Public Noticed USGS-Ecosystems Mission Area, UMESC
Draft Permit Fact Sheet

General Information

Permit Number:	WI-0045756-08-0
Permittee Name:	USGS - Ecosystems Mission Area, UMESC
Address:	2630 Fanta Reed Rd
City/State/Zip:	La Crosse WI 54603-1223
Discharge Location:	Discharge is from the wastewater treatment system to the backwaters (wetlands) of the Black River on the west bank of the river 0.1 miles north of Interstate 90. NW1/4, NW1/4, Section 16, T16N R7W, Section Town of Campbell, La Crosse County, WI
Receiving Water:	the backwaters (wetlands) of the Black River, located in the Lower Black River Watershed of the Black River Basin in La Crosse County
Stream Flow ($Q_{7,10}$):	0 cfs
Stream Classification:	Warmwater Sportfish, Non-Public Water Supply
Discharge Type:	Continuous, Existing

Facility Description

United States Geological Survey, Ecosystems Mission Area, Upper Midwest Environmental Sciences Center conducts research on methods to control and manage aquatic and terrestrial organisms, on the effects of contaminants on aquatic ecosystems, on large river ecology, and on chemicals showing potential for use in fisheries as toxicants, anesthetics, and therapeutants as part of the chemical registration process. The Center includes facilities for rearing fish and other aquatic organisms, laboratories, mapping and geographical information systems data acquisition, and office space. The facility produces about 1200 pounds of cold-water fish and about 1450 pounds of warm-water fish per year. Most fish are raised to fingerling or bio-assay size before being used for research.

All sanitary wastewater is discharged to the City of La Crosse wastewater treatment plant. Nonchemical laden wastewater (fish rearing pond, fish holding tank, nonchemical laboratory and oil & water separator aquarium wastewater) containing suspended fish fecal matter & used food, flows by gravity to a lift station located adjacent to the settling ponds and is pumped into large (stabilization) pond where approximately five days of detention time is provided. The wastewater then flows through a control manhole to the small (quiescent) pond for one day of polishing and is discharged via sample point 001 to the backwaters (wetlands) of the Black River. The annual average discharge at sample point 001 in 2023 was 0.600 million gallons per day (MGD). Sample point 002 is located at a storm drain and discharges two sources of air conditioning cooling water, parking lot and roof top storm water, and occasionally when the hydraulic capacity of the treatment system is exceeded, overflows from the fish rearing ponds, and discharges to the backwaters of the Black River. The annual average discharge at sample point 002 in 2023 was 0.115 million gallons per day (MGD).

The wastewater system collects the process wastewater from the research lab that involves the use of various chemicals. This waste stream flows to a wet well in the treatment building where it is pumped through granular activated carbon filters. Samples are analyzed before and after activated carbon adsorption. The treated wastewater effluent then flows to the small pond where it combines with wastewater flow from the large pond before discharge via sample point 001. One day of retention time is provided before discharge via sample point 001 to the backwaters (wetlands) of the Black River. Sample point 005 is a ‘virtual’ sample point used to calculate composite values to determine compliance with total phosphorus discharges from 001 and 002. Operational changes since the last permit issuance is the installation of a temperature and flow measurement station at sample point 002.

Proposed changes for sample point 001 include: 1) new daily flow monitoring with a continuous sample type, 2) increased dissolved oxygen and pH monitoring to the 5/week minimum frequency for this type of facility, 3) increased ammonia nitrogen monitoring from quarterly to monthly sample frequency so sufficient data is available for analysis at the next permit reissuance, 4) total residual chlorine is now specified as total halogens as residual chlorine and a new monthly average limit, 5) new total recoverable arsenic monitoring, 6) monthly monitoring for PFOS and PFOA has been added in accordance with s. NR 106.98(2), Wis. Adm. Code, 7) increased temperature monitoring along with a temperature compliance schedule to determine site-specific limit criteria, and 8) a new Chronic WET testing limit.

Proposed changes for sample point 002 include: 1) increased daily flow monitoring from weekly to daily, 2) decreased BOD/TSS monitoring from weekly to monthly, 3) added dissolved oxygen monitoring, and 4) increased temperature monitoring along with a temperature compliance schedule to determine site-specific limit criteria for potential limits.

Proposed changes for combined sample point 005 (001+002) includes increased daily flow monitoring from weekly to daily.

