

# Public Noticed Cornell WWTP Draft Permit Fact Sheet

## General Information

Permit Number:	WI-0021300-11-0	
Permittee Name:	City of Cornell	
Address:	City Hall Box 796	
City/State/Zip:	Cornell WI 54732	
Discharge Location:	Cornell Wastewater Treatment Plant, 602 S. 3 <sup>rd</sup> St., Cornell, WI 54732 East bank of the Chippewa River, 1500 feet south of the Xcel dam	
Receiving Water:	the Chippewa River in the McCann Creek and Fisher River Watershed of the Lower Chippewa River Basin in Chippewa County	
Stream Flow (Q <sub>7,10</sub> ):	100 cfs	
Stream Classification:	Warm water sport fish, non-public water supply	
Discharge Type:	Existing, Continuous	
Design Flow(s)	Annual Average	0.395 MGD
Significant Industrial Loading?	No	
Operator at Proper Grade?	Yes	
Approved Pretreatment Program?	N/A	

## Facility Description

The Cornell Wastewater Treatment Plant is a secondary type treatment facility designed to treat wastewater from the City of Cornell. The facility has an annual average design flow of 0.395 million gallons per day (MGD), and an actual annual average in 2023 of 0.187 MGD. The facility completed Phase 1 of 2 of facility upgrades in 2022 including all new headworks equipment. The primary treatment now includes a vertical fine screen, vortex grit removal with grit washing followed by a Parshall flume, and primary settling tanks. A new septage receiving station with flow equalization was also added. Secondary treatment includes a rotating biological contactor (RBC) and secondary settling tanks. Effluent is disinfected seasonally via ultraviolet radiation prior to discharge to the Chippewa River. Sludge is treated and stored in aerobic digesters before land application on Department approved sites. Significant monitoring and/or limit changes in the upcoming permit term are as follows: 1) addition of influent phosphorus monitoring in 2025 only, 2) increased effluent sample frequencies for CBOD, TSS, phosphorus, and ammonia from 2/week to the standard 3/week, 3) the addition of effluent flow monitoring, 4) the addition of annual effluent monitoring for total nitrogen, nitrite + nitrate nitrogen and total Kjeldahl nitrogen, 5) effluent fecal coliform monitoring has been replaced with Escherichia coli (E. coli) monitoring, and 6) the approved alternate effluent limit for phosphorus will remain at the current limit of 6.0 mg/L (monthly average). Additionally, to quantitate the risk, PFAS sludge sampling has been included in the permit pursuant to ss. NR 214.18(5)(b) and NR 204.06(2)(b)9., Wis. Adm. Code.

# Substantial Compliance Determination

**Enforcement During Last Permit:** The facility was issued a Notice of Noncompliance (NON) in February of 2024 for effluent copper limit violations occurring from March 2021 to June 2023. The facility adjusted their sampling methods and has completed additional monitoring in the collection system to try to identify a source. No exceedances have occurred since the change in sampling methods in August of 2023. The facility was issued three NONs (May 2020, September 2019, and April 2019) for effluent CBOD and TSS violations. Recent facility upgrades have addressed these violations and no CBOD or TSS exceedances have occurred since September of 2021.

After a desktop review of all discharge monitoring reports, CMARs, land application reports completed by Logan Rubeck, and a site visit on 8/23/2023 completed by Nicholas Lindstrom, the Cornell Wastewater Treatment Facility has been found to be in substantial compliance with their current permit.

**Compliance determination entered by Logan Rubeck on 06/14/2024.**

Sample Point Designation		
Sample Point Number	Discharge Flow, Units, and Averaging Period	Sample Point Location, Waste Type/Sample Contents and Treatment Description (as applicable)
701	0.187 MGD (2023)	Representative influent samples shall be collected after grit removal at the Parshall flume.
001	No effluent flow monitoring, added for this permit term.	Representative samples for E. coli shall be collected after disinfection; all others shall be collected prior to disinfection.
003	18 tons (2023)	Representative sludge samples shall be collected annually from the digester and prior to land application, and once in 2026 for PCBs.

## 1 Influent – Monitoring Requirements

### 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	2/Week	24-Hr Flow Prop Comp	
CBOD5		mg/L	2/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total		mg/L	2/Week	24-Hr Flow Prop Comp	
Phosphorus, Total		mg/L	2/Month	24-Hr Flow Prop Comp	Monitoring in 2025 only.

### Changes from Previous Permit:

Flow sample frequency has changed from continuous to daily for eDMR reporting purposes, and new phosphorus monitoring at 2/month for 2025 only.

## Explanation of Limits and Monitoring Requirements

Influent CBOD5 monitoring per NR 210.05(1)(d)3 to show 85% removal. 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. Phosphorus monitoring was added in 2025 only to further evaluate how this parameter can be addressed in the future.

## 2 Surface Water - Monitoring and Limitations

### Sample Point Number: 001- EFFLUENT TO CHIPPEWA RIVER

Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Flow Rate		MGD	Daily	Continuous	
CBOD5	Monthly Avg	25 mg/L	3/Week	24-Hr Flow Prop Comp	
CBOD5	Weekly Avg	40 mg/L	3/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total	Monthly Avg	30 mg/L	3/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total	Weekly Avg	45 mg/L	3/Week	24-Hr Flow Prop Comp	
pH Field	Daily Max	9.0 su	Daily	Grab	
pH Field	Daily Min	6.0 su	Daily	Grab	
Nitrogen, Ammonia (NH3-N) Total	Monthly Avg	46 mg/L	3/Week	24-Hr Flow Prop Comp	
Nitrogen, Ammonia (NH3-N) Total	Weekly Avg	46 mg/L	3/Week	24-Hr Flow Prop Comp	
Nitrogen, Ammonia (NH3-N) Total	Daily Max - Variable	mg/L	3/Week	24-Hr Flow Prop Comp	Daily maximum limit varies with effluent pH. See Ammonia section below for limits.
Nitrogen, Ammonia Variable Limit		mg/L	3/Week	See Table	Daily maximum limit varies with effluent pH. See Ammonia section below for limits.
E. coli	Geometric Mean - Monthly	126 #/100 ml	Weekly	Grab	Limits apply May - Sept annually. See E. coli section.

