Permit Fact Sheet

General Information

Permit Number	WI-0029831-10-0
Permittee Name and Address	Village of Yorkville 925 15th Ave Union Grove WI 53182-0015
Permitted Facility Name and Address	Yorkville Sewer Utility District No 1 14100 Washington Avenue, Sturtevant, WI 53177
Permit Term	August 01, 2025 to July 31, 2030
Discharge Location	Discharge is conveyed east of I-94 and daylighted to Ives Grove Ditch approximately 1.34 miles east-northeast of treatment plant (42.73608° N, 87.93451° W)
Receiving Water	Ives Grove Creek, a tributary to Hoods Creek in Root River of Root River in Racine County
Stream Flow ($Q_{7,10}$)	0 cfs
Stream Classification	Limited aquatic life (LAL) Community
Discharge Type	existing, continuous
Annual Average Design Flow (MGD)	0.236 MGD
Industrial or Commercial Contributors	None
Plant Classification	A1 - Suspended Growth Processes; B - Solids Separation; C - Biological Solids/Sludges; P - Total Phosphorus; L - Laboratory; SS - Sanitary Sewage Collection System
Approved Pretreatment Program?	N/A

Facility Description

The Village of Yorkville completed a facility update in 2022 and currently operates a 0.236 million gallon per day (MGD) annual average design flow wastewater treatment facility (WWTF) servicing an approximate population of 1,000, including residents and non-residents. There are no significant industrial users in the service area. The WWTF operates a sequencing batch reactor (SBR) facility consisting of an influent pump station, fine screening, grit removal, and two SBR tanks run in parallel. Aqua Hawk RE2 may be dosed to the SBRs for chemical phosphorus removal. Secondary effluent flows to a post-EQ aeration tank and discharges to Ives Grove Ditch to Hoods Creek (Root River Watershed, Racine County). Waste activated sludge is pumped to an aerobic holding tank before being hauled offsite for disposal by another permitted facility.

Substantial Compliance Determination

Enforcement During Last Permit:

The Department issued the permittee a notice of noncompliance (NON) on September 29, 2020 for effluent exceedance for chloride. Additionally, the Department issued a NON on December 15, 2022 for a sewage treatment facility overflow. Yorkville has completed all previously required actions as part of the enforcement process.

After a desk top review of all discharge monitoring reports, CMARs, compliance schedule items, a site visit on August 1, 2023, by DNR wastewater engineer, Jacob Van Susteren-Wedesky and a desktop review on February 12, 2025 of all compliance schedule reports, CMARs, and monitoring data, this facility has been found to be in substantial compliance with their current permit.

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	NA	INFLUENT: Composite samples shall be collected from influent channel after 1/4" bar screen.
001	0.088 MGD (October 2019 – October 2024)	EFFLUENT: 24-hr flow proportional composite samples shall be collected from the aerated effluent EQ tank.
003	600,000 gal/year 25 dry US Tons/year	SLUDGE: Class B, Aerobically digested liquid sludge. Representative composite samples shall be collected prior to hauling at the aerobic digester.

Permit Requirements

1 Influent – Monitoring Requirements

1.1 Sample Point Number: 701- INFLUENT TO 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	Composite	
Suspended Solids, Total		mg/L	3/Week	Composite	

1.1.1 Changes from Previous Permit:

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

Addition of flow rate to accurately represent the facility.

1.1.2 Explanation of Limits and Monitoring Requirements

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

2 Surface Water - Monitoring and Limitations

2.1 Sample Point Number: 001- EFFLUENT

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Continuous	
BOD5, Total	Weekly Avg	30 mg/L	3/Week	24-Hr Flow Prop Comp	
BOD5, Total	Monthly Avg	20 mg/L	3/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total	Weekly Avg	30 mg/L	3/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total	Monthly Avg	20 mg/L	3/Week	24-Hr Flow Prop Comp	
pH Field	Daily Min	6.0 su	Daily	Grab	
pH Field	Daily Max	9.0 su	Daily	Grab	
Dissolved Oxygen	Daily Min	4.0 mg/L	5/Week	Grab	
E. coli	Geometric Mean - Monthly	126 #/100 ml	Weekly	Grab	Monitoring and limit effective year-round per the Effluent Limitations for E. coli Schedule.
E. coli	% Exceedance	10 Percent	Monthly	Calculated	Monitoring and limit effective year-round per the Effluent Limitations for E. coli Schedule. See the E. coli Percent Limit section below. Enter the result in the DMR on the last day of the month.
Nitrogen, Ammonia Variable Limit		mg/L	2/Week	Calculated	Report the calculated variable ammonia limit on the DMR year-round. See 'Daily Maximum Ammonia Limits' permit section.
Nitrogen, Ammonia (NH3-N) Total	Daily Max - Variable	mg/L	2/Week	24-Hr Flow Prop Comp	Report Ammonia effluent value on the DMR year-round.

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	5.1 mg/L	2/Week	24-Hr Flow Prop Comp	Limit effective in May - October.
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	21 mg/L	2/Week	24-Hr Flow Prop Comp	Limit effective in November - March.
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	15 mg/L	2/Week	24-Hr Flow Prop Comp	Limit effective in April.
Nitrogen, Ammonia (NH3-N) Total	Monthly Avg	2.2 mg/L	2/Week	24-Hr Flow Prop Comp	Limit effective in May - October.
Nitrogen, Ammonia (NH3-N) Total	Monthly Avg	9.4 mg/L	2/Week	24-Hr Flow Prop Comp	Limit effective in November - March.
Nitrogen, Ammonia (NH3-N) Total	Monthly Avg	7.7 mg/L	2/Week	24-Hr Flow Prop Comp	Limit effective in April.
Phosphorus, Total	Monthly Avg	0.8 mg/L	3/Week	24-Hr Comp	Limit effective through June 30, 2027.
Phosphorus, Total	Monthly Avg	0.6 mg/L	3/Week	24-Hr Comp	Limit effective on July 1, 2027.
Phosphorus, Total		lbs/month	Monthly	Calculated	Report the total monthly phosphorus discharged in lbs/month on the last day of the month on the DMR. See Standard Requirements in the permit for 'Appropriate Formulas' to calculate the Total Monthly Discharge in lbs/month.
Phosphorus, Total		lbs/yr	Annual	Calculated	Report the sum of the total monthly discharges (for the months that the MDV is in effect) for the calendar year on the Annual report form.
Chloride	Daily Max	780 mg/L	4/Month	24-Hr Flow Prop Comp	This is an interim limit effective in May - November. Sampling shall be conducted on four consecutive days each month. See Chloride Variance permit sections.
Chloride	Daily Max	960 mg/L	4/Month	24-Hr Flow Prop Comp	This is an interim limit effective in December - April. Sampling shall be conducted on four

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
					consecutive days each month. See Chloride Variance permit sections.
Chloride	Weekly Avg	450 mg/L	4/Month	24-Hr Flow Prop Comp	This is an interim limit effective in May - November. Sampling shall be conducted on four consecutive days each month. See Chloride Variance permit sections.
Chloride	Weekly Avg	710 mg/L	4/Month	24-Hr Flow Prop Comp	This is an interim limit effective in December - April. Sampling shall be conducted on four consecutive days each month. See Chloride Variance permit sections.
Chloride		lbs/day	4/Month	Calculated	Chloride Mass = daily concentration (mg/L) x daily flow (MGD) x 8.34
Nitrogen, Total Kjeldahl		mg/L	See Listed Qtr(s)	24-Hr Flow Prop Comp	Annual in rotating quarters. See 'Nitrogen Series Monitoring' permit section.
Nitrogen, Nitrite + Nitrate Total		mg/L	See Listed Qtr(s)	24-Hr Flow Prop Comp	Annual in rotating quarters. See 'Nitrogen Series Monitoring' permit section.
Nitrogen, Total		mg/L	See Listed Qtr(s)	Calculated	Total Nitrogen shall be calculated as the sum of reported values for Total Kjeldahl Nitrogen and Total Nitrite + Nitrate Nitrogen.
Chronic WET		TUc	See Listed Qtr(s)	24-Hr Flow Prop Comp	Three Chronic WET tests during permit term. See Whole Effluent Toxicity (WET) Testing permit 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. See additional explanation of limits under “Explanation of Limits and Monitoring Requirements” below.

- **Disinfection & E. coli:** At the end of the compliance schedule, disinfection requirements and E. coli limits of 126 #/100 ml as a monthly geometric mean that may not be exceeded and 410 #/100 ml as a daily maximum that may not be exceeded more than 10 percent of the time in any calendar month will apply. Monitoring is not required until the limit becomes effective at the end of the compliance schedule.
- **Ammonia**: Updated the weekly average limits.
- **Phosphorus**: The permittee has applied for a multi-discharger variance (MDV) for phosphorus for this permit term and the application has been approved by the Department. An MDV interim limit of 0.6 mg/L has been added that goes into effect per a compliance schedule. The permittee is now required to report the total amount of phosphorus discharged in lbs/month and lbs/year. By March 1 of each year the permittee shall make a payment(s) to participating county(s) of $66.62 per pound of phosphorus discharged during the previous year in excess of the target value of 0.2 mg/L.
- **Chloride**: Updated interim daily maximum limits from 1400 mg/L to 780 mg/L (May to November) and 960 mg/L (December to April).
- **Zinc**: removed monitoring for zinc since the data is significantly less than the calculated limits.
- **Total Nitrogen Monitoring:** Annual monitoring is required in specific quarters as outlined in the permit.
- **WET testing:** removed Acute WET testing and Chronic WET test reduced to three times during the permit term.

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 **December 20, 2024**.

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.

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 limits whenever practicable.

Phosphorus: Phosphorus rules became effective December 1, 2010 per NR 217, Wis. Adm. Code, that required the permittee to comply with water quality based effluent limits (WQBELs) for total phosphorous. The final phosphorus WQBELs are 0.225 mg/L as a monthly average and 0.075 mg/L and 0.15 lbs/day as six-month averages were to become effective as scheduled unless a variance was granted. For this permit term, the permittee has applied for the Multi-Discharger Variance (MDV) for phosphorus as provided for in s. 283.16, Wis. Stats., and approved by USEPA on February 6, 2017 for a 10-year duration. The permittee qualifies for the MDV because it is an existing source and a major facility upgrade is needed to comply with the applicable phosphorus WQBELs, thereby creating a financial burden. The interim effluent limit for total phosphorus is 0.6 mg/L as an average monthly limit. The limit was derived using DMR data from July 1, 2022 to October 31, 2024.

Conditions of the MDV require the permittee to optimize phosphorus removal throughout the proposed permit term, comply with interim limits and make annual payments to participating county(s) by March 1 of each year based on the pounds of phosphorus discharged during the previous year in excess of the specified target value. A reopener clause is included in the permit to address the current MDV's expiration date, as a permit action may be required to update or remove variance provisions if the MDV is altered or unavailable after February 6, 2027.

The "price per pound" value is $50.00 adjusted for CPI annually during the first quarter as defined by s. 283.16(8)(a)2, Wis. Stats and takes effect for reissued permits with effective dates starting April 1. This may differ from the "price per

pound" that is public noticed; however, the "price per pound" is set upon reissuance and is applicable for the entire permit term. The participating county(s) uses these payments to implement non-point source phosphorus control strategies at the watershed level.

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

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

It was determined that the permittee is required to disinfect year-round. See WQBEL for further explanation. Chlorine limits listed in the WQBEL would apply if Yorkville decides to use the chlorination for disinfection.

Chloride: The permittee has re-applied for a variance from the chronic chloride water quality criterion, which requires EPA approval. Interim limits of 710 mg/L (December- April) and 450 mg/L (May-November) as weekly averages and 960 mg/L (December- April) and 780 mg/L (May-November) as daily maximums are included. As a condition of this variance target values of 640 mg/L (December-April) and 400 mg/L (May-November) as weekly averages and the implementation of chloride source reduction measures, intended to lead to compliance with the target value by the end of the permit term, are also included in the proposed permit. See the schedules section for the chloride compliance schedule. Acute and chronic chloride toxicity criteria for the protection of aquatic life are included in Tables 1 and 5 of ch. NR 105, Wis. Adm. Code; Subchapter IV of ch. NR 106 establishes the procedure for calculating water quality-based effluent limitations (WQBELs) for chloride.

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	Liquid	No Land Application			25
Does sludge management demonstrate compliance? Yes						
Is additional sludge storage required? Yes						
Is Radium-226 present in the water supply at a level greater than 2 pCi/liter? No.						
Is a priority pollutant scan required? No.						

3.1 Sample Point Number: 003- Liquid 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	

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
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	
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	
PCB Total Dry Wt	Ceiling	50 mg/kg	Once	Composite	Once in 2028.
PCB Total Dry Wt	High Quality	10 mg/kg	Once	Composite	Once in 2028.
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.

3.1.1 Changes from Previous Permit:

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

PCBs: added PCBs per s. NR 204.

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

3.1.2 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).