In addition, new requirements include the submittal of an updated land application management plan, and 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 at sludge sample point 003 (stabilization pond).

Substantial Compliance Determination

Enforcement During Last Permit: There have been no formal enforcement actions taken at this facility during the previous permit term.

After a desk top review of all discharge monitoring reports, compliance schedule items, review of a previous inspection performed by Julia Stephenson on June 22, 2022 and a site visit by Katie Jo Jerzak on August 7, 2024, this facility has been found to be in substantial compliance with their current permit.

Compliance determination entered by Katie Jo Jerzak, PE, Wastewater Compliance Engineer on August 27, 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	0.031 MGD (2023)	Representative samples of influent to the activated carbon filtration system shall be collected from the chem-wastewater wet well prior to that system.
101	0.031 MGD (2023)	Representative samples of treated effluent from the activated carbon filtration system shall be collected prior to discharge to the small (quiescent) pond.
103	0.521 MGD (2023)	Representative samples shall be collected from the nonchemical wet well prior to discharge into the large (stabilization) pond.
001	0.600 MGD (2023)	Representative samples of effluent from the small (quiescent) pond shall be collected at the meter building prior to discharge to the backwaters (wetlands) of the Black River.
002	0.115 MGD (2023)	Representative flow and temperature samples shall be collected from the flow meter, and grab samples shall be collected from the concrete access pit following the combination of inflows and prior to discharge to the backwaters (wetlands) of the Black River. Discharge is limited to storm drain bypass of fish rearing pond, excess environmental chamber chillers and process water chamber chillers and parking lot/roof top storm water.
005	0.715 MGD (2023)	The permittee shall calculate the combined flow and phosphorus results from Outfall 001 and Outfall 002 and report it at Outfall 005.

Sample Point Designation		
Sample Point Number	**Discharge Flow, Units, and Averaging Period**	**Sample Point Location, Waste Type/Sample Contents and Treatment Description (as applicable)**
003	No sludge land applied	In the event of pond sludge removal, representative samples of sludge shall be collected per application from the large (stabilization) pond per the list below. In the event of pond sludge removal, the analysis shall be conducted prior to land application of the sludge. The permittee is required to submit form 3400-52 'Other Methods of Disposal or Distribution Report' and 'Land Application Report Form' 3400-55 by January 31 following each year the sludge is hauled.
004	No sludge land applied	In the event of pond sludge removal, representative samples of sludge shall be collected per application from the small (quiescent) pond per the list below, except once in 2026 for PFAS. In the event of pond sludge removal, the analysis shall be conducted prior to land application of the sludge. The permittee is required to submit form 3400-52 'Other Methods of Disposal or Distribution Report' and 'Land Application Report Form' 3400-55 by January 31 following each year the sludge is hauled.

1 Influent – Monitoring Requirements

Sample Point Number: 701- INFLUENT

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Monthly	Total Daily	
BOD5, Total		mg/L	Monthly	24-Hr Flow Prop Comp	
Suspended Solids, Total		mg/L	Monthly	24-Hr Flow Prop Comp	

Changes from Previous Permit:

None

Explanation of Limits and Monitoring Requirements

Flow, BOD, and TSS are monitored for comparisons to removal efforts at sample points 001 and 002.

2 Inplant - Monitoring and Limitations

Sample Point Number: 101- EFFLUENT PRIOR TO SMALL POND

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Estimated	
BOD5, Total		mg/L	Monthly	24-Hr Flow Prop Comp	
Suspended Solids, Total		mg/L	Monthly	24-Hr Flow Prop Comp	

Changes from Previous Permit:

None

Explanation of Limits and Monitoring Requirements

Flow, BOD, and TSS are monitored for comparisons to removal efforts at sample points 001 and 002.

Sample Point Number: 103- EFFLUENT TO LARGE POND

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Estimated	
BOD5, Total		mg/L	Monthly	24-Hr Flow Prop Comp	
Suspended Solids, Total		mg/L	Monthly	24-Hr Flow Prop Comp	

Changes from Previous Permit:

None

Explanation of Limits and Monitoring Requirements

Flow, BOD, and TSS are monitored for comparisons to removal efforts at sample points 001 and 002.