<b>Monitoring Requirements and Limitations</b>					
<b>Parameter</b>	<b>Limit Type</b>	<b>Limit and Units</b>	<b>Sample Frequency</b>	<b>Sample Type</b>	<b>Notes</b>
E. coli	% Exceedance	10 Percent	Monthly	Calculated	Limits apply May - Sept annually. See E. coli section. Enter the result in the DMR on the last day of the month.
Copper, Total Recoverable	Daily Max	37 ug/L	Monthly	24-Hr Flow Prop Comp	Sample concurrently with WET tests.
Copper, Total Recoverable	Weekly Avg	37 ug/L	Monthly	24-Hr Flow Prop Comp	Sample concurrently with WET tests.
Copper, Total Recoverable	Monthly Avg	37 ug/L	Monthly	24-Hr Flow Prop Comp	Sample concurrently with WET tests.
Copper, Total Recoverable	Daily Max	0.14 lbs/day	Monthly	24-Hr Flow Prop Comp	Sample concurrently with WET tests.
Phosphorus, Total	Monthly Avg	6.0 mg/L	3/Week	24-Hr Flow Prop Comp	
Phosphorus, Total		20 lbs/day	3/Week	Calculated	
Nitrogen, Total Kjeldahl		mg/L	See Listed Qtr(s)	24-Hr Flow Prop Comp	Annual in rotating quarters. See Nitrogen Series Monitoring section below.
Nitrogen, Nitrite + Nitrate Total		mg/L	See Listed Qtr(s)	24-Hr Flow Prop Comp	Annual in rotating quarters. See Nitrogen Series Monitoring section below.
Nitrogen, Total		mg/L	See Listed Qtr(s)	Calculated	Annual in rotating quarters. See Nitrogen Series Monitoring section below. Total Nitrogen shall be calculated as the sum of reported values for Total Kjeldahl Nitrogen and Total Nitrite + Nitrate Nitrogen.
Acute WET		TUa	See Listed Qtr(s)	24-Hr Flow Prop Comp	See WET section below.

### **Changes from Previous Permit**

Changes include 1) the addition of effluent flow monitoring, 2) increased sample frequencies for CBOD, TSS, phosphorus, and ammonia from 2/week to the standard 3/week, 3) the addition of annual effluent monitoring for total nitrogen, nitrite + nitrate nitrogen and total Kjeldahl nitrogen, 4) effluent fecal coliform monitoring has been replaced with Escherichia coli (E. coli) limits and monitoring, and 5) the approved alternate effluent limit for phosphorus will remain at the current limit of 6.0 mg/L (monthly average).

## Explanation of Limits and Monitoring Requirements

The effluent monitoring frequency for all parameters were considered. Monitoring frequencies are based on the size and type of the facility and are established to best characterize effluent quality and variability, to detect events of noncompliance, and to ensure fairness and consistency in permits issued across the state. Requirements in administrative code (NR 108, 205, 210 and 214 Wis. Adm. Code) and Section 283.55, Wis. Stats. were considered, where applicable, when determining the appropriate monitoring frequencies for pollutants that have final effluent limits in effect during this permit term. For more information see the March 22, 2021 version of the Bureau of Water Quality Program Guidance Document “Monitoring Frequencies for Individual Wastewater Permits”. Using the criteria previously stated, the department has determined CBOD, TSS, phosphorus, and ammonia nitrogen will be increased from 2/week to 3/week to address variability and conform to standard sampling requirements of similar facilities.

**MUNICIPAL EFFLUENT LIMITS** –In accordance with the federal regulation 40 CFR 122.45(d), and to comply with the expression of limits requirements in ss. NR 106.07 and NR 205.065(7), Wis. Adm. Codes, limits in this permit are to be expressed as weekly average and monthly average limits whenever practicable which applies to ammonia nitrogen limits of 46 mg/L monthly and weekly averages.

Limits were determined for this existing discharge using chs. NR 102, 104,105, 106, 207, 210, 212 and 217 of the Wisconsin Administrative Code (where applicable). For additional information on any of the limits see the June 20, 2024 memo from Ben Hartenbower to Angela Parkhurst titled “Water Quality-Based Effluent Limitations for the Cornell Wastewater Treatment Facility WPDES Permit No. WI-0021300”.

**CBOD, TSS and pH:** Pursuant to s. NR 210.05(1)(d), Wis. Adm. Code, the permittee has requested the substitution of CBOD5 effluent limitations for BOD5 limitations. The permittee has demonstrated that the conditions in s. NR 210.07(4), Wis. Adm. Code, for making this substitution have been met and the department concurs. Categorical limitations for CBOD5 TSS and pH are specified in s. NR 210.05(1), Wis. Adm. Code, where the receiving water is classified as fish and aquatic life (Warm Water Sport Fish community) in s. NR 102.04 (3), Wis. Adm. Code. Limits for CBOD, TSS and pH correspond to the requirements in the current permit since the facility has not increased the capacity of the wastewater treatment system since the last permit issuance, nor are increases expected during the term of the proposed permit.

**Ammonia:** Current acute and chronic ammonia toxicity criteria for the protection of aquatic life are included in Tables 2C and 4B of ch. NR 105, Wis. Adm. Code. Subchapter IV of ch. NR 106 establishes the procedure for calculating water quality based effluent limitations (WQBELs) for ammonia.

Water quality-based effluent limitations were evaluated for Ammonia Nitrogen based upon water quality criteria in ch. NR 105 (as revised March 2004), including acute toxicity criteria (ATC) and chronic toxicity criteria (CTC). Effluent limitations for ammonia are calculated using the procedures in s. NR 106.32, Wis. Adm. Code and are shown in the WQBEL memo referenced above. In addition to weekly average and monthly average ammonia limits of 46 mg/L, daily maximum ammonia limits that vary with effluent pH apply year-round. The variable daily maximum ammonia limits have changed based on effluent pH in accordance with s. NR 106.32(2), Wis. Adm. Code. See table below titled for more information. Samples for ammonia shall be collected at the same time as the pH samples.

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	108	7.0 < pH ≤ 7.1	66	8.0 < pH ≤ 8.1	14
6.1 < pH ≤ 6.2	106	7.1 < pH ≤ 7.2	59	8.1 < pH ≤ 8.2	11
6.2 < pH ≤ 6.3	104	7.2 < pH ≤ 7.3	52	8.2 < pH ≤ 8.3	9.4
6.3 < pH ≤ 6.4	101	7.3 < pH ≤ 7.4	46	8.3 < pH ≤ 8.4	7.8
6.4 < pH ≤ 6.5	98	7.4 < pH ≤ 7.5	40	8.4 < pH ≤ 8.5	6.4

6.5 < pH ≤ 6.6	94	7.5 < pH ≤ 7.6	34	8.5 < pH ≤ 8.6	5.3
6.6 < pH ≤ 6.7	89	7.6 < pH ≤ 7.7	29	8.6 < pH ≤ 8.7	4.4
6.7 < pH ≤ 6.8	84	7.7 < pH ≤ 7.8	24	8.7 < pH ≤ 8.8	3.7
6.8 < pH ≤ 6.9	78	7.8 < pH ≤ 7.9	20	8.8 < pH ≤ 8.9	3.1
6.9 < pH ≤ 7.0	72	7.9 < pH ≤ 8.0	17	8.9 < pH ≤ 9.0	2.6

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

E. coli limits and monitoring is required at the permit effective date. 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 also apply.

**Copper:** The methods for calculating limitations for municipal treatment facilities to conform to 40 CFR 122.45(d) are specified in s. NR 106.07(3), Wis. Adm. Code.

Considering available effluent data from the current permit term (October 2018 to December 2023), the 30-day P<sub>99</sub> concentration is 31.0 µg/L, the 4-day P<sub>99</sub> concentration is 41.0 µg/L, and the 1-day P<sub>99</sub> concentration is 62.0 µg/L. The 1-day P<sub>99</sub> of the effluent data exceeds the calculated daily maximum limit, therefore concentration and mass limits, as well as monthly monitoring, are required.