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 a draft risk assessment was released in early 2025. 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 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 Disinfection and Effluent Limitations for E. coli

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

Required Action	Due Date
Progress Report: The permittee shall submit a progress report on development and submittal of a facility plan for upgrades to meet disinfection requirements and E. coli limits.	12/31/2025
Submit Facility Plan: The permittee shall submit a Facility Plan per s. NR 110.09, Wis. Adm. Code for meeting disinfection requirements and complying with E. coli surface water limitations. The permittee may submit an abbreviated facility plan if the Department determines that the modifications are minor.	06/30/2026
Final Plans and Specifications: The permittee shall submit final construction plans to the Department for approval pursuant to ch. NR 108, Wis. Adm. Code, specifying treatment plant upgrades that must be constructed to meet disinfection requirements per s. NR 210.06(1), Wis. Adm Code, achieve compliance with final E. coli limitations, and a schedule for completing construction of the upgrades by the complete construction date specified below.	06/30/2027
Treatment Plant Upgrade to Meet Limitations: The permittee shall initiate bidding, procurement, and/or construction of the project. The permittee shall obtain approval of the final construction plans and schedule from the Department pursuant to s. 281.41. Stats., prior to initiating activities defined as construction under ch. NR 108, Wis. Adm. Code. Upon approval of the final construction plans and schedule by the Department pursuant to s. 281.41, Stats., the permittee shall construct the treatment plant upgrades in accordance with the approved plans and specifications.	12/31/2027
Construction Upgrade Progress Report: The permittee shall submit a progress report on construction upgrades.	12/31/2028
Complete Construction: The permittee shall complete construction of wastewater treatment system upgrades.	06/30/2029
Achieve Compliance: The permittee shall achieve compliance with final E. coli limitations.	07/31/2029

4.1.1 Explanation of Schedule

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

4.2 Phosphorus Schedule - Continued Optimization

The permittee is required to optimize performance to control phosphorus discharges per the following schedule.

Required Action	Due Date
Optimization: The permittee shall continue to implement the optimization plan as previously approved to optimize performance to control phosphorus discharges. Submit a progress report on optimizing removal of phosphorus by the Due Date.	06/30/2026
Progress Report #2: Submit a progress report on optimizing removal of phosphorus.	06/30/2027
Progress Report #3: Submit a progress report on optimizing removal of phosphorus.	06/30/2028
Progress Report #4: Submit a progress report on optimizing removal of phosphorus.	06/30/2029
Progress Report #5: Submit a progress report on optimizing removal of phosphorus.	06/30/2030

4.2.1 Explanation of Schedule

Per s. 283.16(6)(a), Wis. Stats. the Department may include a requirement that the permittee optimize the performance of a point source in controlling phosphorus discharges, which may be necessary to achieve compliance with multi-discharger variance interim limits. This compliance schedule requires the permittee to continue to implement the optimization plan that was approved during the previous permit term.

4.3 Phosphorus Payment per Pound to County

The permittee is required to make annual payments for phosphorus reductions to the participating county or counties in accordance with s. 283.16(8), Wis. Stats, and the following schedule. The price per pound will be set at the time of permit reissuance and will apply for the duration of the permit.

Required Action	Due Date
Annual Verification of Phosphorus Payment to County: The permittee shall make a total payment to the participating county or counties approved by the Department by March 1 of each calendar year. The amount due is equal to the following: [(lbs of phosphorus discharged minus the permittee's target value) times $66.62 or $640,000, whichever is less. See the payment calculation steps in the Surface Water section. The permittee shall submit Form 3200-151 to the Department by March 1 of each calendar year indicating total amount remitted to the participating counties to verify that the correct payment was made. The first payment verification form is due by the specified Due Date. Note: The applicable Target Value is 0.2 mg/L as defined by s. 283.16(1)(h), Wis. Stats. The "per pound" value is $50.00 adjusted for CPI.	03/01/2026
Annual Verification of Payment #2: Submit Form 3200-151 to the Department indicating total amount remitted to the participating counties.	03/01/2027
Annual Verification of Payment #3: Submit Form 3200-151 to the Department indicating total	03/01/2028

amount remitted to the participating counties.	
Annual Verification of Payment #4: Submit Form 3200-151 to the Department indicating total amount remitted to the participating counties.	03/01/2029
Annual Verification of Payment #5: Submit Form 3200-151 to the Department indicating total amount remitted to the participating counties.	03/01/2030
Continued Coverage: If the permittee intends to seek a renewed variance, an application for the MDV (Multi Discharger Variance) shall be submitted as part of the application for permit reissuance in accordance with s. 283.16(4)(b), Wis. Stats.	
Annual Verification of Payment After Permit Expiration: In the event that this permit is not reissued prior to the expiration date, the permittee shall continue to submit Form 3200-151 to the Department indicating total amount remitted to the participating counties by March 1 each year.	

4.3.1 Explanation of Schedule

Subsection 283.16(6)(b), Wis. Stats., requires permittees that have received approval for the multi-discharger variance (MDV) to implement a watershed project that is designed to reduce non-point sources of phosphorus within the HUC 8 watershed in which the permittee is located. The permittee has selected the "Payment to Counties" watershed option described in s. 283.16(8), Wis. Stats. Under this option the permittee shall make annual payment(s) to participating county(s) that are calculated based on the amount of phosphorus actually discharged during a calendar year in pounds per year less the amount of phosphorus that would have been discharged had the permittee discharged phosphorus at a target value concentration of 0.2 mg/L. The pounds of phosphorus discharged in excess of the target value is multiplied by a per pound phosphorus charge that will equal $66.62 per pound. This schedule requires the permittee to submit Form 3200-151 to the Department indicating the total amount remitted to the participating county(s).

4.4 Chloride Source Reduction Measures (Target Value)

As a condition of the variance to the water quality based effluent limitation(s) for chloride granted in accordance with s. NR 106.83(2), Wis. Adm. Code, the permittee shall perform the following actions.

Required Action	Due Date
Annual Chloride Progress Report: Submit an annual chloride progress report related to the source reduction activities for the previous year. The annual chloride progress report shall: Indicate which chloride source reduction measures or activities in the Source Reduction Plan have been implemented and state which, if any, source reduction measures from the Source Reduction Plan were not pursued and why. Include an assessment of whether each implemented source reduction measure appears to be effective or ineffective at reducing pollutant discharge concentrations and identify actions planned for the upcoming year; Include an analysis of trends in weekly, monthly and annual average chloride concentrations and total mass discharge of chloride based on chloride sampling and flow data; and Include an analysis of how effluent chloride varies with time and with significant loadings of chloride. Note that the interim limitation listed in the Surface Water section of this permit remains enforceable until new enforceable limits are established in the next permit issuance. The first annual chloride progress report is to be submitted by the Date Due.	01/31/2026
Annual Chloride Progress Report #2: Submit the chloride progress report, related to the source reduction activities for the previous year, as defined above.	01/31/2027

Annual Chloride Progress Report #3: Submit the chloride progress report, related to the source reduction activities for the previous year, as defined above.	01/31/2028
Annual Chloride Progress Report #4: Submit the chloride progress report, related to the source reduction activities for the previous year, as defined above.	01/31/2029
Final Chloride Report: Submit the final chloride report documenting the success in meeting the chloride target values of 400 mg/L (May to November) as a weekly average and 640 mg/L (December to April) as a weekly average, as well as the anticipated future reduction in chloride sources and chloride effluent concentrations. The report shall: Summarize chloride source reduction measures that have been implemented during the current permit term and state which, if any, source reduction measures from the Source Reduction Plan were not pursued and why; Include an assessment of which source reduction measures appear to have been effective or ineffective. Evaluate any needed changes to the pollutant reduction strategy accordingly; Include an analysis of trends in weekly, monthly and annual average chloride concentrations and total mass discharge of chloride based on chloride sampling and flow data during the current permit term; and Include an analysis of how influent and effluent chloride varies with time and with significant loadings of chloride as identified in the source reduction plan. If the permittee intends to reapply for a chloride variance, for the reissued permit, proposed target limits and a detailed source reduction measures plan, outlining the source reduction activities proposed for the upcoming permit term, shall also be included per ss. NR 106.90 (5) and NR 106.83 (4), Wis. Adm. Code. An updated source reduction measures plan shall: Include an explanation of why or how each source reduction measure will result in reduced discharge of the target pollutant; and Evaluate any available information on pollutant sources, timing, and concentration to update the mass balance assumptions and expected sources of the pollutant, and Identify any information needs that would help to better determine pollutant sources and make plans to collect that information. Note that the target value is the benchmark for evaluating the effectiveness of the chloride source reduction measures but is not an enforceable limitation under the terms of this permit.	12/31/2029
Annual Chloride Reports After Permit Expiration: In the event that this permit is not reissued by the date the permit expires the permittee shall continue to submit annual chloride reports for the previous year following the due date of Annual Chloride Progress Reports listed above. Annual Chloride Progress Reports shall include the information as defined above.	

4.4.1 Explanation of Schedule

This compliance schedule is a condition of receiving a variance from the acute water quality-based chloride limit of 760 mg/L and chronic water quality based chloride limit of 400 mg/L. The schedule requires that annual reports shall indicate which source reduction measures Yorkville has implemented during each calendar year to meet the target values of 400 mg/L, May -November, and 640 mg/L, December-April, and an analysis of chloride concentration and mass discharge data based on chloride sampling and flow data. The annual reports shall document progress made towards meeting the chloride target values by the end of the permit term.

4.5 Phosphorus Multi-Discharger Variance Interim Limit (0.6 mg/L)

This compliance schedule requires the permittee to achieve compliance with the specified MDV interim effluent limit in accordance with s. 283.16(6), Wis. Stats., by the due date.

Required Action	Due Date
Report on Effluent Discharges: Submit a report on effluent discharges of phosphorus with conclusions regarding compliance.	12/31/2025
Action Plan: Submit an action plan for complying with the specified interim effluent limit. If construction is required, include plans and specifications with the submittal.	06/30/2026
Initiate Actions: Initiate actions identified in the plan.	12/31/2026
Complete Actions: Complete actions identified in the plan and achieve compliance with the specified interim effluent limit.	06/30/2027

4.5.1 Explanation of Schedule

Subsection 283.16(6), Wis. Stats., establishes required interim phosphorus effluent limits that must be met for multi-discharger variance (MDV) eligibility. The schedule above provides the permittee with two years to comply with that limit.

Other Comments

NA

Attachments

Water Quality-Based Effluent Limitations for Yorkville Sewer Utility District No. 1 WPDES Permit No. WI-0029831-10, by Nicole Krueger, Water Resources Engineer, dated December 20, 2024; updated February 13, 2025

EPA Data Sheet

SRM dated March 21, 2025

MDV Evaluation Checklist

MDV Conditional Approval

Justification Of Any Waivers From Permit Application Requirements

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

Prepared By: Victoria Ziegler Wastewater Specialist Date: March 24, 2025

CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: 12/20/2024

TO: Victoria Ziegler – SER

FROM: Nicole Krueger – SER Nicole Krueger

SUBJECT: Water Quality-Based Effluent Limitations for Yorkville Sewer Utility District No. 1
WPDES Permit No. WI-0029831-10

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 Yorkville Sewer Utility District No. 1 in Racine County. This municipal wastewater treatment facility (WWTF) discharges to Ives Creek, located in the Root River Watershed in the Fox (IL) River 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
Flow Rate						1,2
BOD_5			30 mg/L	20 mg/L		1
TSS			30 mg/L	20 mg/L		1,3
pH	9.0 s.u.	6.0 s.u.				1
Dissolved Oxygen		4.0 mg/L				1
Bacteria						4
E. coli				126 #/100 mL geometric mean		
Chlorine	19 µg/L		7.3 µg/L	**7.3 µg/L**		5,6
Ammonia Nitrogen						7
October	Variable		5.1 mg/L	2.2 mg/L		
November – March	Variable		20 mg/L	9.4 mg/L		
April	Variable		14 mg/L	7.2 mg/L		
May – September	Variable		5.1 mg/L	2.2 mg/L		
Phosphorus						3,8
LCA Interim Limit				0.8 mg/L		
HAC Interim Limit				0.6 mg/L		
Final WQBEL				0.225 mg/L	0.075 mg/L 0.16 lbs/day	
Chloride						9
May – November	780 mg/L		450 mg/L			
December – April	960 mg/L		710 mg/L			
TKN, Nitrate+Nitrite, and Total Nitrogen						10
Chronic WET						11,12

Footnotes:

1. No changes from the current permit.
2. Monitoring only.

3. A Total Maximum Daily Load (TMDL) is being developed for the Fox (IL) River Basin to address TSS and phosphorus water quality impairments within the TMDL area. This TMDL will likely result in limitations for TSS and phosphorus 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.
4. Bacteria limits apply year-round. Additional limit: No more than 10 percent of *E. coli* bacteria samples collected in any calendar month may exceed 410 count/100 mL. A compliance schedule is recommended in the reissued permit.
5. Chlorine limits would only be required should Yorkville decide to use chlorination for disinfection.
6. Additional limits to comply with the expression of limits requirements in ss. NR 106.07 and NR 205.065(7), Wis. Adm. Codes, are included in bold.
7. The variable daily maximum ammonia nitrogen limit table corresponding to various effluent pH values may be included in the permit in place of the single limit. These limits apply year-round.