3 Surface Water - Monitoring and Limitations

Sample Point Number: 001- EFFLUENT to BACKWATERS

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Continuous	
BOD5, Total	Daily Max	40 mg/L	Monthly	24-Hr Flow Prop Comp	
BOD5, Total	Monthly Avg	20 mg/L	Monthly	24-Hr Flow Prop Comp	
Suspended Solids, Total	Daily Max	40 mg/L	Weekly	24-Hr Flow Prop Comp	
Suspended Solids, Total	Monthly Avg	20 mg/L	Weekly	24-Hr Flow Prop Comp	
pH Field	Daily Max	9.75 su	5/Week	Grab	
pH Field	Daily Min	6.0 su	5/Week	Grab	
Dissolved Oxygen		mg/L	5/Week	Grab	
Nitrogen, Ammonia (NH3-N) Total		mg/L	Monthly	24-Hr Flow Prop Comp	
Halogen, Total Residual as Cl2	Daily Max	19 ug/L	5/Week	Grab	See Total Halogen footnote in permit.
Halogen, Total Residual as Cl2	Monthly Avg	7.3 ug/L	5/Week	Grab	See Total Halogen footnote in permit.
Halogen, Total Residual as Cl2	Weekly Avg	7.3 ug/L	5/Week	Grab	See Total Halogen footnote in permit.
Arsenic, Total Recoverable		ug/L	Quarterly	24-Hr Flow Prop Comp	Sample concurrently with WET tests.
PFOS		ng/L	Monthly	Grab	Monitoring only. See PFOS/PFOA Minimization Plan Determination of Need schedule.
PFOA		ng/L	Monthly	Grab	Monitoring only. See PFOS/PFOA Minimization Plan Determination of Need schedule.
Temperature Maximum		deg F	Daily	Continuous	See Temperature footnote in permit and Compliance Schedule Section.

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Phosphorus, Total		mg/L	Weekly	24-Hr Flow Prop Comp	Limits apply at Sample Point 005. See Phosphorus footnote in permit.
Acute WET		TUa	See Listed Qtr(s)	24-Hr Flow Prop Comp	See WET footnote in permit.
Chronic WET	Monthly Avg	1.0 TUc	See Listed Qtr(s)	24-Hr Flow Prop Comp	See WET footnote in permit.

Changes from Previous Permit

Proposed changes for sample point 001 include: 1) new daily flow monitoring with a continuous sample type, 2) increased dissolved oxygen and pH monitoring to the 5/week minimum frequency for this type of facility, 3) increased ammonia nitrogen monitoring from quarterly to monthly sample frequency so sufficient data is available for analysis at the next permit reissuance, 4) total residual chlorine is now specified as total halogens as residual chlorine and a new monthly average limit, 5) new total recoverable arsenic monitoring, 6) monthly monitoring for PFOS and PFOA has been added in accordance with s. NR 106.98(2), Wis. Adm. Code, 7) increased temperature monitoring along with a temperature compliance schedule to determine site-specific limit criteria, and 8) a new Chronic WET testing limit.

Explanation of Limits and Monitoring Requirements

Limits were determined using chs. NR 102, 104, 105, 106, 207, 210, 212 and 217 of the Wisconsin Administrative Code (where applicable). See memo from Benjamin Hartenbower to Holly Heldstab titled "Water Quality-Based Effluent Limitations for the Upper Midwest Environmental Center (permitted under United States Geological Survey), (WI-00045756)" dated April 15, 2024 for more information. The additives information in the WQBEL memo was based on information available at that time. Because the permittee submitted additional data after the memo was completed, the additives information in the WQBEL is no longer accurate. Attachment #1 - Part 8 - Additive Review (Page 22 of 25) of the WQBEL memo is outdated and should be disregarded. A new document, titled "Updated Additive Review for the Upper Midwest Environmental Science Center (permitted as United States Geological Survey)", dated November 14, 2024, will replace these pages of the WQBEL memo.

Monitoring Frequencies- The Monitoring Frequencies for Individual Wastewater Permits (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 fairness and consistency in permits issued across the state. Guidance and requirements in administrative code were considered when determining the appropriate monitoring frequencies for pollutants that have final effluent limits in effect during this permit term. Changes include increased dissolved oxygen and pH monitoring to the 5/week minimum frequency for this type of facility.