Copper daily maximum limits of 37 µg/L and 0.41 lbs/day continue from their current permit is required, as well as weekly and monthly average limits of 37 ug/L were also included in the permit to meet the expression of limits requirements.

**Phosphorus:** Phosphorus requirements are based on the Phosphorus Rules that became effective 12/1/2010 as detailed in NR 102 Water Quality Standards and NR 217 Effluent Standards and Limitations for Phosphorus. Chapter NR 217 of the Wis. Adm. Code addresses point source dischargers of phosphorus to surface waters. The code categorically limits industrial dischargers of more than 60 pounds of phosphorus per month and municipal dischargers of more than 150 pounds of phosphorus per month to 1.0 mg/L unless an alternative limit is approved. For Cornell, an alternative effluent limit for phosphorus was submitted September 12, 2024 and approved September 20, 2024 with a limit of 6.0 mg/L monthly average (current limit). NR 217 also specifies WQBELs (water quality based effluent limits) for discharges of phosphorus to surface waters of the state from publicly and privately owned wastewater facilities, noncontact cooling water discharges which contain phosphorus, concentrated animal feeding operations that discharge through alternative treatment facilities and a facility/site that is regulated under NR 216 where the standards in NR151 and 216 are not sufficient to meet phosphorus criteria. WQBELs for phosphorus are needed whenever the discharge contains phosphorus at concentrations or loadings that will cause or contribute to an exceedance of the water quality standards. The mass limit of 20 lbs/day monthly average will continue this permit term.

**Total Nitrogen Monitoring (NO<sub>2</sub>+NO<sub>3</sub>, TKN and Total N)**- The Department has included effluent monitoring for Total Nitrogen in the permit through the authority under §§ 283.55(1)(e), Wis. Stats., which allows the department to require the permittee to submit information necessary to identify the type and quantity of any pollutants discharged from the point source, and through s. NR 200.065(1)(h), Wis. Adm. Code, which allows for this monitoring to be collected during the permit term. More information on the justification to include total nitrogen monitoring in wastewater permits can be found in the “Guidance for Total Nitrogen Monitoring in Wastewater Permits” dated October 1, 2019. Annual tests are scheduled in the following rotating quarters:

January – March 2025

April – June 2026

July – September 2027

October – December 2028

January – March 2029

**Thermal:** Requirements for Temperature are included in NR 102 Subchapter II Water Quality Standards for Temperature and NR 106 Subchapter V Effluent Limitations for Temperature. Thermal discharges must meet the Public Health criterion of 120° F and the Fish & Aquatic Life criteria which are established to protect aquatic communities from lethal and sub-lethal thermal effects. Due to the amount of upstream flow available for dilution in the limit calculation (Qs:Qe >20:1), the lowest calculated limitation is 120° F (s. NR 106.55(6)(a), Wis. Adm. Code). For activated sludge systems of domestic waste, there is no reasonable potential for the discharge to exceed this limit. Therefore, temperature limits and monitoring are not required.

**PFOS and PFOA:** NR 106 Subchapter VIII – Permit Requirements for PFOS and PFOA Dischargers became effective on August 1, 2022. Pursuant to s. NR 106.98(3)(b), Wis. Adm. Code, the department evaluated the need for PFOS and PFOA monitoring taking into consideration the presence of potential PFOS or PFOA industrial wastes, remediation sites and other potential sources of PFOS or PFOA. Based on information available at the time the permit was drafted, the department has determined the permittee does not need to sample for PFOS or PFOA as part of this permit reissuance. The department may re-evaluate the need for sampling at the next permit reissuance if new information becomes available that suggests PFOS or PFOA may be present in the discharge.

**Whole Effluent Toxicity-** Whole effluent toxicity (WET) testing requirements and limits (if applicable) are determined in accordance with ss. NR 106.08 and NR 106.09 Wis. Adm. Code, as revised August 2016. (See the current version of the Whole Effluent Toxicity Program Guidance Document and checklist and WET information, guidance and test methods at <http://dnr.wi.gov/topic/wastewater/wet.html>). Two Acute tests are required this permit term in the following quarters:

October - December 2026

April - June 2029

### 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	Alkaline Stabilization	pH Adjustment	Land Application	18
Does sludge management demonstrate compliance? Yes						
Is additional sludge storage required? Yes, 180 days provided						
Is Radium-226 present in the water supply at a level greater than 2 pCi/liter? No						
Is a priority pollutant scan required? No						

#### Sample Point Number: 003- SLUDGE

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



Monitoring Requirements and Limitations					
Parameter	Limit Type	Limit and Units	Sample Frequency	Sample Type	Notes
Zinc Dry Wt	High Quality	2,800 mg/kg	Annual	Composite	
Nitrogen, Total Kjeldahl		Percent	Annual	Composite	
Nitrogen, Ammonium (NH4-N) Total		Percent	Annual	Composite	
Phosphorus, Total		Percent	Annual	Composite	
Phosphorus, Water Extractable		% of Tot P	Annual	Composite	
Potassium, Total Recoverable		Percent	Annual	Composite	
PCB Total Dry Wt	Ceiling	50 mg/kg	Once	Composite	Sample once in 2026.
PCB Total Dry Wt	High Quality	10 mg/kg	Once	Composite	Sample once in 2026.
PFOA + PFOS		ug/kg	Annual	Calculated	Report the sum of PFOA and PFOS. See PFAS Permit Sections for more information.
PFAS Dry Wt			Annual	Grab	Perfluoroalkyl and Polyfluoroalkyl Substances based on updated DNR PFAS List. See PFAS Permit Sections for more information.

## Changes from Previous Permit:

**PFAS** – Annual monitoring is included in the permit pursuant s. NR 204.06(2)(b)9., Wis. Adm. Code.

## Explanation of Limits and Monitoring Requirements

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

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

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

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

## **Other Comments:**

TBD

## **Attachments:**

Water Quality Based Effluent Limits: June 20, 2024 memo from Ben Hartenbower to Angela Parkhurst titled “Water Quality-Based Effluent Limitations for the Cornell Lisbon Wastewater Treatment Facility WPDES Permit No. WI-0021300”.

Alternative Effluent Limit Memo: September, 2024 memo from Ben Hartenbower to Angela Parkhurst titled “Alternate Phosphorus Limitation Approval for the Cornell Wastewater Treatment Facility WPDES Permit No. WI-0021300”.