Effluent pH s.u.	**Limit mg/L**	**Effluent pH s.u.**	**Limit mg/L**	**Effluent pH s.u.**	**Limit mg/L**
$6.0 \leq pH \leq 6.1$	54	$7.0 < pH \leq 7.1$	33	$8.0 < pH \leq 8.1$	6.9
$6.1 < pH \leq 6.2$	53	$7.1 < pH \leq 7.2$	30	$8.1 < pH \leq 8.2$	5.7
$6.2 < pH \leq 6.3$	52	$7.2 < pH \leq 7.3$	26	$8.2 < pH \leq 8.3$	4.7
$6.3 < pH \leq 6.4$	51	$7.3 < pH \leq 7.4$	23	$8.3 < pH \leq 8.4$	3.9
$6.4 < pH \leq 6.5$	49	$7.4 < pH \leq 7.5$	20	$8.4 < pH \leq 8.5$	3.2
$6.5 < pH \leq 6.6$	47	$7.5 < pH \leq 7.6$	17	$8.5 < pH \leq 8.6$	2.7
$6.6 < pH \leq 6.7$	45	$7.6 < pH \leq 7.7$	14	$8.6 < pH \leq 8.7$	2.2
$6.7 < pH \leq 6.8$	42	$7.7 < pH \leq 7.8$	12	$8.7 < pH \leq 8.8$	1.8
$6.8 < pH \leq 6.9$	39	$7.8 < pH \leq 7.9$	10	$8.8 < pH \leq 8.9$	1.6
$6.9 < pH \leq 7.0$	36	$7.9 < pH \leq 8.0$	8.4	$8.9 < pH \leq 9.0$	1.3

8. Under the phosphorus MDV, a level currently achievable (LCA) interim limit of 0.8 mg/L should be effective upon permit reissuance. A compliance schedule may be included in the permit until the highest attainable condition (HAC) limit of 0.6 mg/L can be met. The final WQBELs remain at 0.225 mg/L as a monthly average and 0.075 mg/L as a six-month average, as well as the respective mass limit of 0.16 lbs/day.
9. These are variance interim limits for the WQBELs for chloride. If the variance is not approved, the WQBELs of 760 mg/L as a daily maximum, 400 mg/L and 860 lbs/day as a weekly average, and an alternative wet weather mass limit.
10. As recommended in the Department's October 1, 2019 Guidance for Total Nitrogen Monitoring in Wastewater Permits, annual total nitrogen monitoring is recommended for all minor municipal permittees. Total Nitrogen is the sum of nitrate (NO_3), nitrite (NO_2), and total kjeldahl nitrogen (TKN) (all expressed as N).
11. Chronic WET testing is recommended 3/permit term. The Instream Waste Concentration (IWC) to assess chronic test results is 100%. 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%, 75%, 50%, 25% & 12.5% and the dilution water used in WET tests conducted on Outfall 001 shall be a grab sample collected from the receiving water or from laboratory control water.
12. 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).

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 (2) – Narrative & Outfall Map

PREPARED BY: Nicole Krueger, Water Resources Engineer – SER

E-cc: Jacob Van Susteren-Wedesky, Wastewater Engineer – SER
Bryan Hartsook, 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
Yorkville Sewer Utility District No. 1

WPDES Permit No. WI-0029831-10

Prepared by: Nicole Krueger

PART 1 – BACKGROUND INFORMATION

Facility Description

The Yorkville Sewer Utility District currently operates a 0.26 million gallon per day (MGD) annual average design flow wastewater treatment facility (WWTF). There are no significant industrial users in the service area. The WWTF was upgraded in August 2022 and includes an activated sludge treatment process consisting of one influent pump station, a fine bar screen, grit removal, two sequencing batch reactors, and post aeration. An aerobic digester is used to treat biosolids. Aqua Hawk RE2 is added for phosphorus removal as needed.

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

Existing Permit Limitations

The current permit, which expired on September 30, 2024, includes the following effluent limitations and monitoring requirements.

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Flow Rate						1
BOD_5			30 mg/L	20 mg/L		2,3
TSS			30 mg/L	20 mg/L		2,3
pH	9.0 s.u.	6.0 s.u.				2
Dissolved Oxygen		4.0 mg/L				2
Ammonia Nitrogen May – October November – April	 Variable Variable		 5.1 mg/L 29 mg/L	 2.2 mg/L 12.4 mg/L		4
Phosphorus				0.8 mg/L		5
Chloride May – November December – April	 1,400 mg/L 1,400 mg/L		 450 mg/L 710 mg/L			6
Zinc, Total Recoverable						1
Acute WET						7
Chronic WET						7

Footnotes:

1. Monitoring only.
2. 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.

3. These limits are based on the Limited Aquatic Life (LAL) community of the immediate receiving water as described in s. NR 104.02(3)(b), Wis. Adm. Code.
4. The variable daily maximum ammonia nitrogen limit table corresponding to various effluent pH is included and the limits apply year-round.

Effluent pH (s.u.)	NH_3-N Limit (mg/L)	Effluent pH (s.u.)	NH_3-N Limit (mg/L)	Effluent pH (s.u.)	NH_3-N Limit (mg/L)
$6.0 < pH \leq 6.1$	55	$7.0 < pH \leq 7.1$	36	$8.0 < pH \leq 8.1$	8.4
$6.1 < pH \leq 6.2$	54	$7.1 < pH \leq 7.2$	33	$8.1 < pH \leq 8.2$	6.9
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$6.8 < pH \leq 6.9$	42	$7.8 < pH \leq 7.9$	12	$8.8 < pH \leq 8.9$	1.8
$6.9 < pH \leq 7.0$	39	$7.9 < pH \leq 8.0$	10	$8.9 < pH \leq 9.0$	1.6

5. This is an interim MDV limit which became effective on July 1, 2022. The final WQBELs are 0.225 mg/L as a monthly average and 0.075 mg/L as a six-month average.
6. These are variance interim limits to the daily maximum and weekly average WQBELs of 760 mg/L and 400 mg/L, respectively.
7. Annual acute and chronic WET tests are required in the current permit. The IWC for chronic WET was 100%.

Receiving Water Information

- Name: Ives Grove Creek, a tributary to Hoods Creek
- Waterbody Identification Code (WBIC): 3300
- Classification used in accordance with chs. NR 102 and 104, Wis. Adm. Code: The receiving water is listed in ch. NR 104, Wis. Adm. Code as a limited aquatic life (LAL) community from the outfall to Hoods Creek (approximately 1.1 miles downstream of the outfall). At this location, the classification changes to a limited forage fish (LFF) community downstream to the Root River, approximately 8 miles from the outfall location.
- Low flows used in accordance with chs. NR 106 and 217, Wis. Adm. Code: The following 7-Q_{10} and 7-Q_2 values are from estimates from USGS, where Outfall 001 is located and at the LFF classification, approximately 1.1 miles downstream.

  7-Q_{10} = 0 cfs (cubic feet per second)
  7-Q_2 = 0 cfs
  Low flows of the Root River at Caledonia, approximately 8 miles downstream of the outfall, where the classification changes to warmwater sport fishery:
  7-Q_{10} = 2.4 cfs
  7-Q_2 = 4.2 cfs
- Hardness = 153 mg/L as $CaCO_3$. This value represents the geometric mean of data from chronic WET testing from 10/04/2016 – 07/14/2020.
- % of low flow used to calculate limits in accordance with s. NR 106.06(4)(c)5., Wis. Adm. Code: Not applicable where the receiving water low flows are zero.
- Source of background concentration data: Background concentrations are not included because they don't impact the calculated WQBEL when the receiving water low flows are equal to zero.

- Multiple dischargers: None
- Impaired water status: The immediate receiving water is not impaired. The Root River, approximately 8 miles downstream, is 303(d) listed as impaired for total phosphorus.

Effluent Information

- Design flow rate(s):
  Annual average = 0.26 MGD (Million Gallons per Day)
  Peak daily = 0.728 MGD
  Peak weekly = 0.416 MGD
  Peak monthly = 0.356 MGD

  For reference, the actual average flow from 10/01/2019 – 10/31/2024 was 0.088 MGD.

- Hardness = 381 mg/L as $CaCO_3$. This value represents the geometric mean of data from the permit reissuance application from 03/28/2024 – 04/09/2024.
- Acute dilution factor used in accordance with s. NR 106.06(3)(c), Wis. Adm. Code: Not applicable – this facility does not have an approved Zone of Initial Dilution (ZID).
- Water source: Domestic wastewater with water supply from wells
- Additives:
- Effluent characterization: This facility is categorized as a minor municipality, so the permit application required effluent sample analyses for a limited number of common pollutants, as specified in s. NR 200.065, Table 1, Wis. Adm. Code, primarily metal substances plus ammonia, chloride, hardness and phosphorus.
- Effluent data for substances for which a single sample was analyzed is shown in the tables in Part 2 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.

Effluent Copper Data

	Copper µg/L
1-day P_{99}	18.6
4-day P_{99}	12.4
30-day P_{99}	7.05
Mean	7.85
Std	3.78
Sample size	17
Range	<5 – 12.9
Dates*	04/02/2017 – 05/03/2024

"<" means that the pollutant was not detected at the indicated level of detection. The mean concentration was calculated using zero in place of the non-detected results.
*Copper data from the previous permit application was used in this evaluation because there was not enough data submitted to calculate P_{99}'s

Effluent Chloride Data*

	Chloride mg/L
1-day P_{99}	878
4-day P_{99}	691

Attachment #1

	Chloride mg/L
30-day P_{99}	588
Mean	535
Std	121
Sample size	237
Range	282 - 1120

* Data from February 2021 is excluded from this evaluation because there were leaks next to the highway which allowed a high amount of chloride into the plant and is not representative of normal conditions. The rest of this memo does not include this data.

Effluent Zinc Data

	Zinc µg/L
1-day P_{99}	61.3
4-day P_{99}	42.9
30-day P_{99}	33.3
Mean	28.6
Std	10.5
Sample size	15
Range	19 – 50

The following table presents the average concentrations and loadings at Outfall 001 from 10/01/2019 – 10/31/2024 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	7.68 mg/L*
TSS	8.0 mg/L*
pH field	7.87 s.u.
Phosphorus	0.93 mg/L*
Ammonia Nitrogen	2.42 mg/L*
Chloride	551 mg/L
Dissolved Oxygen	8.61 mg/L

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

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

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

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

Acute Limits based on 1-Q_{10}

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

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

Where:

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

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

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

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

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

If the receiving water is effluent dominated under low stream flow conditions, the 1-Q_{10} method of limit calculation produces the most stringent daily maximum limitations and should be used while making reasonable potential determinations. This is the case for Yorkville.

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

Daily Maximum Limits based on Acute Toxicity Criteria (ATC)

RECEIVING WATER FLOW = 0 cfs

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.
Chlorine		19.0		19.0	3.81			
Arsenic		340		340	68.0	0.26		
Cadmium	381	47.8		47.8	9.6	<0.23		
Chromium	301	4446		4446	889	1.25		
Copper	381	54.8		54.8			18.6	12.9
Lead	356	365		365	72.9	<0.2		
Nickel	268	1080		1080	216	2.22		
Zinc	333	345		345			61.3	50
Chloride (mg/L)		757		757			**878**	**1120**

* 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.

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

Weekly Average Limits based on Chronic Toxicity Criteria (CTC)

RECEIVING WATER FLOW = 0 cfs

SUBSTANCE	REF. HARD.* mg/L	CTC	MEAN BACK-GRD.	WEEKLY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	4-day P_{99}	4-day MAX. CONC.
Chlorine		7.28		7.28	1.46			
Arsenic		152		152	30.4	0.26		
Cadmium	153	3.44		3.44	0.69	<0.23		
Chromium	153	187		187	37.4	1.25		
Copper	153	14.9		14.9			12.4	
Lead	153	42.2		42.2	8.4	<0.2		
Nickel	153	74.8		74.8	15.0	2.22		
Zinc	153	175		175			42.9	
Chloride (mg/L)		395		395			**691**	**800**

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

Monthly Average Limits based on Wildlife Criteria (WC)

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

Monthly Average Limits based on Human Threshold Criteria (HTC)

RECEIVING WATER FLOW = 0 cfs

SUBSTANCE	HTC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Cadmium	370		370	74.0	<0.23
Chromium (+3)	3818000		3818000	763600	1.25
Lead	140		140	28.0	<0.2
Nickel	43000		43000	8600	2.22

Monthly Average Limits based on Human Cancer Criteria (HCC)

RECEIVING WATER FLOW = 0 cfs

	HCC	MEAN BACK-	MO'LY AVE.	1/5 OF EFFL.	MEAN EFFL.

Attachment #1

SUBSTANCE		GRD.	LIMIT	LIMIT	CONC.
Arsenic	13.3		13.3	2.66	0.26

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 chloride.

Chloride – Considering available effluent data from the current permit term (10/01/2019 – 10/14/2024), the 1-day P_{99} chloride concentration is 1082 mg/L, and the 4-day P_{99} of effluent data is 786 mg/L.

Because the 4-day P_{99} exceeds the calculated weekly average WQBEL, an effluent limit is needed in accordance with s. NR 106.05(4)(b), Wis. Adm. Code.

However, Subchapter VII of ch. NR 106, Wis. Adm. Code, provides for a variance from water quality standards for this substance, and Yorkville has requested such a variance. That variance may be granted subject to the following conditions:
1) The permit shall include an "Interim" limitation intended to prevent an increase in the discharge of Chloride;
2) The permit shall specify "Source Reduction Measures" to be implemented during the permit term, with periodic progress reports; and
3) The permit shall include a "Target Limit" or "Target Value" to gage the effectiveness of the Source Reduction Measures, and progress toward the WQBELs.

Interim Limit for Chloride
Section NR 106.82(9), Wis. Adm. Code, defines a "Weekly average interim limitation" as either the 4-day P_{99} concentration or 105% of the highest weekly average concentration of the representative data.

The table below shows the statistical summary of chloride, separated into two seasons.