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 daily maximum and monthly average limits whenever practicable. Minor changes have been made to Total Halogens as Residual Chlorine to include the 7.3 mg/L monthly average. In addition, potential temperature limits with both these limit expressions are included in the 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. It was determined no limits are needed, however, increased

ammonia nitrogen monitoring from quarterly to monthly sample frequency is required so sufficient data is available for analysis at the next permit reissuance.

pH - The daily maximum pH of 9.75 su was given due to algae interference, per NR 102.04(4)(c).

Total Recoverable Arsenic - Based on a comparison of the effluent data and calculated effluent limitations for arsenic, quarterly monitoring is required to ensure enough data for effluent limit calculations for the next permit term.

Total Halogen as Residual Chlorine – Because chlorinated compounds are used as additives at Outfall 001, effluent limitations are recommended to assure proper de-chlorination. In order to not exceed water quality criteria specified in ch. NR 105, Wis. Adm. Code, a daily maximum limit of 19 µg/L (19.03, rounded to two significant figures) is 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 is included in the permit because it is more restrictive than the daily maximum limit. Because halogenated compounds other than chlorine are included in the list of additives, the limits are expressed as Total Halogen as Residual Chlorine limitations, which use the same analytical method.

PFOS and PFOA – NR 106 Subchapter VIII – Permit Requirements for PFOS and PFOA Dischargers became effective on August 1, 2022. At the first reissuance of a WPDES permit after August 1, 2022, the new rule requires WPDES permits for industrial dischargers to be evaluated on a case-by-case basis to determine if monitoring is required pursuant to s. NR 106.98(2)(d), Wis. Adm. Code. The department evaluated the need for PFOS and PFOA monitoring taking into consideration industry type and other potential sources of PFOS or PFOA. Based on information available at the time the proposed permit was drafted, it was identified that previous monitoring produced a PFOS result of 95.6 ng/L and a PFOA result of 17.7 ng/L. These results are greater than one fifth of the respective criteria for each substance.

Therefore, monthly monitoring is included due to the variability/seasonality of discharge. The initial determination of the need for sampling shall be conducted for up to two years in order to determine if the permitted discharge has the reasonable potential to cause or contribute to an exceedance of the PFOS or PFOA standards under s. NR 102.04(8)(d)1, Wis. Adm. Code.

Thermal- Requirements for Temperature are included in NR 102 Subchapter II Water Quality Standards for Temperature and NR 106 Subchapter V Effluent Limitations for Temperature. Thermal discharges must meet the Public Health criterion of 120 degrees F and the Fish & Aquatic Life criteria which are established to protect aquatic communities from lethal and sub-lethal thermal effects.

Comparing the representative highest effluent temperature to the calculated effluent limits determines the reasonable potential of exceeding the effluent limits. The months in which limitations are recommended are shown in bold. Based on the analysis of Outfall 001, weekly average temperature limits are necessary for April through June and September through November. The complete thermal limit table is as follows:

Month	Calculated Effluent Limit	
	Weekly Avg. Effluent Limit (°F)	Daily Max. Effluent Limit (°F)
APR	**57**	
MAY	**66**	
JUN	**76**	
SEP	**74**	
OCT	**62**	
NOV	**51**	

The limits in the above table become effective at the end of the permit term if the site-specific temperature data from the compliance schedule results in no changes to the calculated limits or a modification is not requested. Temperature monitoring is required upon permit issuance.

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. 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. Because sample point 001 is not the only contributor to the final effluent discharged to the receiving water, only phosphorus monitoring is required at this sample point and the amount reported is combined with sample point 002 for compliance with the phosphorus limits that are applied at sample point 005.

Total Nitrogen Monitoring (NO2+NO3, TKN and Total N)- No monitoring is required for this type of industrial facility that does not show unusually high levels of TN (> 40 mg/L)

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).

Using the guidance documents above, 3 acute and 3 chronic WET tests are required during the permit term. WET limits must alsobe 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, which was shown for chronic WET tests using the procedures in s. NR 106.08(6) and representative data from 2005 to 2021. Therefore in addition to 3 Chronic WET tests during the permit term, a 1.0 monthly average limit has been given.