## **Expiration Date:**

September 30, 2029

## **Justification Of Any Waivers From Permit Application Requirements**

None

**Prepared By: Angela Parkhurst**

**Wastewater Specialist**

**Date: October 17, 2024**

**Notice of reissuance will be published in the Cornell & Lake Holcombe Courier, PO Box 546, Cornell, WI 54732-0546**

# CORRESPONDENCE/MEMORANDUM

DATE: June 20, 2024

TO: Angela Parkhurst– WCR/Eau Claire

FROM: Benjamin Hartenbower – WCR/Eau Claire

SUBJECT: Water Quality-Based Effluent Limitations for the Cornell Wastewater Treatment Facility  
WPDES Permit No. WI-0021300

This is in response to your request for an evaluation of the need for water quality-based effluent limitations (WQBELs) using chapters NR 102, 104, 105, 106, 207, 210, 212, and 217 of the Wisconsin Administrative Code (where applicable), for the discharge from the Cornell Wastewater Treatment Facility in Chippewa County. This municipal wastewater treatment facility (WWTF) discharges to the Chippewa River, located in the McCann Creek and Fisher River Watershed in the Lower Chippewa 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	Footnotes
Flow Rate					1,2
CBOD <sub>5</sub>			40 mg/L	25 mg/L	1
TSS			45 mg/L	30 mg/L	1
pH	9.0 s.u.	6.0 s.u.			1
Ammonia Nitrogen	Variable		<b>46 mg/L</b>	<b>46 mg/L</b>	3,4
E.Coli				126 #/100 mL geometric mean	5
Copper	37 µg/L, 0.41 lbs/day		<b>37 µg/L</b>	<b>37 µg/L</b>	4
Phosphorus				20 lbs/day 6.0 mg/L 1.0 mg/L	6
TKN, Nitrate+Nitrite, and Total Nitrogen					7
Acute WET					8

Footnotes:

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

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

Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L
6.0 ≤ pH ≤ 6.1	108	7.0 < pH ≤ 7.1	66	8.0 < pH ≤ 8.1	14
6.1 < pH ≤ 6.2	106	7.1 < pH ≤ 7.2	59	8.1 < pH ≤ 8.2	11
6.2 < pH ≤ 6.3	104	7.2 < pH ≤ 7.3	52	8.2 < pH ≤ 8.3	9.4
6.3 < pH ≤ 6.4	101	7.3 < pH ≤ 7.4	46	8.3 < pH ≤ 8.4	7.8
6.4 < pH ≤ 6.5	98	7.4 < pH ≤ 7.5	40	8.4 < pH ≤ 8.5	6.4
6.5 < pH ≤ 6.6	94	7.5 < pH ≤ 7.6	34	8.5 < pH ≤ 8.6	5.3
6.6 < pH ≤ 6.7	89	7.6 < pH ≤ 7.7	29	8.6 < pH ≤ 8.7	4.4
6.7 < pH ≤ 6.8	84	7.7 < pH ≤ 7.8	24	8.7 < pH ≤ 8.8	3.7
6.8 < pH ≤ 6.9	78	7.8 < pH ≤ 7.9	20	8.8 < pH ≤ 8.9	3.1
6.9 < pH ≤ 7.0	72	7.9 < pH ≤ 8.0	17	8.9 < pH ≤ 9.0	2.6

4. Additional limits to comply with the expression of limits requirements in ss. NR 106.07 and NR 205.065(7), Wis. Adm. Codes, are included in bold.
5. Bacteria limits apply during the disinfection season of May - September. Additional limit: No more than 10 percent of *E. coli* bacteria samples collected in any calendar month may exceed 410 count/100 mL.
6. This is a technology based effluent limit (TBEL) for phosphorus required in accordance with s. NR 217.04, Wis. Adm. Code.
7. 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<sub>3</sub>), nitrite (NO<sub>2</sub>), and total kjeldahl nitrogen (TKN) (all expressed as N).
8. Two acute WET tests are recommended in the reissued permit. Sampling WET concurrently with any chemical-specific toxic substances is recommended. Tests should be done in rotating quarters, to collect seasonal information about this discharge 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 Benjamin Hartenbower at (715) 225-4705 or Benjamin.Hartenbower@wisconsin.gov or Diane Figiel at Diane.Figiel@wisconsin.gov.

Attachments (2) – Narrative & Map

PREPARED BY: \_\_\_\_\_ Date: \_\_\_\_\_  
 Benjamin Hartenbower, PE,  
 Water Resources Engineer

E-cc:  
 Logan Rubeck, Wastewater Engineer – WCR/Eau Claire  
 Geisa Thielen, Regional Wastewater Supervisor – WCR/Eau Claire  
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**Water Quality-Based Effluent Limitations for  
the Cornell Wastewater Treatment Facility  
WPDES Permit No. WI-0021300**

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**PART 1 – BACKGROUND INFORMATION**

**Facility Description:**

The Cornell Wastewater Treatment Facility consists of headworks, primary clarifier tanks, and Rotating Biological Contactor (RBC) followed by final clarifiers and UV system. Outfall 001 is located at the East bank of the Chippewa River one-quarter mile down stream of the Xcel Dam.

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, 2023, includes the following effluent limitations and monitoring requirements.

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Footnotes
Flow Rate					1,3
CBOD <sub>5</sub>			40 mg/L	25 mg/L	1
TSS			45 mg/L	30 mg/L	1
pH	9.0 s.u.	6.0 s.u.			1
Ammonia Nitrogen	Variable		46 mg/L	46 mg/L	4
Fecal Coliform May - September			<b>656 #/100 mL geometric mean</b>	400 #/100 mL geometric mean	4
Copper	37 µg/L, 0.41 lbs/day		<b>37 µg/L</b>	<b>37 µg/L</b>	4
Phosphorus				6.0 mg/L, 20 lbs/day	
Acute WET					5

Footnotes:

1. These limitations are not being evaluated as part of this review. Because the water quality criteria (WQC), reference effluent flow rates, and receiving water characteristics have not changed, limitations for these water quality characteristics do not need to be re-evaluated at this time.

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

Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L
7.2 < pH ≤ 7.3	>46	7.8 < pH ≤ 7.9	20	8.4 < pH ≤ 8.5	6.4
7.3 < pH ≤ 7.4	46	7.9 < pH ≤ 8.0	17	8.5 < pH ≤ 8.6	5.3
7.4 < pH ≤ 7.5	40	8.0 < pH ≤ 8.1	14	8.6 < pH ≤ 8.7	4.4
7.5 < pH ≤ 7.6	34	8.1 < pH ≤ 8.2	11	8.7 < pH ≤ 8.8	3.7
7.6 < pH ≤ 7.7	29	8.2 < pH ≤ 8.3	9.4	8.8 < pH ≤ 8.9	3.1
7.7 < pH ≤ 7.8	24	8.3 < pH ≤ 8.4	7.8	8.9 < pH ≤ 9.0	2.6

3. Monitoring only.  
 4. Additional limits to comply with the expression of limits requirements are included in bold.  
 5. Acute WET testing required: Jan - March 2020 and July - Sept 2022.