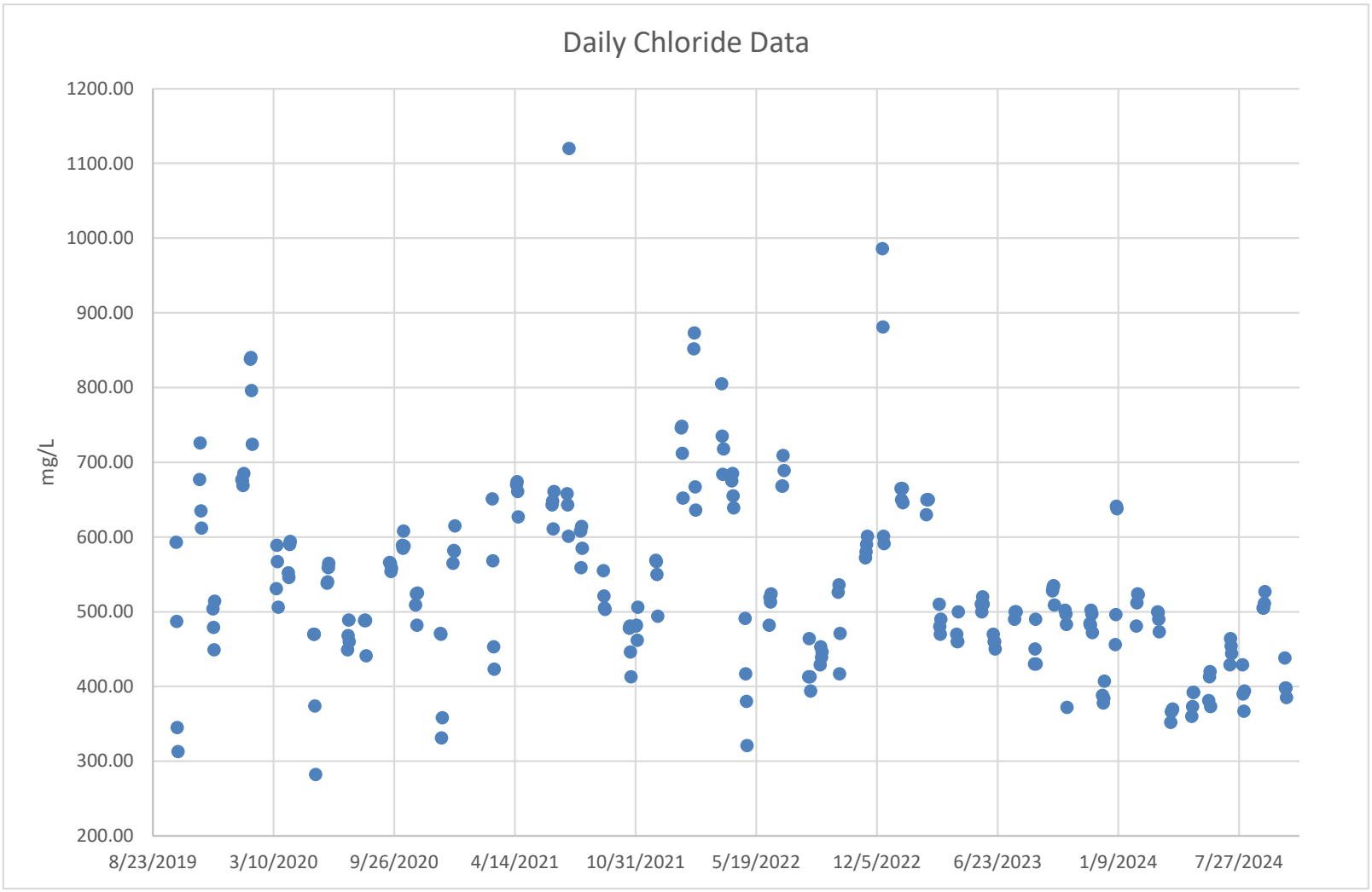
Effluent Chloride Data

	May – November	December – April
1-day P_{99}	779	961
4-day P_{99}	629	755
30-day P_{99}	546	642
Mean	502	584
Std	100	133
Sample size	141	96
Range	282 - 1120	331 - 986

Daily Maximum Limits
The current permit includes an interim daily maximum limit of 1,400 mg/L. All data during the permit term was reported to be below this limit. As a result, **an interim daily maximum limit of 780 mg/L for**

May – November and 960 for December – April are recommended in the reissued permit. These values are equal to the 1-day P_{99}'s of representative effluent data, rounded.

The graph below shows all chloride data which was reported during the current permit term.



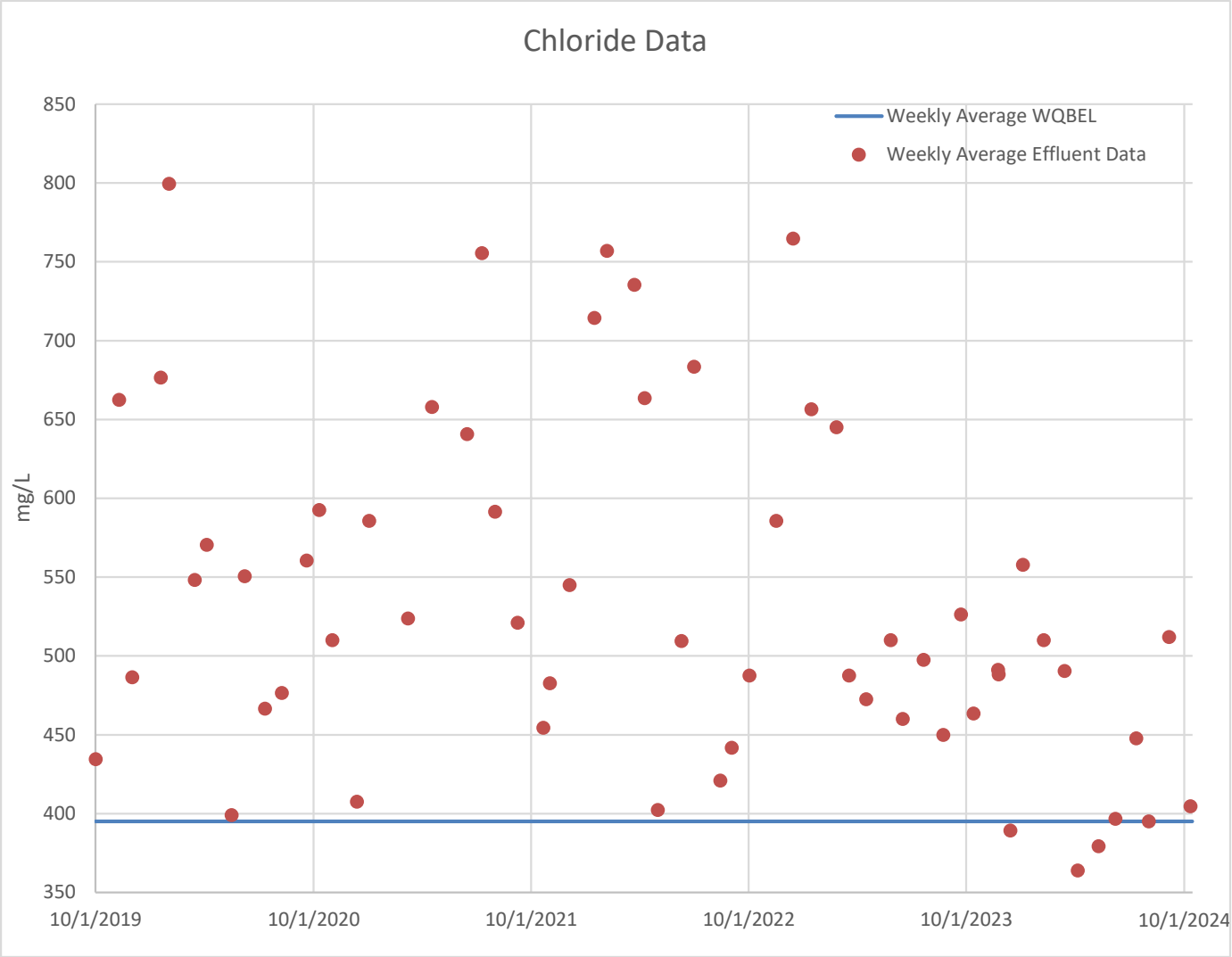
Weekly Average Limits

Ideally, the effluent chloride concentration at facilities with variances will trend downward as a result of source reduction measures and the recalculated interim limits would decrease. However, effluent concentrations at Yorkville have increased during the current permit term are higher than the current interim weekly average limits.

Although the 4-day P_{99} effluent chloride concentrations at Yorkville are higher than the current interim limits of 450 mg/L for May – November and 710 mg/L for December – April, the Department does not find it appropriate to increase the interim concentration limit in the reissued permit, because it would be

counterproductive to meeting the final WQBEL. **Therefore, the current weekly average interim chloride limits are recommended for permit reissuance.**

The graph below shows the weekly average chloride data which was reported during the current permit term.



A target limit and permit language for Source Reduction Measures are not recommended as part of this evaluation. These should follow contact with Yorkville, though if the Department and Yorkville are unable to reach agreement on all the terms of a Chloride Variance, the calculated limits described earlier should be included in the permit, in accordance with s. NR 106.83(3), Wis. Adm. Code.

Chloride Monitoring Recommendations

Four samples per month (on consecutive days) are recommended. This allows for averaging of the results to compare with the interim limit and allows the use of the average in determining future interim limits, and degree of success with chloride reduction measures.

In the absence of a variance, Yorkville would be subject to the WQBELs of 757 mg/L as a daily maximum; 400 mg/L as a weekly average; the weekly average mass limit of 860 lbs/day (395 mg/L × 0.26 MGD × 8.34); and an alternative wet weather mass limit.

Mercury – The permit application did not require monitoring for mercury because Yorkville is categorized as a minor facility as defined in s. NR 200.02(8), Wis. Adm. Code. In accordance with s. NR 106.145(3)(a)3, Wis. Adm. Code, a minor municipal discharger shall monitor, and report results of influent and effluent mercury monitoring once every three months if, "there are two or more exceedances in the last five years of the high-quality sludge mercury concentration of 17 mg/kg specified in s. NR 204.07(5), Wis. Adm. Code." A review of the past five years of sludge characteristics data reveals that all the sample results are within expected analytical ranges and well below the 17 mg/kg level. The average concentration in the sludge from 12/23/2019 – 08/01/2024 was 0.78 mg/kg, with a maximum reported concentration of 4.66 mg/kg. **Therefore, no mercury monitoring is recommended at Outfall 001.**

Zinc – The current permit includes monthly monitoring for zinc because there was reasonable potential for zinc limits based on data collected prior to the 2013 WQBEL memo. Although there was not reasonable potential for zinc limits in the previous permit, monitoring was recommended to continue. Because the data is significantly less than the calculated limits, **monitoring is not recommended to continue in the reissued permit.**

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

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

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

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

The current ammonia limits are based on an LFF classification to be protective of Hoods Creek 1.1 miles downstream of the outfall.

Daily Maximum Limits based on Acute Toxicity Criteria (ATC)

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

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

Where:

A = 0.411 and B = 58.4 for a Limited Forage Fishery, and
pH (s.u.) = that characteristic of the effluent.

The effluent pH data was examined as part of this evaluation. A total of 1855 sample results were reported from 10/02/2019 – 10/31/2024. The maximum reported value was 8.55 s.u. (Standard pH Units). The effluent pH was 8.30 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 8.36 s.u. The mean plus the standard deviation multiplied by a factor of 2.33, an estimate of the upper ninety ninth percentile for a normally distributed dataset, is 8.35 s.u. Therefore, a value of 8.35 s.u. is believed to represent the maximum reasonably expected pH, and therefore most appropriate for determining daily maximum limitations for ammonia nitrogen. Substituting a value of 8.35 s.u. into the equation above yields an ATC = 4.3 mg/L.

Daily Maximum Ammonia Nitrogen Effluent Limitations Calculation Method

In accordance with s. NR 106.32(2), Wis. Adm. Code daily maximum ammonia limitations are calculated using the 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	8.6
1-Q_{10}	4.3

The 1-Q_{10} method yields the most stringent limits for Yorkville.

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

Daily Maximum Ammonia Nitrogen Limits – LFF

Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L
6.0 ≤ pH ≤ 6.1	54	7.0 < pH ≤ 7.1	33	8.0 < pH ≤ 8.1	6.9
6.1 < pH ≤ 6.2	53	7.1 < pH ≤ 7.2	30	8.1 < pH ≤ 8.2	5.7
6.2 < pH ≤ 6.3	52	7.2 < pH ≤ 7.3	26	8.2 < pH ≤ 8.3	4.7
6.3 < pH ≤ 6.4	51	7.3 < pH ≤ 7.4	23	8.3 < pH ≤ 8.4	3.9
6.4 < pH ≤ 6.5	49	7.4 < pH ≤ 7.5	20	8.4 < pH ≤ 8.5	3.2
6.5 < pH ≤ 6.6	47	7.5 < pH ≤ 7.6	17	8.5 < pH ≤ 8.6	2.7
6.6 < pH ≤ 6.7	45	7.6 < pH ≤ 7.7	14	8.6 < pH ≤ 8.7	2.2
6.7 < pH ≤ 6.8	42	7.7 < pH ≤ 7.8	12	8.7 < pH ≤ 8.8	1.8
6.8 < pH ≤ 6.9	39	7.8 < pH ≤ 7.9	10	8.8 < pH ≤ 8.9	1.6

Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L
6.9 < pH ≤ 7.0	36	7.9 < pH ≤ 8.0	8.4	8.9 < pH ≤ 9.0	1.3

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

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 **Limited Forage 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 = 1.0,
C = the minimum of 3.09 or $3.73 \times 10^{(0.028 \times (25 - T))}$ – (Early Life Stages Present), or
C = $3.73 \times 10^{(0.028 \times (25 - T))}$ – (Early Life Stages Absent), and
T = the temperature (ºC) of the receiving water – (Early Life Stages Present), or
T = the maximum of the actual temperature (ºC) and 7 - (Early Life Stages Absent)

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 (ºC) of the receiving water – (Early Life Stages Present), or
T = the maximum of the actual temperature (ºC) 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-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.