Acute tests are required in the following quarters:

1st January – March 2025

2nd July - September 2027

3rd April - June 2029

Chronic tests are required in the following quarters:

1st January – March 2025

2nd April – June 2026

3rd July – September 2027

4th October – December 2028

5th April – June 2029

Additives – The additives information in the WQBEL memo was based on information available at that time. Because the permittee submitted additional data after the memo was completed, the additives information in the WQBEL is no longer accurate. Attachment #1 - Part 8 - Additive Review (Page 22 of 25) of the WQBEL memo is outdated and should be disregarded. A new document, titled "Updated Additive Review for the Upper Midwest Environmental Science Center (permitted as United States Geological Survey)", dated November 14, 2024, will replace these pages of the WQBEL memo.

The permittee shall maintain an additives log that includes additive name, date(s) used, amount used, location in the facility where additives are introduced and duration of the physical addition in hours each day. This log shall be maintained on site and available to the Department upon request. In its application for permit reissuance, the permittee shall identify and provide usage rates for each additive that may be discharged to waters of the State. In the event that the permittee wishes to commence use of an additive that may be discharged to waters of the State or increase the usage rate of an additive greater than that indicated in the permit application, the permittee must notify the Department prior to initiating such a change and follow the procedures in Standard Requirements Additives section. The Department may modify the permit in accordance with s. 283.53, Stats, to impose restrictions on the use of the additive.

Sample Point Number: 002- STORM WTR, BYPASS, REARING WTR

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Continuous	
BOD5, Total	Daily Max	40 mg/L	Monthly	Grab	
BOD5, Total	Monthly Avg	20 mg/L	Monthly	Grab	
Suspended Solids, Total	Daily Max	40 mg/L	Monthly	Grab	
Suspended Solids, Total	Monthly Avg	20 mg/L	Monthly	Grab	
pH Field		su	Weekly	Grab	
Dissolved Oxygen		mg/L	Weekly	Grab	
Nitrogen, Ammonia (NH3-N) Total		mg/L	Weekly	Grab	
Arsenic, Total Recoverable		ug/L	Quarterly	Grab	
Temperature Maximum		deg F	Daily	Continuous	See Temperature footnote in permit and Compliance Schedule Section.
Phosphorus, Total		mg/L	Weekly	Grab	Limits apply at Sample Point 005. See Phosphorus footnote in permit.

Changes from Previous Permit

Proposed changes for sample point 002 include: 1) increased daily flow monitoring from weekly to daily with a continuous sample type, 2) decreased BOD/TSS monitoring from weekly to monthly, 3) added dissolved oxygen monitoring, and 4) increased temperature monitoring along with a temperature compliance schedule to determine site-specific limit criteria for potential limits.

Explanation of Limits and Monitoring Requirements

Limits were determined using chs. NR 102, 104, 105, 106, 207, 210, 212 and 217 of the Wisconsin Administrative Code (where applicable). See memo from Benjamin Hartenbower to Holly Heldstab titled "Water Quality-Based Effluent Limitations for the Upper Midwest Environmental Center (permitted under United States Geological Survey), (WI-00045756)" dated April 15, 2024 for more information.

Monitoring Frequencies- The Monitoring Frequencies for Individual Wastewater Permits (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 fairness and consistency in permits issued across the state. Guidance and requirements in administrative code were considered when determining the appropriate monitoring frequencies for pollutants that have final effluent limits in effect during this permit term. Using the criteria previously stated, the department has determined the need to increase monitoring frequency for temperature to daily to allow for enough data collection for the temperature compliance schedule and potential limits.

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 daily maximum and monthly average limits whenever practicable. Potential temperature limits with both these limit expressions are included in the permit.

Dissolved Oxygen- Dissolved oxygen monitoring was added for consistency with sample point 001 and potential interactions with additives.

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. It was determined no limits are needed, however, weekly monitoring will continue.

Total Recoverable Arsenic - Based on a comparison of the effluent data and calculated effluent limitations for arsenic, quarterly monitoring is required to ensure enough data for effluent limit calculations for the next permit term.

Thermal- Requirements for Temperature are included in NR 102 Subchapter II Water Quality Standards for Temperature and NR 106 Subchapter V Effluent Limitations for Temperature. Thermal discharges must meet the Public Health criterion of 120 degrees F and the Fish & Aquatic Life criteria which are established to protect aquatic communities from lethal and sub-lethal thermal effects.