**Receiving Water Information**

- Name: The Chippewa River
- Waterbody Identification Code (WBIC): 2050000
- Classification used in accordance with chs. NR 102 and 104, Wis. Adm. Code: Warm Water Sport Fish (WWSF) community, non-public water supply.  
 Low flows used in accordance with chs. NR 106 and 217, Wis. Adm. Code: the minimum FERC required flow during non-drought conditions, in the Chippewa River  
     7-Q<sub>10</sub> = 400 cfs (cubic feet per second)  
     7-Q<sub>2</sub> = 400 cfs  
     Harmonic Mean Flow = 400 cfs
- Hardness = 49 mg/L as CaCO<sub>3</sub>. This value represents the geometric mean of 540 samples collected in Chippewa River from 04/11/1961 to 03/25/1998.
- % of low flow used to calculate limits in accordance with s. NR 106.06(4)(c)5., Wis. Adm. Code: 25%
- Source of background concentration data: Chloride data is from the Chippewa River. Metals data from the Black River at Hemlock is used for this evaluation because there is no data available for the Chippewa River and the the Black River is within the same ecological landscape so ambient water quality characteristics are expected to be similar. The numerical values are shown in the tables below. If no data is available, the background concentration is assumed to be negligible and a value of zero is used in the computations. Background data for calculating effluent limitations for ammonia nitrogen are described later.
- Multiple dischargers: There are several other dischargers to the Chippewa River however they are not in the immediate vicinity and the mixing zones do not overlap. Therefore, the other dischargers do not impact this evaluation.
- Impaired water status: The Chippewa River is listed as impaired for PCBs and Mercury.

**Effluent Information:**

- Design Flow Rates(s):  
     Annual Average = 0.395 MGD (Million Gallons per Day)  
     Peak daily = 1.310 MGD  
 For reference, the actual average flow from October 2018 to December 2023 was 0.148 MGD.

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- Hardness = 151 mg/L as CaCO<sub>3</sub>. This value represents the geometric mean of 4 effluent samples collected from 03/07/2023 to 03/17/2023.
- Acute dilution factor used in accordance with s. NR 106.06 (3) (c), Wis. Adm. Code: Not applicable – this facility does not have an approved Zone of Initial Dilution (ZID).
- Water Source: Domestic wastewater with water supply from wells
- Additives: Quik-Zyme L
- 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, and hardness. The permit-required monitoring for Copper and Phosphorus from October 2018 to December 2023 is used in this evaluation.

**Chemical Specific Effluent Data at Outfall 001**

	Copper µg/L
1-day P <sub>99</sub>	62
4-day P <sub>99</sub>	41
30-day P <sub>99</sub>	31
Mean	26
Std	11
Sample size	63
Range	4 - 62

**Chemical Specific Effluent Data at Outfall 001**

Sample Date	Chloride mg/L
03/07/2023	157
03/10/2023	198
03/14/2023	224
03/17/2023	140
mean	180

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

The following table presents the average concentrations and loadings at Outfall 001 from October 2018 to December 2023 for all parameters with limits in the current permit to meet the requirements of s. NR 201.03(6):

**Parameter Averages with Limits**

	Average Measurement	Average Mass Discharged
CBOD <sub>5</sub>	16 mg/L*	
TSS	18 mg/L	
pH	7.36 s.u.	
Ammonia Nitrogen	16.1 mg/L	
Fecal Coliform	169#/100 mL	
Copper	26 µg/L	0.0384 lbs/day
Phosphorus	4.15 mg/L	5 lbs/day

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

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

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

1. The maximum effluent concentration exceeds the calculated limit (s. NR 106.05(3), Wis. Adm. Code)
2. If 11 or more detected results are available in the effluent, the upper 99<sup>th</sup> percentile (or P<sub>99</sub>) 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<sub>10</sub>**

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<sub>10</sub> receiving water low flow to determine if more restrictive effluent limitations are needed to protect the receiving stream from discharges which may cause or contribute to an exceedance of the acute water quality standards. The mass balance equation is provided below.

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

Where:

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

Q<sub>s</sub> = average minimum 1-day flow which occurs once in 10 years (1-day Q<sub>10</sub>)  
 if the 1-day Q<sub>10</sub> flow data is not available = 80% of the average minimum 7-day flow which occurs once in 10 years (7-day Q<sub>10</sub>).

Q<sub>e</sub> = 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

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



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If the receiving water is effluent dominated under low stream flow conditions, the 1-Q<sub>10</sub> method of limit calculation produces the most stringent daily maximum limitations and should be used while making reasonable potential determinations. This is not the case for the Cornell Wastewater Treatment Facility and the limits are set based on two times the acute toxicity criteria.

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

**Daily Maximum Limits based on Acute Toxicity Criteria (ATC)**

RECEIVING WATER FLOW = 320 cfs, (1-Q<sub>10</sub> (estimated as 80% of 7-Q<sub>10</sub>)), as specified in s. NR 106.06 (3) (bm), Wis. Adm. Code.

SUBSTANCE	REF. HARD. mg/L	ATC	MEAN BACK-GRD.	MAX. EFFL. LIMIT**	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	1-day P <sub>99</sub>	1-day MAX. CONC.
Arsenic		339.8		679.6	135.9	<1		
Cadmium	151	16.59	0.009	33.2	6.6	<2		
Chromium (+3)	151	2532.88	0.622	5065.8	1013.2	<3		
Copper	151	22.95	1.265	45.9			<b>62</b>	<b>62</b>
Lead	151	159.67	0.178	319.3	63.9	<1		
Nickel	151	666.51		1333	266.6	<8		
Zinc	151	173.04	1.710	346	69	55		
Chloride		757	7.100	1514	303	180		224

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

**Weekly Average Limits based on Chronic Toxicity Criteria (CTC)**

RECEIVING WATER FLOW = 100.0 cfs (¼ of the 7-Q<sub>10</sub>), as specified in s. NR 106.06 (4) (c), Wis. Adm. Code

SUBSTANCE	REF. HARD. mg/L	CTC	MEAN BACK-GRD.	WEEKLY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	4-day P <sub>99</sub>
Arsenic		152.2		25030	5006	<1	
Cadmium	49	1.41	0.009	230.4	46.1	<2	
Chromium (+3)	49	74.07	0.622	12079.5	2415.9	<3	
Copper	49	5.66	1.265	724			41
Lead	49	14.15	0.178	2297.9	459.6	<1	
Nickel	49	28.71		4721.5	944.3	<8	
Zinc	49	64.9	1.710	10393.6	2078.7	55	
Chloride		395	7.100	63799	12760	180	

**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 = 100.0 cfs (¼ of Harmonic Mean), as specified in s. NR 106.06 (4), Wis. Adm. Code.

SUBSTANCE	HTC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Cadmium	370	0.009	60847	12169	<2
Chromium (+3)	3818000	0.622	627888055	125577611	<3
Lead	140	0.178	22994.6	4598.9	<1
Nickel	43000		7071553	1414311	<8

**Monthly Average Limits based on Human Cancer Criteria (HCC)**

RECEIVING WATER FLOW = 100.0 cfs (¼ of Harmonic Mean), as specified in s. NR 106.06 (4), Wis. Adm. Code.

SUBSTANCE	HCC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Arsenic	13.3		2187.2	437.4	<1

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

**Conclusions and Recommendations:** Based on a comparison of the effluent data and calculated effluent limitations, limits are required for Copper.

Copper – Considering available effluent data from the current permit term (October 2018 to December 2023), the 30-day P<sub>99</sub> concentration is 31.0 µg/L, the 4-day P<sub>99</sub> concentration is 41.0 µg/L, and the 1-day P<sub>99</sub> concentration is 62.0 µg/L. The 1-day P<sub>99</sub> of the effluent data exceeds the calculated daily maximum limit, therefore concentration and mass limits, as well as monthly monitoring, are required.