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 ºC, during the winter

and spring months. Burbot, an early spawning species, are not believed to be present in Ives Grove based on conversations with local fisheries biologists. So "ELS Absent" criteria apply from October through March, and "ELS Present" criteria will apply from April through September for the LFF and WWSF classifications.

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 – LFF

Limited Forage Fish Classification		Oct. – March	April	May – Sept.
Effluent Flow	Qe (MGD)	0.26	0.26	0.26
Background Information	7-Q_{10} (cfs)	0.0	0.0	0.0
	7-Q_2 (cfs)	0.0	0.0	0.0
	Ammonia (mg/L)	0.25	0.09	0.07
	Average Temperature (°C)	6	10	18
	Max Temperature (°C)	13	10	21
	pH (s.u.)	7.99	8.04	8.08
	% of Flow used	25	25	100
	Reference Weekly Flow (cfs)	0.0	0.0	0.0
	Reference Monthly Flow (cfs)	0.0	0.0	0.0
Criteria mg/L	4-day Chronic			
	Early Life Stages Present			6.84
	Early Life Stages Absent	20.72	23.13	
	30-day Chronic			
	Early Life Stages Present			2.74
	Early Life Stages Absent	8.29	9.25	
Effluent Limitations mg/L	Weekly Average			
	Early Life Stages Present			6.8
	Early Life Stages Absent	21	23	
	Monthly Average			
	Early Life Stages Present			2.7
	Early Life Stages Absent	8.3	9.3	

To be protective of the warmwater sport fish classification 8 miles downstream of Outfall 001, the following limits are calculated.

Weekly and Monthly Ammonia Nitrogen Limits – WWSF

Warmwater sport fishery classification		Oct. – March	April	May – Sept.
Effluent Flow	Qe (MGD)	0.26	0.26	0.26
Background Information	7-Q_{10} (cfs)	2.4	2.4	2.4
	7-Q_2 (cfs)	4.2	4.2	4.2
	Ammonia (mg/L)	0.25	0.09	0.07
	Average Temperature (°C)	4	9	18
	Max Temperature (°C)	10	9	21
	pH (s.u.)	7.99	8.04	8.08
	% of Flow used	25	25	100

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Warmwater sport fishery classification		Oct. – March	April	May – Sept.
	Reference Weekly Flow (cfs)	0.6	0.6	2.4
	Reference Monthly Flow (cfs)	0.8925	0.8925	3.57
Criteria mg/L	4-day Chronic			
	Early Life Stages Present		5.74	3.56
	Early Life Stages Absent	8.26		
	30-day Chronic			
	Early Life Stages Present		2.30	1.42
	Early Life Stages Absent	3.30		
Effluent Limitations mg/L	Weekly Average			
	Early Life Stages Present		14	24
	Early Life Stages Absent	20		
	Monthly Average			
	Early Life Stages Present		7.2	13
	Early Life Stages Absent	10		

Ammonia Decay

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

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

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

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

The velocity of receiving water is assumed to be 5 miles per day and the distance from the point of discharge to the classification change is approximately 8 miles for a travel time of 1.6 days. This equation shows that at the location where the classification change, 71%-87% of the ammonia is remaining during April. After decay, the limits are increased as shown in the following table. The limits shown in bold are the most stringent between the calculated limits and the limits currently effective in the permit.

Ammonia Nitrogen Decay Limits Comparison

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	LFF limits - At outfall -		WWSF limits		Ammonia Nitrogen Remaining at classification change (%)	After decay		Current Limits	
Months Applicable	Weekly Average (mg/L)	Monthly Average (mg/L)	Weekly Average (mg/L)	Monthly Average (mg/L)		Weekly Average (mg/L)	Monthly Average (mg/L)	Weekly Average (mg/L)	Monthly Average (mg/L)
October	21	8.3	20	10	87	20	9.4	**5.1**	**2.2**
Nov. – March	21	8.3	20	10	87	**20**	**9.4**	29	12.4
April	23	9.3	14	7.2	83	**14**	**7.2**	29	12.4
May – Sept	6.9	2.7	24	13	71	9.7	3.9	**5.1**	**2.2**

Effluent Data

The following table evaluates the statistics based upon ammonia data reported from 10/01/2019 – 10/31/2024, with those results being compared to the calculated limits to determine the need to include ammonia limits in Yorkville'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.

Data collected prior to August 2022 is not included in this evaluation. Yorkville completed a major facility upgrade to address nitrification issues that went online on 08/01/2022, so data prior to this is not considered representative of current treatment conditions.

Ammonia Nitrogen Effluent Data

Ammonia Nitrogen mg/L	October	November – March	April	May – September
1-day P_{99}	0.49	5.61	3.09	3.03
4-day P_{99}	0.31	3.25	1.83	1.70
30-day P_{99}	0.17	1.35	0.76	0.72
Mean*	0.10	0.49	0.29	0.31
Std	0.11	1.73	0.88	0.83
Sample size	41	119	158	272
Range	<0.11 – 0.53	<0.039 - 10	<0.039 - 5.4	<0.039 – 5.4

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

Based on this comparison, there is not reasonable potential for any of the ammonia limits.

The permit currently has daily maximum, weekly average, and monthly average limits year-round. 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 for May – October are less restrictive than the weekly average limit of 5.1 mg/L and the monthly average limit of 2.2 mg/L in the current permit. 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.

Final Ammonia Nitrogen Limits

	Daily Maximum mg/L	Weekly Average mg/L	Monthly Average mg/L
October	Variable	5.1	2.2
November – March	Variable	20	9.4
April	Variable	14	7.2
May – September	Variable	5.1	2.2

PART 4 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR BACTERIA

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

Yorkville had previously been exempted from disinfection based on the limited aquatic life or limited forage fish community classification of the receiving water. Section NR 210.06(3)(g), Wis. Adm. Code, states that disinfection decisions may be made based on the hydrologic classifications listed in s. NR 104.02(1), Wis. Adm. Code (**not** on the water quality classifications - i.e., limited forage fish, limited aquatic life - that are defined in s. NR 104.02(3), Wis. Adm. Code). The hydrologic classification for Ives Grove Creek is listed in ch. NR 104, Wis. Adm. Code, as continuous. Continuous streams have a higher likelihood of providing opportunities for full contact recreational activities. Therefore, disinfection should not be exempted based solely on this hydrological classification.

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.

These limits are required year-round. The permit will include a compliance schedule to meet these limits.

Year-round disinfection is recommended for Outfall 001. Per s. NR 210.06(3)(a), Wis. Adm. Code and in consideration of the guidance in *Disinfection Requirements for Discharges to Surface Waters (2024)*, **disinfection shall be required in the reissued permit year-round due to the proximity to high level of human contact recreational activities.**

The Root River, just below the Horlick Dam, is within 20 miles downstream of Outfall 001, supports a stocked trout and salmon fishery. This location is a popular fishing spot for anglers year-round which involves a high level of human contact with the water. To be protective of this recreational activity, **year-round bacteria limits are recommended.**

During the compliance schedule, instream E. coli sampling may be conducted downstream of Outfall 001 to determine if bacteria persists at the recreational area per s. NR 210.06(3)(f), Wis. Adm. Code, and determine if disinfection is needed October – April.

Total Residual Chlorine – **If chlorine is the chosen disinfection mechanism, effluent limitations would be recommended to assure proper operation of the de-chlorination system.** Section NR 210.06(2)(b), Wis. Adm. Code, states, "When chlorine is used for disinfection, the daily maximum total residual chlorine concentration of the discharge may not exceed 0.10 mg/L." Because the WQBELs are more restrictive, they are recommended instead. Specifically, **a daily maximum limit of 19 µg/L would be required.** Due to revisions to s. NR 106.07(2), Wis. Adm. Code, mass limitations are no longer required. The **weekly average effluent limitation of 7.3 µg/L would be included in the permit because it is more restrictive than the daily maximum limit.**

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 monthly average limit of 7.3 µg/L would be required** to meet expression of limits requirements in addition to the daily max and weekly average limits.

PART 5 – PHOSPHORUS

Technology-Based Effluent Limit
Because Yorkville currently has an effective limit of 0.8 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.

Phosphorus criteria in s. NR 102.06, Wis. Adm. Code, do not apply to limited aquatic life waters as described in s. NR 102.06(6)(d), Wis. Adm. Code. These waters were not included in the USGS/WDNR stream and river studies and, therefore, the Department lacked the technical basis to determine and propose applicable criteria. At some time in the future, the Department may adopt phosphorus criteria based on new studies focusing on limited aquatic life waters. The Guidance for Implementing Wisconsin's Phosphorus Water Quality Standards for Point Source Discharges (2020) suggests that

during the interim, WQBELs should be based on the criteria and flow conditions for the next stream segment downstream (or downstream lake or reservoir, if appropriate), because ss. 217.12 and 217.13, Wis. Adm. Code, state that the Department must set WQBELs to protect downstream waters. The discharge location of the wastewater from Yorkville is classified as limited aquatic life downstream from the point of discharge downstream to Hoods Creek. Hoods Creek is classified as a limited forage fish classification.

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 0.075 mg/L applies for Hoods Creek.

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 = 0.075 mg/L for Hood Creek
Qs = 100% of the 7-Q_2 of 0 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 = 0.260 MGD = 0.402 cfs
f = the fraction of effluent withdrawn from the receiving water = 0

Since the receiving water flow is equal to zero, the effluent limit is set equal to criteria.

Effluent Data

The following table summarizes effluent total phosphorus monitoring data from 07/01/2022 – 10/31/2024. Data from 11/20, 11/21, and 11/22/2022 and 12/27/2022 is excluded due to a plant upset. Data from 11/29/2023 was also excluded due to the facility's SCADA panel failing.

Total Phosphorus Effluent Data

	Phosphorus mg/L
1-day P_{99}	3.00
4-day P_{99}	1.66
30-day P_{99}	0.95
Mean	0.65
Std	0.61
Sample size	358
Range	0.013 - 3.2

Reasonable Potential Determination

The calculated WQBEL of 0.075 mg/L is less than the current limit of 0.8 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.

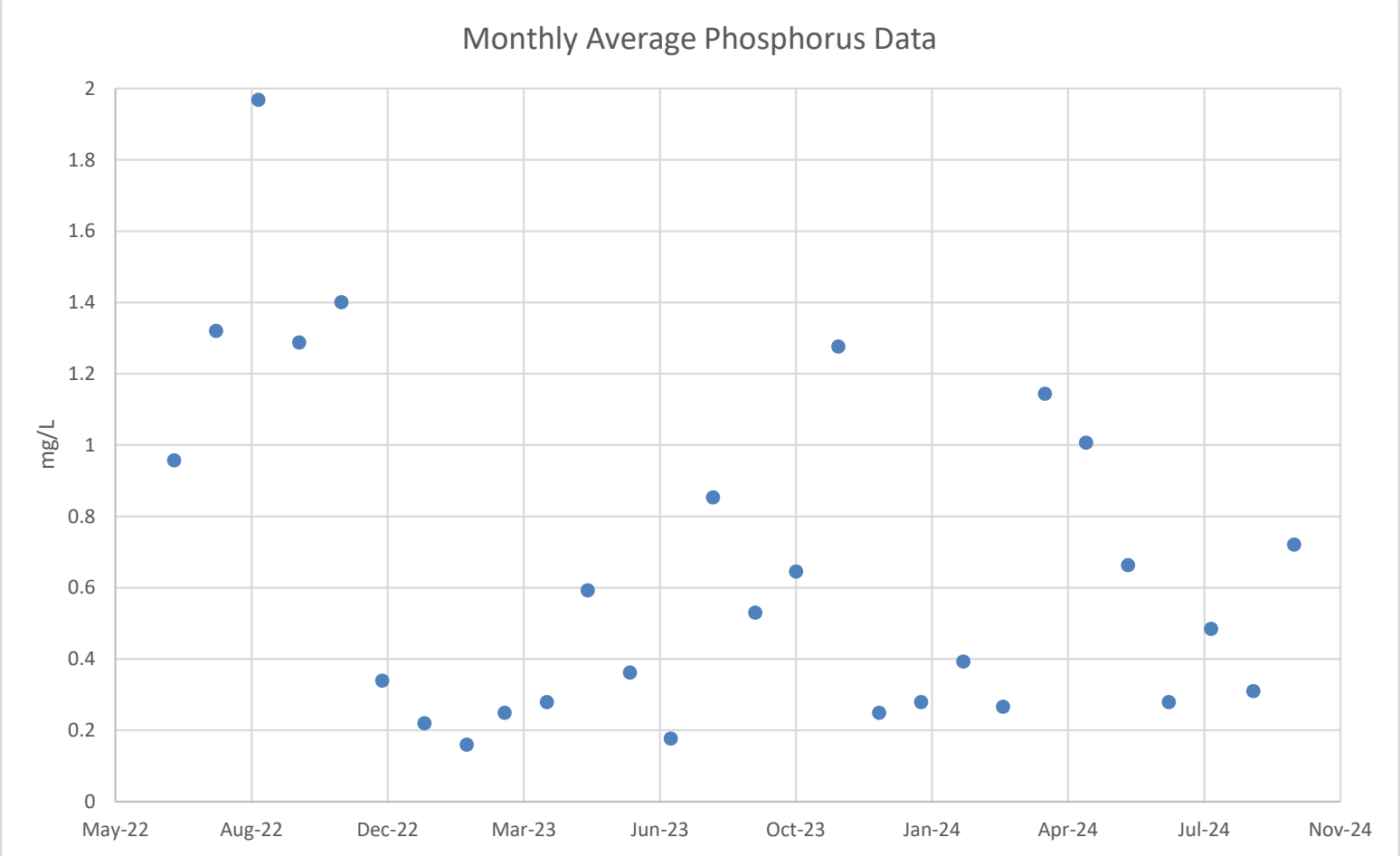
Limit Expression
According to s. NR 217.14(2), Wis. Adm. Code, because the calculated WQBEL is less than or equal to 0.3 mg/L, the effluent limit of 0.075 mg/L may be expressed as a six-month average. If a concentration limitation expressed as a six-month average is included in the permit, a monthly average concentration limitation of 0.225 mg/L, equal to three times the WQBEL 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 0.075 mg/L × 8.34 × 0.26 MGD = 0.16 lbs/day expressed as a six-month average.**