Comparing the representative highest effluent temperature to the calculated effluent limits determines the reasonable potential of exceeding the effluent limits. The months in which limitations are recommended are shown in bold. Outfall 002 requires weekly average temperature limits March through January and daily maximum temperature limits are needed for July. The complete thermal tables used for the limit calculation are as follows:

Month	Calculated Effluent Limit	
	Weekly Avg. Effluent Limit (°F)	Daily Max. Effluent Limit (°F)
JAN	**60**	
MAR	**62**	
APR	**60**	
MAY	**69**	
JUN	**78**	
JUL	**82**	**89**
AUG	**81**	
SEP	**78**	
OCT	**66**	
NOV	**57**	
DEC	**59**	

The limits in the above table become effective at the end of the permit term if the site-specific temperature data from the compliance schedule results in no changes to the calculated limits or a modification is not requested. Temperature monitoring is required upon permit issuance.

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. 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. Because sample point 002 is not the only contributor to the final effluent discharged to the receiving water, only phosphorus monitoring is required at this sample point and the amount reported is combined with sample point 001 for compliance with the phosphorus limits that are applied at sample point 005.

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).

Using the guidance documents above, no tests are required.

Additives – The additives information in the WQBEL memo was based on information available at that time. Because the permittee submitted additional data after the memo was completed, the additives information in the WQBEL is no longer accurate. Attachment #1 - Part 8 - Additive Review (Page 22 of 25) of the WQBEL memo is outdated and should be disregarded. A new document, titled "Updated Additive Review for the Upper Midwest Environmental Science Center (permitted as United States Geological Survey)", dated November 14, 2024, will replace these pages of the WQBEL memo.

The permittee shall maintain an additives log that includes additive name, date(s) used, amount used, location in the facility where additives are introduced and duration of the physical addition in hours each day. This log shall be maintained on site and available to the Department upon request. In its application for permit reissuance, the permittee shall identify and provide usage rates for each additive that may be discharged to waters of the State. In the event that the permittee wishes to commence use of an additive that may be discharged to waters of the State or increase the usage rate of an additive greater than that indicated in the permit application, the permittee must notify the Department prior to initiating such a change and follow the procedures in Standard Requirements Additives section. The Department may modify the permit in accordance with s. 283.53, Stats, to impose restrictions on the use of the additive.

Sample Point Number: 005- COMBINED OUTFALL 001 + 002

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Daily	Calculated	
Phosphorus, Total	6-Month Avg	0.1 mg/L	Weekly	Calculated	Phosphorus compliance shall be determined by combing phosphorus results from Sample Points 001

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
					and 002, with the calculated results reported for this sample point. See Phosphorus section in permit.
Phosphorus, Total	Monthly Avg	0.3 mg/L	Weekly	Calculated	Phosphorus compliance shall be determined by combing phosphorus results from Sample Points 001 and 002, with the calculated results reported for this sample point. See Phosphorus section in permit.
Phosphorus, Total	6-Month Avg	1.0 lbs/day	Weekly	Calculated	Phosphorus compliance shall be determined by combing phosphorus results from Sample Points 001 and 002, with the calculated results reported for this sample point. See Phosphorus section in permit.

Changes from Previous Permit

Proposed changes for combined sample point 005 (001+002) includes increased daily flow monitoring from weekly to daily.

Explanation of Limits and Monitoring Requirements

Limits were determined using chs. NR 102, 104, 105, 106, 207, 210, 212 and 217 of the Wisconsin Administrative Code (where applicable). See memo from Benjamin Hartenbower to Holly Heldstab titled "Water Quality-Based Effluent Limitations for the Upper Midwest Environmental Center (permitted under United States Geological Survey), (WI-00045756)" dated April 15, 2024 for more information.

Monitoring Frequencies- The Monitoring Frequencies for Individual Wastewater Permits (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 fairness and consistency in permits issued across the state. Guidance and requirements in administrative code were considered when determining the appropriate monitoring frequencies for pollutants that have final effluent limits in effect during this permit term. Using the criteria previously stated, the department has determined no frequency changes are needed for parameters with effluent limits.

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. 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.

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 0.100 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 0.300 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 and is to be applied at this combined sample point 005 using data from 001 and 002.