The current permit contains limits of 37 µg/L which were evaluated for the Cornell Wastewater Treatment Facility pursuant to chs. NR 105 and 106, Wis. Adm. Code. At the time of permit issuance there was reasonable potential to exceed the daily maximum total recoverable limit of 37 µg/L using an effluent hardness of 122 mg/L. Weekly and monthly average limits were also included in the permit to meet the expression of limits requirements.

Information required for the calculation of dissolved-based limits includes the conversion factors from ss. NR 105.05 (5) (for acute criteria) or NR 105.06 (8) (for chronic criteria), Wis. Adm. Code. Background data is also required to translate the dissolved criteria into a site-specific number (the “translator”) from which a total recoverable limit may be calculated based on the fraction of the discharged metal which would be dissolved in the receiving water. To perform this translation the following background data is required:

$$\text{Translator} = \frac{M_{tr}}{M_d}$$

Where:

$M_d$ : Dissolved metals concentration in the receiving water ( $\mu\text{g/L}$ )

$M_T$ : Total Recoverable metals concentration in the receiving water ( $\mu\text{g/L}$ )

This type of metals data is limited for the Chippewa River. However, the nearest site with such data is in a nearby basin, namely the Chippewa at Durand. Use of a data from nearby basins may be considered per s. NR 106.06(4)(e)1, Wis. Adm. Code. There are data on total recoverable and dissolved copper such that a translator may be estimated at the site:

Total Recoverable Copper ( $\mu\text{g/L}$ )	Dissolved Copper ( $\mu\text{g/L}$ )	Translator
1.210	1.099	1.101

Multiplying the translator, the conversion factor from ch. NR 105, Wis. Adm. Code, and the applicable criterion will give an indication of the amount of “relief” potentially available to the recommended permit limits if the dissolved fraction is considered from the available data:

$$\text{Translated Criteria} = \text{NR 105 Criterion} * \text{Conversion Factor} * \text{Translator}$$

$$\text{Copper (Acute)} = 22.95 \mu\text{g/L} * 0.960 * 1.10 = 24.26 \mu\text{g/L}$$

Effluent limits calculated based on the translated criteria are as follows:

$$\text{Daily Maximum Limit: } 2 * \text{ATC} = 2 * 24.26 = 48.51 \mu\text{g/L}$$

Using the dissolved-based approach for copper limits, the daily maximum limit is 49  $\mu\text{g/L}$ . The acute mass limitation would be 0.530 lbs/day and is based on the concentration limit and the peak daily design flow rate of 1.310 MGD ( $49 \mu\text{g/L} * 1.310 \text{ MGD} * 8.34/1000$ ) in accordance with s. NR 106.07(2)(a), Wis. Adm. Code.

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

**Antidegradation:**

The calculated daily maximum limit of 49  $\mu\text{g/L}$  is less restrictive than the limit of 37  $\mu\text{g/L}$  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 of 37  $\mu\text{g/L}$  and 0.41 lbs/day must be continued in the reissued permit.

**Expression of Limits:**

Revisions to ch. NR 106, Wis. Adm. Code, in September 2016 aligned Wisconsin’s WQBELs with 40 CFR § 122.45(d), which specifies that effluent limits for continuous dischargers must be expressed as weekly and monthly averages for publicly owned treatment works and as daily maximums and monthly averages for all other dischargers, unless shown to be impracticable. Because a daily maximum copper limit is necessary for the Cornell Wastewater Treatment Facility, weekly and monthly average limits are also required under this code revision.

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The methods for calculating limitations for municipal treatment facilities to conform to 40 CFR 122.45(d) are specified in s. NR 106.07(3), Wis. Adm. Code, and are as follows:

Whenever a daily maximum limitation is determined necessary to protect water quality, a weekly and monthly average limitation shall also be included in the permit and set equal to the daily maximum limit unless a more restrictive limit is already determined necessary to protect water quality.

Therefore, **monthly and weekly average limits of 37 µg/L** are recommended in the permit.

PFOS and PFOA

The need for PFOS and PFOA monitoring is evaluated in accordance with s. NR 106.98, Wis. Adm. Code. Monitoring of the water supply produced a PFOS result of 0.4 ng/L and a PFOA result of 0.0 ng/L. These results are less than one fifth of the respective criteria for each substance. Based on the annual design flow and lack of nondomestic contributions, it is unlikely that the effluent will contain PFOS or PFOA. **Therefore, monitoring is not recommended.** If information becomes available that indicates PFOS or PFOA may be present in the effluent, the monitoring requirements may change.

Mercury – The permit application did not require monitoring for mercury because the Cornell Wastewater Treatment Facility is categorized as a minor facility as defined in s. NR 200.02(8), Wis. Adm. Code. In accordance with s. NR 106.145(3)(a)3., Wis. Adm. Code, a minor municipal discharger shall monitor, and report results of influent and effluent mercury monitoring once every three months if, there are two or more exceedances in the last five years of the high-quality sludge mercury concentration of 17 mg/kg specified in s. NR 204.07(5). A review of the past five years of sludge characteristics data reveals that all the sample results are within expected analytical ranges and well below the 17 mg/kg level. The average concentration in the sludge from 2019 to 2023 was 0.55 mg/kg, with a maximum reported concentration of 1.90 mg/kg. **Therefore, no mercury monitoring is recommended at Outfall 001.**

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

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

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

**Daily Maximum Limits based on Acute Toxicity Criteria (ATC):**

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

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

Where:

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

The effluent pH data was examined as part of this evaluation. A total of 1918 sample results were reported from October 2018 to December 2023. The maximum reported value was 8.00 s.u. (Standard pH Units). The effluent pH was 7.90 s.u. or less 99% of the time. The 1-day P<sub>99</sub>, calculated in accordance with s. NR 106.05(5), Wis. Adm. Code, is 8.06 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 8.04 s.u. Therefore, a value of 8.06 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 8.06 s.u. into the equation above yields an ATC = 7.50 mg/L.

**Daily Maximum Ammonia Nitrogen Effluent Limitations Calculation Method**

In accordance with s. NR 106.32(2), Wis. Adm. Code daily maximum ammonia limitations are calculated using the 1-Q<sub>10</sub> 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<sub>10</sub> (estimated as 80 % of 7-Q<sub>10</sub>) and the 2×ATC approach are shown below.

**Daily Maximum Ammonia Nitrogen Determination**

	Ammonia Nitrogen Limit mg/L
2×ATC	15.00
1-Q <sub>10</sub>	3895

The 2×ATC method yields the most stringent limits for the Cornell Wastewater Treatment Facility.

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 table has been expanded from the table in the current permit to included ammonia nitrogen limits throughout the pH range.