Multi-Discharge Variance Interim Limit
With the permit application, Yorkville has re-applied for the phosphorus multi-discharger variance (MDV). Conditions of the phosphorus MDV require the facility to comply with an interim phosphorus limit in lieu of meeting the final WQBEL. **The recommended interim limit during the 2nd permit under MDV approval, pursuant to s. 283.16 (6) (a), Wis. Stats., is 0.6 mg/L as a monthly average. A compliance schedule may be appropriate to meet this interim limit but compliance with 0.6 mg/L shall be no later than the end of the reissued permit. The previous interim limit of 0.8 mg/L should not be exceeded during the compliance schedule.**

The graph below shows the monthly average phopshours data from the current permit term, after the current HAC of 0.8 mg/L became effective.

Attachment #1



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

Wis. Adm. Code, which has a daily maximum effluent temperature limitation of 120 ºF. The 86 °F limit applies because the hydrologic classification is not listed as a wetland in ch. NR 104, Wis. Adm. Code.

Reasonable Potential
Based on the available discharge temperature data from 01/01/2011 – 12/31/2011 shown below, the maximum daily effluent temperature reported was 72.5 °F; therefore, no reasonable potential for exceeding the daily maximum limit exists, and **no limits or monitoring are recommended**.

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	50	51	-	86
FEB	49	51	-	86
MAR	50	51	-	86
APR	54	55	-	86
MAY	59	61	-	86
JUN	66	67	-	86
JUL	70	72	-	86
AUG	71	72	-	86
SEP	71	73	-	86
OCT	67	68	-	86
NOV	63	63	-	86
DEC	58	59	-	86

The effluent temperature is also below the LFF criteria with 1.1 miles of cooling. Therefore, it is protective of downstream waters.

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 **100%** 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:

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

Where:

Q_e = annual average flow = 0.15 MGD = 0.232 cfs
f = fraction of the Q_e withdrawn from the receiving water = 0
Q_s = ¼ of the 7-Q_{10} = 0 cfs ÷ 4 = 0 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 used when making WET determinations.

WET Data History

Date Test Initiated	Acute Results LC_{50} %				Chronic Results IC_{25} %					Footnotes
	C. dubia	Fathead minnow	Pass or Fail?	Used in RP?	*C. dubia*	Fathead Minnow	Algae (IC_{50})	Pass or Fail?	Use in RP?	
10/20/2005					>100	>100		Pass	No	1
06/08/2006					>100	>100		Pass	No	1
07/12/2007					>100	>100		Pass	No	1
05/20/2014					>100	>100		Pass	No	1
07/14/2015					>100	>100		Pass	No	1
10/04/2016					>100	>100		Pass	No	1
04/28/2020	>100	>100	Pass	Yes	80.7	>100		Fail	No	1
06/23/2020					>100	>100		Pass	No	1
07/14/2020					69	>100		Fail	No	1
04/05/2022	>100	>100	Pass	Yes	>100	>100		Pass	No	1
08/23/2022	>100	>100	Pass	Yes	>100	>100		Pass	Yes	
11/28/2023	>100	>100	Pass	Yes	>100	>100		Pass	Yes	
01/30/2024	>100	>100	Pass	Yes	>100	>100		Pass	Yes	

Footnotes:

1. *Data Not Representative.* Completion of a successful TRE, which found and fixed the source of toxicity, caused data prior to the TRE to no longer be representative of the discharge. Yorkville believes the phosphorus removal chemical which was used from April 2020 – May 2021 contributed to the toxicity. Yorkville also completed a major upgrade which went online in August 2022 to address nitrification issues during winter months which was also believed to have contributed to toxicity in the effluent. Data prior to this upgrade is not considered representative in this evaluation.

- 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 = 0 < 1.0, reasonable potential is not shown, and a limit is not required.

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 = 100%. **15 Points**
Historical Data	3 tests used to calculate RP. No tests failed. **0 Points**	3 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**

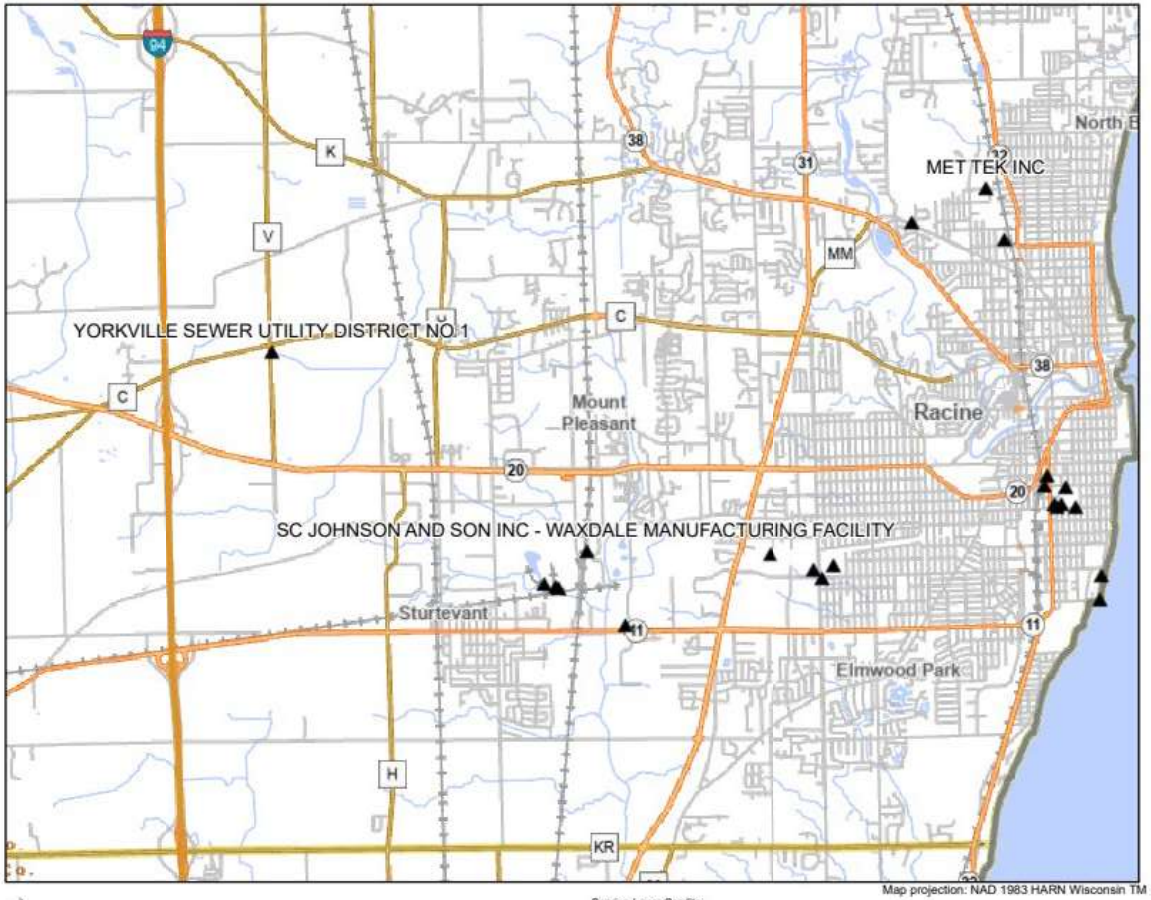
Attachment #1

	Acute	Chronic
Receiving Water Classification	The immediate receiving water is codified as LAL, however the water currently supports a full fish and aquatic life community. **5 Points**	Same as Acute. **5 Points**
Chemical-Specific Data	Reasonable potential for limits for chloride based on ATC; Ammonia nitrogen limit carried over from the current permit. Ammonia, chromium, copper, nickel, and zinc detected. Additional Compounds of Concern: None **8 Points**	Reasonable potential for limits for chloride based on CTC; Ammonia nitrogen limit carried over from the current permit. Ammonia, chromium, copper, nickel, and zinc detected. Additional Compounds of Concern: None **8 Points**
Additives	0 Biocides and 1 Water Quality Conditioner added. Permittee has proper P chemical SOPs in place. **1 Point**	All additives used more than once per 4 days. **1 Point**
Discharge Category	0 Industrial Contributors. **0 Points**	Same as Acute. **0 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**	**29 Points**
Recommended Monitoring Frequency (from Checklist):	No WET tests needed	3 tests during permit term
Limit Required?	No	No
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, no acute and 3 tests/permit term 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).

WISCONSIN DEPARTMENT OF NATURAL RESOURCES

Yorkville Outfall Location



Legend: (some map layers may not be displayed)

- Surface Water Outfalls
- Rivers and Streams
- Intermittent Streams
- Open Water
- water

Latest Leaf Off Imagery

- Red: Band_1
- Green: Band_2
- Blue: Band_3

2022 Leaf On Imagery

- Red: Band_1
- Green: Band_2
- Blue: Band_3

Notes:

Map projection: NAD 1983 HARN Wisconsin TM

Service Layer Credits:
2022 Leaf On Imagery: , Latest Leaf Off Imagery: , Basic Basemap (Cached):

N

Map: 0 5,000 10,000 Feet
0 1,000 2,000 Meters

This map is a product generated by a DNR web mapping application.

This map is for informational purposes only and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. The user is solely responsible for verifying the accuracy of information before using for any purpose. By using this product for any purpose user agrees to be bound by all disclaimers found here: https://dnr.wisconsin.gov/legal.

Date Printed: 12/3/2024 1:24 PM

Yorkville Sewer Utility
CHLORIDE SOURCE REDUCTION
Permit Number: **WI-0029831-09-2**
Date: 03/20/2025

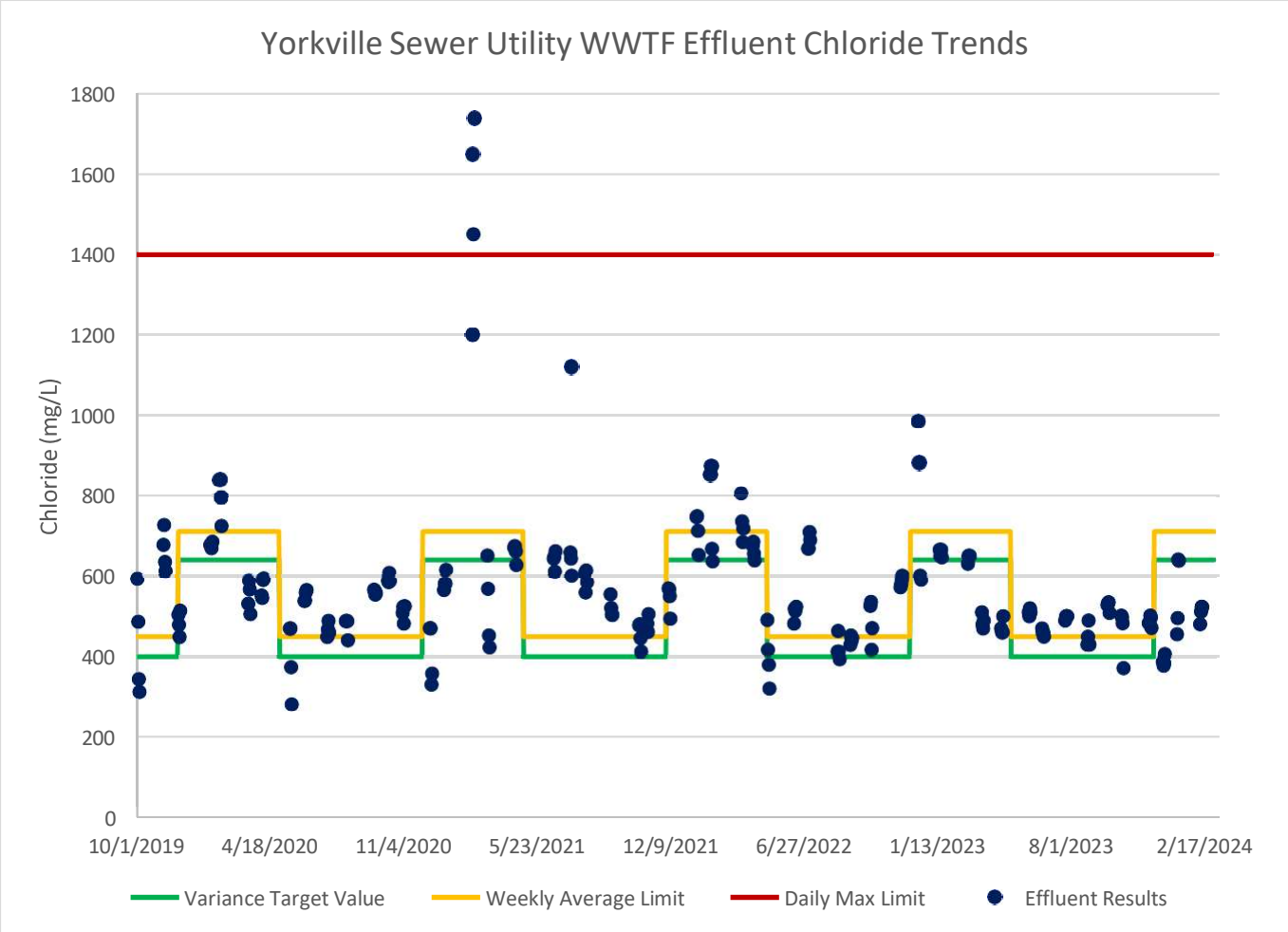
Narrative

The Village of Yorkville (Yorkville), Wisconsin is located in western Racine County along Interstate Highway 94 (I-94) approximately 10 miles west of Racine, WI. The Wastewater Treatment Plant (WWTP) receives flow from residential, commercial and industrial sources within its sewer service area. The WWTP is located adjacent to the Racine County Highway department (RCHD). The RCHD has two large salt storage structures, and one structure for storage of IBC totes of liquid chloride for road de- icing operations. The Village is contracted with the RCHD for winter road plowing and salting operations. RCHD has started to implement brine pre-wetting and trucks have data loggers to track application rates.