Because the discharge is to a surface water that is to or upstream of a phosphorus impaired water, a mass limit is also required, pursuant to s. NR 217.14(1)(a), Wis. Adm. Code. This final mass limit shall be 0.100 mg/L × 8.34 × 1.416 MGD = 1.20 lbs/day expressed as a six-month average to be applied at this combined sample point 005 using data from both 001 and 002.

4 Land Application - Sludge/By-Product Solids (industrial only)

Sample Point Number: 003- LARGE (STABILIZATION) POND

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Solids, Total		Percent	Per Application	Grab	
Nitrogen, Total Kjeldahl		Percent	Per Application	Grab	
Chloride		Percent	Per Application	Grab	
pH Field		su	Per Application	Grab	
Nitrogen, Ammonium (NH4-N) Total		Percent	Per Application	Grab	
Phosphorus, Total		Percent	Per Application	Grab	
Phosphorus, Water Extractable		% of Tot P	Per Application	Grab	
Potassium, Total Recoverable		Percent	Per Application	Grab	

Changes from Previous Permit:

None

Explanation of Limits and Monitoring Requirements

Requirements for land application of industrial sludge are determined in accordance with ch. NR 214 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.

Sample Point Number: 004- SMALL (QUIESCENT) POND

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Solids, Total		Percent	Per Application	Grab	
Nitrogen, Total Kjeldahl		Percent	Per Application	Grab	
Chloride		Percent	Per Application	Grab	
pH Field		su	Per Application	Grab	
Nitrogen, Ammonium (NH4-N) Total		Percent	Per Application	Grab	
Phosphorus, Total		Percent	Per Application	Grab	
Phosphorus, Water Extractable		% of Tot P	Per Application	Grab	
Potassium, Total Recoverable		Percent	Per Application	Grab	
PFOA + PFOS		ug/kg	Once	Calculated	Report the sum of PFOA and PFOS. See PFAS Permit Sections for more information.
PFAS Dry Wt			Once	Grab	Perfluoroalkyl and Polyfluoroalkyl Substances based on updated DNR PFAS List. See PFAS

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
					Permit Sections for more information.

Changes from Previous Permit:

To quantitate the risk, new 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.

Explanation of Limits and Monitoring Requirements

Requirements for land application of industrial sludge are determined in accordance with ch. NR 214 Wis. Adm. Code.

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.

5 Schedules

5.1 Temperature Compliance Schedule

The compliance schedule applies to both sample points 001 and 002 temperature limitations.

Required Action	Due Date
Study Plan: Submit a study plan for approval for collecting data for site specific ambient temperature data. The plan should include information on proposed sample locations, frequency of data collection, and methods used to record and collect data.	06/30/2025
Implement Plan: Start collecting data for site specific ambient temperature per the approved study plan.	09/30/2025
Progress Report #1: Submit a progress report on the implementation of the temperature study plan. The progress report shall include sample locations, sample dates and times, recorded results, along with a summary of any challenges encountered and proposed modifications to the study plan, if applicable.	06/30/2026

Progress Report #2: Submit a progress report on the implementation of the temperature study plan. The progress report shall include sample locations, sample dates and times, recorded results, along with a summary of any challenges encountered and proposed modifications to the study plan, if applicable.	03/31/2027
Site-Specific Temperature Evaluation Report: Submit a report with at least 2 years of data and other requirements of s. NR 102.26(1) Wis. Adm. Code or other means of compliance if applicable.	12/31/2027
Progress Report #3: Submit a progress report on the implementation of the temperature study plan. The progress report shall include sample locations, sample dates and times, recorded results, along with a summary of any challenges encountered and proposed modifications to the study plan, if applicable.	12/31/2028
Complete Actions and Achieve Compliance: Complete actions necessary to achieve compliance with effluent temperature limitations at sample points 001 and 002.	12/31/2029