**Daily Maximum Ammonia Nitrogen Limits – WWSF**

Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L
6.0 ≤ pH ≤ 6.1	108	7.0 < pH ≤ 7.1	66	8.0 < pH ≤ 8.1	14
6.1 < pH ≤ 6.2	106	7.1 < pH ≤ 7.2	59	8.1 < pH ≤ 8.2	11
6.2 < pH ≤ 6.3	104	7.2 < pH ≤ 7.3	52	8.2 < pH ≤ 8.3	9.4
6.3 < pH ≤ 6.4	101	7.3 < pH ≤ 7.4	46	8.3 < pH ≤ 8.4	7.8
6.4 < pH ≤ 6.5	98	7.4 < pH ≤ 7.5	40	8.4 < pH ≤ 8.5	6.4
6.5 < pH ≤ 6.6	94	7.5 < pH ≤ 7.6	34	8.5 < pH ≤ 8.6	5.3
6.6 < pH ≤ 6.7	89	7.6 < pH ≤ 7.7	29	8.6 < pH ≤ 8.7	4.4
6.7 < pH ≤ 6.8	84	7.7 < pH ≤ 7.8	24	8.7 < pH ≤ 8.8	3.7
6.8 < pH ≤ 6.9	78	7.8 < pH ≤ 7.9	20	8.8 < pH ≤ 8.9	3.1
6.9 < pH ≤ 7.0	72	7.9 < pH ≤ 8.0	17	8.9 < pH ≤ 9.0	2.6

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

The ammonia limit calculation also warrants evaluation of weekly and monthly average limits based on chronic toxicity criteria for ammonia, since those limits relate to the assimilative capacity of the receiving water.

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

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

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

Where:

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

E = 0.854,

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

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

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

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

The 4-day criterion is equal to the 30-day criterion multiplied by 2.5. The 4-day criteria are used in a mass-balance equation with the 7-Q<sub>10</sub> (4-Q<sub>3</sub>, if available) to derive weekly average limitations. And the 30-day criteria are used with the 30-Q<sub>5</sub> (estimated as 85% of the 7-Q<sub>2</sub> if the 30-Q<sub>5</sub> is not available) to derive monthly average limitations. The stream flow value is further adjusted to temperature; 100% of the flow is used if the Temperature ≥ 16 °C, 25% of the flow is used if the Temperature < 11 °C, and 50% of the flow is used if the Temperature ≥ 11 °C but < 16 °C.

Section NR 106.32 (3), Wis. Adm. Code, provides a mechanism for less stringent weekly average and monthly average effluent limitations when early life stages (ELS) of critical organisms are absent from the receiving water. This applies only when the water temperature is less than 14.5 °C, during the winter and spring months. Based on a review of the DNR Fisheries database, burbot, an early spawning species, are believed to be present in Chippewa River. So “ELS Absent” criteria apply from October through December, and “ELS Present” criteria will apply from January through September for a WWSF classification.

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

**Weekly and Monthly Ammonia Nitrogen Limits – WWSF**

		<b>April &amp; May</b>	<b>June-September</b>	<b>October-March</b>
<b>Effluent Flow</b>	Qe (MGD)	0.395	0.395	0.395
<b>Background Information</b>	7-Q <sub>10</sub> (cfs)	400	400	400
	7-Q <sub>2</sub> (cfs)	400	400	400
	Ammonia (mg/L)	0.07	0.04	0.08
	Temperature (°C)	14.4	20.6	10.0
	pH (s.u.)	7.37	7.61	7.46
	% of Flow used	50	100	25
	Reference Weekly Flow (cfs)	200	400	100
	Reference Monthly Flow (cfs)	170	340	85
<b>Criteria mg/L</b>	4-day Chronic			
	Early Life Stages Present	12.09	6.69	11.25
	Early Life Stages Absent	12.15	6.69	15.05
	30-day Chronic			
	Early Life Stages Present	4.84	2.68	4.50
	Early Life Stages Absent	4.86	2.68	6.02
<b>Effluent Limitations mg/L</b>	Weekly Average			
	Early Life Stages Present	3942.77	4353.91	1836.32
	Early Life Stages Absent	3961.79	4353.91	2461.80
	Monthly Average			
	Early Life Stages Present	1329.60	1467.39	618.36
	Early Life Stages Absent	1336.07	1467.39	831.25

**Effluent Data**

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

**Ammonia Nitrogen Effluent Data**

<b>Ammonia Nitrogen mg/L</b>	
1-day P <sub>99</sub>	44.30
4-day P <sub>99</sub>	28.10
30-day P <sub>99</sub>	19.90
Mean	16.10
Std	8.30
Sample size	274
Range	2 - 44.5

Based on this comparison, daily limits are required year-round.

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The permit also currently has weekly average and monthly average limits of 46 mg/L. Where there are existing ammonia nitrogen limits in the permit, the limits must be retained regardless of reasonable potential, consistent with s. NR 106.33(1)(b), Wis. Adm. Code:

- (b) If a permittee is subject to an ammonia limitation in an existing permit, the limitation shall be included in any reissued permit. Ammonia limitations shall be included in the permit if the permitted facility will be providing treatment for ammonia discharges.

**Conclusions and Recommendations**

In summary, the recommendation is to expand the variable daily maximum ammonia nitrogen limit table throughout the pH range. These limits apply year-round. 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
Variable	46	46

**PART 4 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR BACTERIA**

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

1. The geometric mean of *E. coli* bacteria in effluent samples collected in any calendar month may not exceed 126 counts/100 mL.
2. No more than 10 percent of *E. coli* bacteria samples collected in any calendar month may exceed 410 counts/100 mL.

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

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

**Effluent Data**

The Cornell Wastewater Treatment Facility has monitored effluent *E. coli* from May 2022 to September 2022 and a total of 22 results are available. A geometric mean of 126 counts/100 mL was never exceeded, with a maximum monthly geometric mean of 34 counts/100 mL. Effluent data never exceeded 410 counts/100 mL. The maximum reported value was 410 counts/100 mL. Based on this effluent data it appears that the facility can meet new *E. coli* limits and a compliance schedule is not needed in the reissued permit.



**PART 5 – PHOSPHORUS****Technology-Based Effluent Limit**

Subchapter II of Chapter NR 217, Wis. Adm. Code, requires municipal wastewater treatment facilities that discharge greater than 150 pounds of Total Phosphorus per month to comply with a monthly average limit of 1.0 mg/L, or an approved alternative concentration limit.

Because the Cornell Wastewater Treatment Facility does not currently have an existing technology-based limit, the need for this limit in the reissued permit is evaluated. The data demonstrates that the annual monthly average phosphorus loading is greater than 150 lbs/month, which is the threshold for municipalities in accordance to s. NR 217.04(1)(a)1, Wis. Adm. Code, and therefore a technology-based limit is required.