The water in the Yorkville area is incredibly hard water requiring almost everyone to have a water softening system. The Village of Yorkville has a water utility that supplies water to part of the sewer district. The water utility is classified as a non-transient non-community public water system. Because of this all of our residential customers are on private wells. The water utility does chlorinate its water for disinfection as required by its DNR permit. The water utility does not soften water, or add any other chemicals other than the Hawkins Azone 15 sodium hypochlorite for disinfection as required by the DNR permit.

- The Village of Yorkville Sewer Utility has operated under a chloride variance that was initially granted in January 2005.
- The Village has started a program to educate water softener owners of impacts of chlorides on water quality, and how to increase softener efficiency.
- The Village has a purchase incentive program to help users upgrade water softeners.
- The Village has an ordinance, sec. 54-213 (a), that limits the amount of chlorides users are permitted to discharge to 450 mg/l. The Village samples every business annually to determine what they are discharging, and a fee of $2.00/lb is applied to every user over the 450 mg/l limit of chloride. This fee is applied to every quarterly bill. The Village has the right to disconnect a customer for non-compliance and/ or place a lien on a property for non-payment.
- The Village continues to invest in collection system inspections, repairs, and manhole inspections to continue to reduce infiltration.
- The Village is continuing to work with the Racine County Highway Department to reduce chlorides. The entire Village Road Committee meets with RCHD annually prior to the winter season to discuss upcoming maintenance needs, and winter operations.

Data Analysis



Planned Actions

SRM/PMP Activities	1st Year	2nd Year	3rd Year	4th Year	5th Year
1. Education for softener users.					
a. Mail flyers (e.g., brochures) to customers in annual bills.	Update the brochure	Annual	Annual	Annual	Reevaluate
b. Post information on the village's website	Review the website	Update website as needed	Update website as needed	Update website as needed	Reevaluate
2. Continue softener upgrade incentive plan. Utility will budget $3000.00 each year and pay up to $250.00 for each high efficiency water softener installed replacing older models.	Evaluate promotion of program	Annual	Annual	Annual	Reevaluate program
3. a. Meet with Racine County Highway Department. Discuss chloride education, winter deicing and salt application equipment.	Annual	Annual	Annual	Annual	Annual
b. Annual RCHD facilities inspections during winter months. Ensure proper storage & handling of salt. Investigate proximity of salt to the sewer collection system.	Annual	Annual	Annual	Annual	Annual
4. Continue industrial sampling program. Annually sample all businesses (industrial & commercial) to characterize chloride discharges.	Annual	Annual	Annual	Annual	Annual
5. Using sampling data, work with business to reduce chlorides. Encourage source reduction measures at highest chloride contributors be implemented.	Annual	Annual	Annual	Annual	Reevaluate
6. Adopt an ordinance Mandating the use of high efficiency softeners. In general, the steps include bringing the ordinance to a commission meeting, the commission legal department creates a draft, the commission votes, the board votes and then an ordinance is considered passed.	Bring to a commission meeting and begin developing ordinance. Detail progress made and/or barriers encountered in annual report.	Continue developing ordinance. If adopted, notify customers and track compliance.	Continue developing ordinance. If adopted, notify customers and track compliance.	Continue developing ordinance. If adopted, notify customers and track compliance. g	Continue developing ordinance. If adopted, notify customers and track compliance.

7. Collection system repairs and Infiltration & Infiltration removal. a. Clean, televise, and inspect 1/3 of the collection system annually.	Annual	Annual	Annual	Annual	Annual
b. Schedule any needed repairs after reviewing televised footage.	Annual	Annual	Annual	Annual	Annual
c. Inspect all manholes in 5 years and schedule needed repairs as problems are found.	Annual	Annual	Annual	Annual	Annual
8. Water softener survey.	Develop survey to find the number, age, and type of softeners	Administer survey	Administer survey again as buildings change owners and uses	Administer survey again as buildings change owners and uses	Review data collected
9 . Develop & refine a mass balance for chloride sample data. Use new data to update historical data, prepare a mass chloride balance, and update chloride mass balance to identify percent contribution from various sources (i.e. County, residential, industrial, commercial…)	Annual	Annual	Evaluate data. Identify potential follow-up.	Annual	Annual

Facility Specific Chloride Variance Data Sheet

Directions: Please complete this form electronically. Record information in the space provided. Select checkboxes by double clicking on them. Do not delete or alter any fields. For citations, include page number and section if applicable. Please ensure that all data requested are included and as complete as possible. Attach additional sheets if needed.

Section I: General Information

A. Name of Permittee: Village of Yorkville

B. Facility Name: Yorkville Sewer Utility District No. 1

C. Submitted by: Wisconsin Department of Natural Resources

D. State: Wisconsin **Substance:** Chloride **Date completed:** February 6, 2025

E. Permit #: WI-0029831-10-0 **WQSTS #:** (EPA USE ONLY)

F. Duration of Variance **Start Date:** August 1, 2025 **End Date:** July 31, 2030

G. Date of Variance Application: April 4, 2024

H. Is this permit a: ☐ **First time submittal for variance**
☒ **Renewal of a previous submittal for variance** *(Complete Section IX)*

Description of proposed variance: The proposed variance is for chloride from the chronic water quality standard of 395 mg/L to an interim limit of 780 mg/L for May to November as a daily maximum and 960 mg/L for December to April as a daily maximum and 450 mg/L for May to November as a weekly average and 710 mg/L as a weekly average. The permit contains source reduction measures along with a target value of 400 mg/L (May to November) and 640 mg/L (December to April) weekly averages.

I. List of all who assisted in the compilation of data for this form

Name	Email	Phone	Contribution
Victoria Ziegler	Victoria.Ziegler@wisconsin.gov	414-391-8946	Permit Drafter and Variance Coordinator
Jacob Van Susteren-Wedesky	Jacob.vansusterenwedesky@wisconsin.gov	414-239-1480	Compliance Engineer
Nicole Krueger	Nicole.Krueger@wisconsin.gov	414-897-5750	Limits Calculator

Section II: Criteria and Variance Information

A. Water Quality Standard from which variance is sought: Chloride

B. List other criteria likely to be affected by variance: None

C. Source of Substance: Main sources include industrial softening and the Racine County Highway Department Main Campus which is adjacent to the treatment plant. Residential water softening is not expected to be a significant contribution of chloride mass loading to the utility. A residential softener tune-up program inspected and adjusted 21 residential softeners in 2021, and there was not a change in chloride levels at the WWTF.

Chloride concentrations are highest in winter and early spring months (December – April). Effluent chloride concentrations have been a downward trend over the last two permit terms. Mass discharge trends do not show a significant increase/decrease. The utility has begun an annual industrial monitoring program and implemented a chloride limit in the sewer use ordinance which has recently helped reduce chlorides from significant sources.

D. Ambient Substance Concentration: 0 mg/L ☐ **Measured** ☒ **Estimated** ☐ **Default** ☒ **Unknown**

E. **If measured or estimated, what was the basis? Include citation.** There is no ambient data available. The 7-Q10 at the point of discharge is 0 cfs so the background concentration does not have an effect on the calculated limits.

F. Average effluent discharge rate: 0.26 MGD (annual average design flow) **Maximum effluent discharge rate:** 0.728 MGD (peak daily design flow)

G. Effluent Substance Concentration: (year-round) 1-day P99 = 878 mg/L, 4-day P99 = 691 mg/L, Average = 535 mg/L ☒ **Measured** ☐ **Default** ☐ **Estimated** ☐ **Unknown**

H. If measured or estimated, what was the basis? Include Citation. Permit-required monitoring from 10/01/2019 – 10/14/2024.

I. Type of HAC:
- ☐ **Type 1: HAC reflects waterbody/receiving water conditions**
- ☐ **Type 2: HAC reflects achievable effluent conditions**
- ☒ **Type 3: HAC reflects current effluent conditions**

J. Statement of HAC: The Department has determined the highest attainable condition of the receiving water is achieved through the application of the variance limit in the permit, combined with a permit requirement that the permittee implement its Chloride SRM plan. Thus, the HAC at commencement of this variance is an interim limit of 780 mg/L for May to November as a daily maximum and 960 mg/L for December to April as a daily maximum and 450 mg/L for May to November as a weekly average and 710 mg/L as a weekly average, which reflects the greatest chloride reduction achievable with the current treatment processes, in conjunction with the implementation of the permittee's Chloride SRM plan. The current effluent condition is reflective of on-site optimization measures that have already occurred. This HAC determination is based on the economic feasibility of available compliance options for the Village of Yorkville at this time (see Economic Section below). The permittee may seek to renew this variance in the subsequent reissuance of this permit; the Department will reevaluate the HAC in its review of such a request. A subsequent HAC cannot be defined as less stringent than this HAC.

K. Variance Limit: May – November: 780 mg/L daily max and 450 mg/L weekly average
December – April: 960 mg/L daily max and 710 mg/L weekly average

L. Level currently achievable (LCA): May – November: 779 mg/L 1-day P99 and 629 mg/L 4-day P99
December – April: 961 mg/L 1-day P99 and 755 mg/L 4-day P99

M. What data were used to calculate the LCA, and how was the LCA derived? (*Immediate compliance with LCA is required.)*
The daily maximum interim limits for May – November and December – April is equal to the LCA. The weekly average interim limits for May – November and December – April are less than the LCA due to the more stringent limits currently being effective.

N. Explain the basis used to determine the variance limit (which must be ≤ LCA). Include citation.

Chapter NR 106, Subchapter VII, Wis. Adm. Code, allows for a variance; the imposition of a less restrictive interim limit; a compliance schedule that stresses source reduction and public education; and allowance for a target value or limit to be a goal for reduction.

Typically, the 4-day P99 of effluent data is used as the variance interim limit. However, the calculated 4-day P99 is 786 mg/L, which is greater than the current variance limit of 710 mg/L weekly average from December – April and 450 mg/L weekly average from May – November. It is considered inappropriate to increase the current variance limit since this would be counterproductive to achieving the ultimate objective of meeting the WQBEL. Hence the current variance limit of 710 mg/L weekly average from December – April and 450 mg/L weekly average from May – November will remain as the variance limits in the proposed permit.

The current permit includes an interim daily maximum limit of 1,400 mg/L. Interim daily maximum limits of 780 mg/L for May – November and 960 mg/L for December – April are proposed in the reissued permit and are equal to the 1-day P99 values of representative data.

O. Select all factors applicable as the basis for the variance provided under 40 CFR 131.10(g). Summarize justification below: ☐ **1** ☐ **2** ☐ **3** ☐ **4** ☐ **5** ☒ **6**

The use of a reverse osmosis system was evaluated. The cost of the system was estimated to an average cost per household that would result in a MHI of 29.46%. The Village of Yorkville does not have municipal wells or a drinking water treatment facility. Centralized lime softening was also evaluated, and the estimated cost of doing

so would be about 3.60% of the MHI, including the cost of current wastewater treatment, cost of hook ups, and the cost of pipes. This does not include the cost of a lime softening plant. The cost estimates are in the range in which the application of either treatment would be expected to result in substantial and widespread economic and social impacts to the community. Without a variance, meeting the water quality standard of 400 mg/L would result in substantial and widespread economic and social impacts.

Section III: Location Information

A. Counties in which water quality is potentially impacted: Racine County

B. Receiving waterbody at discharge point: Ives Groove Ditch (WBIC 3300)

C. Flows into which stream/river? Hoods Creek **How many miles downstream?** ~1mile

D. Coordinates of discharge point (UTM or Lat/Long): Lat: 42.73610ºN Long: 87.93496ºW

E. What is the distance from the point of discharge to the point downstream where the concentration of the substance falls to less than or equal to the chronic criterion of the substance for aquatic life protection?

