluent Limit		
	Ta (default) (°F)	Sub-Lethal WQC (°F)		Acute WQC (°F)	7-day Rolling Average (Qes) (MGD)	Daily Maximum Flow Rate (Qea) (MGD)	Weekly Average (°F)	Daily Maximum (°F)	Weekly Average Effluent Limitation (°F)	Daily Maximum Effluent Limitation (°F)
JAN	33	49	33	1.331	1.410	0	55	68	113	120
FEB	34	50	33	1.329	2.420	0	50	53	114	120
MAR	38	52	33	1.474	1.880	0	51	63	103	120
APR	48	55	33	1.939	2.780	0	54	55	74	120
MAY	58	65	33	1.406	1.550	0	58	59	92	120
JUN	66	76	33	1.570	1.910	0	63	64	110	120
JUL	69	81	33	1.201	1.370	0	66	68	NA	120
AUG	67	81	33	1.131	1.470	0	68	69	NA	120
SEP	60	73	33	1.239	1.890	0	68	68	NA	120
OCT	50	61	33	0.947	1.060	0	65	67	NA	120
NOV	40	49	33	0.939	1.050	0	59	60	100	120
DEC	35	49	33	1.079	1.280	0	54	56	118	120



May 1, 2026

Tiffany Wagner, Environmental Scientist
Ruekert & Mielke, Inc.
[sent only by email]

SUBJECT: Village of Mukwonago WPDES Permit No. WI-0020265
Adaptive Management Plan - Conditional Approval

Dear Ms. Wagner,

The Wisconsin Department of Natural Resources (WDNR) has received the final copy of the Adaptive Management (AM) Plan. The plan was received on May 1, 2026, and included updates that were requested on April 7, 2026, from the original draft received in 2025. The WDNR has reviewed the AM plan and has no additional comments at this time.

Based on the WDNR's review, the AM Plan is in general conformance with the WDNR Adaptive Management Guidance and requirements contained in s. NR 217.18, Wis. Adm. Code. The plan indicates that the Village will continue to utilize AM to comply with the effluent limitations for total phosphorus for their discharge from the Village of Mukwonago Wastewater Treatment Plant, Outfall 001, to the Fox River. Actions outlined in the AM plan involve point and nonpoint phosphorus reductions throughout any of the four local HUC 12 Watersheds that fall within and upstream of the Village. For continued AM eligibility, phosphorus reductions undertaken by the Village and its partners are expected to offset 1,150 lbs/yr to the Fox River within the second permit term. This value is found in section 3.7 of the April 30, 2026, AM plan and is equal to the annual loading of total phosphorus from the WWTP between January 1, 2021, and December 31, 2024.

The WDNR conditionally approves the AM Plan as a basis for phosphorus compliance during the next WPDES permit term. The WDNR has assigned the AM plan a tracking number of AM-2026-02 and will be referenced as such in the draft WPDES permit. The draft permit will contain an interim limit for phosphorus and reporting requirements consistent with s. NR 217.18, Wis. Adm. Code. The AM plan will be included as part of the public notice package for permit reissuance, and final approval is subject to public comment and EPA review.

The WDNR appreciates the Village's continued interest in watershed-based phosphorus compliance. If you have any questions or comments, please contact me at (414) 897-5723 or nicholas.lent@wisconsin.gov.

Thank you,

Nick Lent
Wastewater Engineer

cc: Wayne Castle, V. Mukwonago
Dave Arnott, R/M
Matt Claucherty, WDNR
Marissa Fleege, WDNR
Justin Meyers, WDNR