**Annual Average Mass Total Phosphorus Loading**

Month	Monthly Avg. mg/L	Total Flow MG/month	Total Phosphorus lb./mo.
Jan 2023	3.64	4.24	128.48
Feb 2023	3.49	4.18	121.75
Mar 2023	3.42	7.17	204.77
Apr 2023	1.42	14.70	174.37
May 2023	3.20	6.52	173.87
Jun 2023	4.04	4.05	136.61
Jul 2023	4.43	4.50	166.14
Aug 2023	4.66	4.52	175.75
Sep 2023	4.48	4.54	169.65
Oct 2023	4.89	5.83	237.54
Nov 2023	4.45	4.08	151.48
Dec 2023	4.64	4.03	155.67
Average =			<b>166.34</b>

Total P (lbs/month) = Monthly average (mg/L) × total flow (MG/month) × 8.34 (lbs/gallon)  
Where total flow is the sum of the actual (not design) flow (in MGD) for that month

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

**Water Quality-Based Effluent Limits (QBEL)**

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 QBELs for phosphorus, based on the applicable standards in ch. NR 102, Wis. Adm. Code.

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

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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.

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

Where:

WQC = 0.100 mg/L for the Chippewa River.

Qs = 100% of the 7-Q<sub>2</sub> of 400 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 = 0.395 MGD = 0.612 cfs

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

Section NR 217.13(2)(d), Wis. Adm. Code, specifies that the background phosphorus concentration used in the limit calculation formula shall be calculated using the procedures specified in s. NR 102.07(1)(b) to (c), Wis. Adm. Code. The median shall be calculated with at least one year of data using samples collected once per month during the period of May through October. All representative data from the most recent 5 years shall be used, but data from the most recent 10 years may be used if representative of current conditions.

The following data were considered in estimating the background phosphorus concentration:

SWIMS ID	093051
Station Name	Monitoring station at Chippewa Tailrace
Waterbody	Chippewa River
Sample Count	9
First Sample	06/03/1999
Last Sample	06/06/2001
Mean	0.048 mg/L
Median	0.047 mg/L

Substituting a median value of 0.047 mg/L into the limit calculation equation above, the calculated limit is 35 mg/L.

**Effluent Data**

The following table summarizes effluent total phosphorus monitoring data from October 2018 to December 2023.

	<b>Phosphorus mg/L</b>
1-day P <sub>99</sub>	8.48
4-day P <sub>99</sub>	6.06
30-day P <sub>99</sub>	4.78
Mean	4.15
Std	1.41
Sample size	275
Range	0.8 - 10.4

**Reasonable Potential Determination**

Since the 30-day P<sub>99</sub> of reported effluent total phosphorus data is less than the calculated WQBEL, the discharge does not have reasonable potential to cause or contribute to an exceedance of the water quality criterion. **Therefore, a WQBEL is not required.**

**PART 6 – WATER QUALITY-BASED EFFLUENT LIMITATIONS  
FOR THERMAL**

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

Due to the amount of upstream flow available for dilution in the limit calculation ( $Q_s:Q_e >20:1$ ), the lowest calculated limitation is 120° F (s. NR 106.55(6)(a), Wis. Adm. Code). For biological treatment systems of domestic waste, there is no reasonable potential for the discharge to exceed this limit. **Therefore, temperature limits and monitoring are not recommended.**

**PART 7 – WHOLE EFFLUENT TOXICITY (WET)**

WET testing is used to measure, predict, and control the discharge of toxic materials that may be harmful to aquatic life. In WET tests, organisms are exposed to a series of effluent concentrations for a given time and effects are recorded. Decisions below related to the selection of representative data and the need for WET limits were made according to ss. NR 106.08 and 106.09, Wis. Adm. Code. WET monitoring frequency and toxicity reduction evaluation (TRE) recommendations were made using the best professional judgment of staff familiar with the discharge after consideration of the guidance in the *Whole Effluent Toxicity (WET) Program Guidance Document (2022)*.

- Acute tests predict the concentration that causes lethality of aquatic organisms during a 48 to 96-hour exposure. To assure that a discharge is not acutely toxic to organisms in the receiving water, WET tests must produce a statistically valid LC50 (Lethal Concentration to 50% of the test organisms) greater than 100% effluent, according to s. NR 106.09(2)(b), Wis. Adm Code.
- Chronic testing is usually not recommended where the ratio of the 7-Q<sub>10</sub> to the effluent flow exceeds 100:1. For the Cornell Wastewater Treatment Facility, that ratio is approximately 654:1. With this amount of dilution, there is believed to be little potential for chronic toxicity effects in the Chippewa River associated with the discharge from the Cornell Wastewater Treatment Facility, so the need for chronic WET testing will not be considered further.
- According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual*, 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.
- 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 <sub>50</sub> %				Footnotes  or Comments
	<i>C. dubia</i>	Fathead minnow	Pass or Fail?	Used in RP?	
04/20/2004	>100	>100	Pass	No	1
07/26/2005	>100	>100	Pass	Yes	
10/30/2007	>100	>100	Pass	Yes	
08/18/2009	>100	>100	Pass	Yes	
03/18/2020	>100	>100	Pass	Yes	
09/28/2022	>100	>100	Pass	Yes	

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Footnotes:

1. *Data Not Representative.* Significant changes were made to WET test methods in 2004 and these changes were assumed to be fully implemented by certified labs by no later than June 2005.
- According to s. NR 106.08, Wis. Adm. Code, WET reasonable potential is determined by multiplying the highest toxicity value that has been measured in the effluent by a safety factor, to predict the likelihood (95% probability) of toxicity occurring in the effluent above the applicable WET limit. The safety factor used in the equation changes based on the number of toxicity detects in the dataset. The fewer detects present, the higher the safety factor, because there is more uncertainty surrounding the predicted value. **WET limits must be given, according to s. NR 106.08(6), Wis. Adm. Code, whenever the applicable Reasonable Potential equation results in a value greater than 1.0.**

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

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

Acute 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**

	<b>Acute</b>	<b>Chronic</b>
<b>AMZ/IWC</b>	Not Applicable. <b>0 Points</b>	Chronic WET not evaluated.
<b>Historical Data</b>	Five tests used to calculate RP. No tests failed. <b>0 Points</b>	
<b>Effluent Variability</b>	Copper, TSS, CBOD5, and Fecal Coliform exceedances. NONs sent in 2019, 2020, and 2024 <b>5 Points</b>	
<b>Receiving Water Classification</b>	Warm Water Sport Fish (WWSF) (5 pts) <b>5 Points</b>	
<b>Chemical-Specific Data</b>	Reasonable potential for Ammonia and Copper limits based on ATC; (6 pts) Zinc and Chloride detected. (2 pts) Additional Compounds of Concern: none <b>8 Points</b>	

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	Acute	Chronic
<b>Additives</b>	No biocides and one water quality conditioner used. P chemicals not in use. <b>1 Points</b>	
<b>Discharge Category</b>	No Industrial Contributors <b>0 Points</b>	
<b>Wastewater Treatment</b>	Secondary or Better <b>0 Points</b>	
<b>Downstream Impacts</b>	No impacts known. <b>0 Points</b>	
<b>Total Checklist Points:</b>	<b>19 Points</b>	
<b>Recommended Monitoring Frequency (from Checklist):</b>	2 tests during permit term	
<b>Limit Required?</b>	No	
<b>TRE Recommended? (from Checklist)</b>	No	

- After consideration of the guidance provided in the Department's WET Program Guidance Document (2022) and other information described above, **two acute 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).

Attachment #2