8 miles, just after the point where Hoods Creek meets with the Root River

F. Provide the equation used to calculate that distance *(Include definitions of all variables, identify the values used for the clarification, and include citation):*

(interim limit in mg/L x effluent design flow in cfs) + (background concentration mg/L x background stream flow in cfs)) / (effluent design flow in cfs + background stream flow in cfs) = $\leq$ 395 mg/L.

Ives Grove Ditch flows about 1.1 miles from Outfall 001 and then meets Hoods Creek. Approximately 6.8 miles downstream of this point, Hoods Creek meets the Root River. Little baseflow is expected in Hoods Creek until confluence with the Root River about 7.9 miles from Outfall 001. The annual 7-Q10 at the Root River is 2.4 cfs. Assuming a weekly average discharge concentration of 710 mg/L and a Root River background concentration of 130 mg/L at Racine, the calculated mixed instream chloride is 181 mg/L at the Root River which is below criteria.

G. What are the designated uses associated with the direct receiving waterbody, and the designated uses for any downstream waterbodies until the water quality standard is met?

The receiving water is listed in ch. NR 104, Wis. Adm. Code as a limited aquatic life (LAL) community from the outfall to Hoods Creek (approximately 1.1 miles downstream of the outfall). At this location, the classification changes to a limited forage fish (LFF) community downstream to the Root River, approximately 8 miles from the outfall location.

H. Identify all other variance permittees for the same substance which discharge to the same stream, river, or waterbody in a location where the effects of the combined variances would have an additive effect on the waterbody: None

Permit Number	Facility Name	Facility Location	Variance Limit [mg/L]

I. Please attach a map, photographs, or a simple schematic showing the location of the discharge point as well as all variances for the substance currently draining to this waterbody on a separate sheet

J. Is the receiving waterbody on the CWA 303(d) list? If yes, please list the impairments below. ☐ Yes ☒ No ☐ Unknown

Ives Groove Ditch is not on the CWA 303(d).
Hoods Creek (1mile downstream) is on the CWA 303(d) list.

River Mile	Pollutant	Impairment
0-9.7 miles	Unknown pollutant	Degraded Biological Community

K. **Please list any contributors to the POTW in the following categories:**

Food processors (cheese, vegetables, meat, pickles, soy sauce, etc.)	None
Metal Plating/Metal Finishing	Racine Metal Fab, Proclain Hydraulics
Car Washes	None
Municipal Maintenance Sheds (salt storage, truck washing, etc.)	Racine County Highway Department main campus
Laundromats	None
Other presumed commercial or industrial chloride contributors to the POTW	None

L. If the POTW does not have a DNR-approved pretreatment program, is a sewer use ordinance enacted to address the chloride contributions from the industrial and commercial users? If so, please describe.
Yes, the Village enacted a Sewer Use Ordinance with surcharges for users that do not comply. The surcharge limit was set equal to the WPDES permit limit of 450 mg/L. In 2024, the Village Increased the chloride surcharge from $0.50/lb to $2.00/lb to incentivize more users to comply. The fee is applied to every quarterly bill. The Village has the right to disconnect a customer for non-compliance and/or place a lien on a property for non-payment.

Section 54-213 (a) of the Code of Ordinances of the Village of Yorkville

Section IV: Pretreatment (complete this section only for POTWs with DNR-Approved Pretreatment Programs. See w:\Variances\Templates and Guidance\Pretreatment Programs.docx)

A. Are there any industrial users contributing chloride to the POTW? If so, please list.
N/A, not a POTW with a WDNR-Approved Pretreatment Program.

B. Are all industrial users in compliance with local pretreatment limits for chloride? If not, please include a list of industrial users that are not complying with local limits and include any relevant correspondence between the POTW and the industry (NOVs, industrial SRM updates and timeframe, etc)
N/A

C. When were local pretreatment limits for chloride last calculated?
N/A

D. Please provide information on specific SRM activities that will be implemented during the permit term to reduce the industry's discharge of the variance pollutant to the POTW
N/A

Section V: Public Notice

A. Has a public notice been given for this proposed variance? ☒ **Yes** ☐ **No**
B. If yes, was a public hearing held as well? ☒ **Yes** ☐ **No** ☐ **N/A**
C. What type of notice was given?
☒ **Notice of variance included in notice for permit** ☐ **Separate notice of variance**
D. Date of public notice: April 1, 2025 **Date of hearing:** May 16, 2025
E. Were comments received from the public in regards to this notice or hearing? ☐ **Yes** ☐ **No** *(If yes, see notice of final determination)*

Section VI: Human Health

A. Is the receiving water designated as a Public Water Supply? ☐ **Yes** ☒ **No**
B. Applicable criteria affected by variance: No human health criteria for chloride
C. Identify any expected impacts that the variance may have upon human health, and include any citations:

None

Section VII: Aquatic Life and Environmental Impact

A. Aquatic life use designation of receiving water: Limited Aquatic Life for 1.1 miles, Limited Forage Fish for 6.8 miles, then Warmwater Sport Fish

B. Applicable criteria affected by variance: Acute toxicity criterion of 757 mg/L and chronic toxicity criterion of 395 mg/L from ch. NR 105, Wis. Adm. Code, applicable in all Wisconsin waters regardless of use designation.

C. Identify any environmental impacts to aquatic life expected to occur with this variance, and include any citations:
The daily maximum interim limits do not exceed genus mean acute values for any of the fish and aquatic life species used to develop water quality criteria per ch. NR 105, Wis. Adm. Code.

The interim limit of 710 mg/L for December – April exceeds the genus mean chronic values for *Ceriodaphnia*, *Daphnia*, and *Physa*. The interim limit of 450 mg/L for May – November exceeds the genus mean chronic value for *Ceriodaphnia*.

D. List any Endangered or Threatened species known or likely to occur within the affected area, and include any citations: No federally listed endangered or threatened species

County	Species	Status

Citation: U.S. Fish & Wildlife Service – Environmental Conservation Online System (http://www.fws.gov/endangered/) and National Heritage Index (http://dnr.wi.gov/topic/nhi/)

Section VIII: Economic Impact and Feasibility

A. Describe the permittee's current pollutant control technology in the treatment process:
The facility consists of a lift station, fine bar screen, optional mechanical bar screen, grit removal, two sequencing batch reactors (SBRs) run in parallel, Aqua Hawk RE2 may be dosed to the SBRs for chemical phosphorus removal. After treatment, secondary effluent flows to a post-equalization aeration tank and discharged to Ives Grove Ditch to Hoods Creek.

B. What modifications would be necessary to comply with the current limits? Include any citations.
Installation of reverse osmosis at the treatment plant.

C. How long would it take to implement these changes?
The facility has not estimated implementation time permit.

D. Estimate the capital cost *(Citation)*: $265,500 (Chloride Variance Application)

E. Estimate additional O & M cost *(Citation)*: $86,140 (Chloride Variance Application)

F. Estimate the impact of treatment on the effluent substance concentration, and include any citations:
Reverse osmosis can remove up to 95% of chlorides from water (statement from Axeon Water Technologies). This level of removal would help the facility to constantly meet the WQBEL of 400 mg/L

G. Identify any expected environmental impacts that would result from further treatment, and include any citations:
There would be some impacts based on disposal of brine from RO. These include air pollution impacts from trucking brine and increased chloride impacts at the point where brine is discharged.

H. Is it technically and economically feasible for this permittee to modify the treatment process to reduce the level of the substance in the ☐ **Yes** ☒ **No** ☐ **Unknown**

discharge?

It is not economically feasible for this permittee to modify the treatment process because of the limited funds available to them. Instead, they plan to continue implementing source reduction measures including addressing the chloride mass loading from the adjacent Racine County Highway Department Main Campus salt storage and winter road maintenance activities. Installation of RO would result in a sewer rate of 29.46% of median household income.

The permittee owns a non-transient, non-community water supply for supplying drinking water to industrial users and restaurants in their service area. The non-transient population served is approximated at 900 (source: WDNR Public Drinking Water System Data). Drinking water for residential customers is obtained from private drinking wells. Therefore, the lime softening screener for municipality's without public drinking water was used. Providing regional lime softening for the estimated 73 households based on population served of 183 with a MHI of $111,394, would result in a total cost of hookup and infrastructure of $3,288.13 per household (3.6% MHI increase of current residential user fee).

I. If treatment is possible, is it possible to comply with the limits on the substance? ☒ **Yes** ☐ **No** ☐ **Unknown**

J. If yes, what prevents this from being done? Include any citations.

End of pipe Reverse Osmosis (RO) could reduce effluent chloride concentrations to chronic toxicity criterion. However, attaining the applicable water quality standards specified in the chs. NR 102 to 105, Wis. Adm. Code, may cause substantial and widespread adverse social and economic impacts in the community where the discharger is located.

K. List any alternatives to current practices that have been considered, and why they have been rejected as a course of action, including any citations:

Reverse osmosis (RO)- not economically feasible (29.46% of MHI)

Section IX: Compliance with Water Quality Standards

A. Describe all activities that have been, and are being, conducted to reduce the discharge of the substance into the receiving stream. This may include existing treatments and controls, consumer education, promising centralized or remote treatment technologies, planned research, etc. Include any citations.

1. Education to water softener owners on the impact of chlorides on water quality. In Q2 2021, the Village sent out EPA fliers with the sewer bills.
2. Develop an ordinance requiring the inspection of water softener equipment at time of sale of or transfer of real estate and construction of a new home building. Village is continuing to work with the village board, and the village attorney to get this ordinance passed.
3. Offer to Utility users a purchase incentive to upgrade existing water softeners. $5,000.00 is budgeted every year for this program.
4. The Village conducted a residential softener tune-up program in 2021, which involves a qualified servicing to ensure proper control settings and adjustments.
5. The Village has an ordinance s. 54-213(a), that limits the amount of chlorides users are permitted to discharge to 450 mg/L.
6. The Village continues to invest in collection system inspection, repair, and manhole inspections to reduce infiltration. $25,000 is budgeted annually for this work. ~1/3 of the collection system is cleaned & inspected annually.
7. The Village is continuing to work with the Racine County Highway Department to reduce chlorides from their salt-storage campus. Yorkville conducted an inspection in 2020, and the highway department agreed to make the following changes;
    a. The RCHD changed the procedure for equipment clean-up after a salting event.
    b. The location of the prewetting of the salt has been changed and therefore reducing the infiltration of chlorides into the collection system

c. The garage is now being dry swept instead of being washed with water down the drain like it was in the past.
d. In 2021 the RCHD installed a new storm sewer system on their campus that seemed to help reduce infiltration into the collection system.

8. Develop and refine a mass balance for chloride sampling data. The data has been collected and the Village is working with their engineer to put this together.

B. Describe all actions that the permit requires the permittee to complete during the variance period to ensure reasonable progress towards attainment of the water quality standard. Include any citations.

- Continue educational activities for softener users, including mailing flyers and posting on Village's website.
- Continue with the water softener upgrade incentive plan.
- Meet with Racine County Highway Department annually to discuss salt reduction and chloride education including facility inspections during the winter months.
- Continue with industrial sampling program and work with businesses to reduce chlorides.
- Create an ordinance mandating the use of high efficiency softeners.
- Clean, televise, and inspect 1/3 of the collection system annually. After reviewing televised footage, schedule any needed repairs.
- Inspect all manholes in 5 years and schedule needed repairs as problems are found.
- Develop and administer a water softener survey to find the number, age, and type of water softeners.

Section X: Compliance with Previous Permit

A. Date of previous submittal: July 17, 2019 **Date of EPA Approval:** August 2, 2019

B. Previous Permit #: 0029831-08-0 **Previous WQSTS #:** (EPA USE ONLY)

C. Effluent substance concentration: 1-day P_{99}: 878 mg/L; 4-day P_{99}: 691 mg/L; 30-day P_{99}: 588 mg/L **Variance Limit:** 710 mg/L (December – April) and 450 mg/L (May – November)

D. Target Value(s): 640 mg/L (December – April) and 400 mg/L (Mary – November) **Achieved?** ☐ **Yes** ☒ **No** ☐ **Partial**

E. For renewals, list previous steps that were to be completed. Show whether these steps have been

Condition of Previous Variance	Compliance
Educate softener owners on the impact of chloride on water quality; provide information about increasing softener efficiency and reducing the use of softened water.	☒ **Yes** ☐ **No**
Develop an ordinance requiring the inspection of water softener equipment at time of sale of or transfer of real estate and construction of a new home building.	☐ **Yes** ☒ **No**
Offer to Utility users a purchase incentive to upgrade existing water softeners.	☒ **Yes** ☐ **No**
For existing softeners, the Utility will conduct a residential softener tune-up program, which involves a qualified servicing to ensure proper control settings and adjustments.	☒ **Yes** ☐ **No**
Develop and refine a mass balance for chloride sample data.	☐ **Yes** ☒ **No**
Analyze industrial and commercial contributors to prevent increases in the amount of chloride discharged and seek reductions from those sources.	☒ **Yes** ☐ **No**
Mandate through ordinance that chloride loading from industrial sources does not exceed the effluent limit of the WWTF.	☒ **Yes** ☐ **No**

Continue complying with CMOM practices and specifically regarding manhole inspection, sewer cleaning, and repairs. All manholes will be inspected once every 5 years.	☒ **Yes** ☐ **No**
Continue working with the Racine County Highway Department (RCHD) specifically regarding conformance with local chloride limits.	☒ **Yes** ☐ **No**