5.2 PFOS/PFOA Minimization Plan Determination of Need

Required Action	Due Date
Report on Effluent Discharge: Submit a report on effluent PFOS and PFOA concentrations and include an analysis of trends in monthly and annual average PFOS and PFOA concentrations. This analysis should also include a comparison to the applicable narrative standard in s. NR 102.04(8)(d), Wis. Adm. Code. This report shall include all additional PFOS and PFOA data that may be collected including any influent, intake, in-plant, collection system sampling, and blank sample results. Please submit the laboratory analysis sheets with the report.	12/31/2025
Report on Effluent Discharge and Evaluation of Need: Submit a final report on effluent PFOS and PFOA concentrations and include an analysis of trends in monthly and annual average PFOS and PFOA concentrations of data collected over the last 24 months. Please submit the laboratory analysis sheets with the report. The report shall also provide a comparison on the likelihood of the facility needing to develop a PFOS/PFOA minimization plan. This report shall include all additional PFOS and PFOA data that may be collected including any influent, intake, in-plant, collection system sampling, and blank sample results. The permittee shall also submit a request to the department to evaluate the need for a PFOS/PFOA minimization plan. If the Department determines a PFOS/PFOA minimization plan is needed based on a reasonable potential evaluation, the permittee will be required to develop a minimization plan for Department approval no later than 90 days after written notification was sent from the Department. The Department will modify or revoke and reissue the permit to include PFOS/PFOA minimization plan reporting requirements along with a schedule of compliance to meet WQBELs. Effluent monitoring of PFOS and PFOA shall continue as specified in the permit until the modified permit is issued. If, however, the Department determines there is no reasonable potential for the facility to discharge PFOS or PFOA above the narrative standard in s. NR 102.04(8)(d), Wis. Adm. Code, no further action is required and effluent monitoring of PFOS and PFOA shall continue as specified in the permit.	12/31/2026

5.3 Land Application Management Plan

A management plan is required for the land application system.

Required Action	Due Date
Submit a Sludge Management Plan: The permittee shall submit management plan for approval if removal of sludge will occur during this permit term. The plan shall demonstrate compliance with ch. NR 214 Wis. Adm. Code and at minimum address 1) How and where is sludge sampled; 2) Available sludge storage details and location(s); 3)How will the sludge be removed with details on volume, characterization and how will the treatment plant continue to function during the drawdown; 4) Describe the type of transportation and spreading vehicles and loading and unloading practices; 5) Identify approved land application sites, apply for needed sites, site limitations, total acres needed and vegetative cover management; 6) Specify record keeping procedures including site loading; 7) Address contingency plans for adverse weather and odor/nuisance abatement; and 8) Include any other pertinent information such as other disposal options that may be used or specifications of any pretreatment processes Once approved, all sludge management activities shall be conducted in accordance with the plan. Any changes to the plan must be approved by the Department prior to implementing the changes. No desludging may occur unless approval from the Department is obtained. Daily logs shall be kept that record where the sludge has been disposed. The plan is due at least 60 days prior to desludging.	

Explanation of Schedules

Temperature Compliance Schedule

The Upper Midwest Environmental Science Center will explore potential relief from temperature limits by collecting site-specific ambient temperature to use instead of default background temperatures for streams in Wisconsin, so actual data from the direct receiving water may provide for relaxed thermal limits but only if the site-specific temperatures are lower than the defaults used in the calculated limitations. Therefore a compliance schedule was given to allow for this option detailed in the August 15, 2013 Department *Guidance for Implementation of Wisconsin's Thermal Water Quality Standards* and s. NR 102.26 Wis. Adm. Code.

PFOS/PFOA Minimization Plan Determination of Need

As stated above, NR 106 Subchapter VIII – Permit Requirements for PFOS and PFOA Dischargers became effective on August 1, 2022. S. NR 106.98, Wis. Adm. Code, specifies steps to generate data in order to determine the need for reducing PFOS and PFOA in the discharge. Data generated per the effluent monitoring requirements will be used to determine the need for developing a PFOS/PFOA minimization plan. As part of the schedule, the permittee is required to submit two annual Reports on Effluent Discharge.

If the Department determines that a minimization plan is needed, the permit will be modified or revoked/reissued to include additional requirements.

Land Application Management Plan

If the lagoons are to be de-sludged during this permit term a management plan is needed to show compliance with ch NR 214, Wis. Adm. Code.

Other Comments:

Fact check comments were received October 23, 2024 and addressed in an email sent to the facility November 7, 2024.

Attachments:

Water Quality Based Effluent Memo - Memo from Benjamin Hartenbower to Holly Heldstab titled "Water Quality-Based Effluent Limitations for the Upper Midwest Environmental Center (permitted under United States Geological Survey), (WI-00045756)" dated April 15, 2024

Updated Additives Review – memo from Benjamin Hartenbower to Angela Parkhurst titled "Updated Additive Review for the Upper Midwest Environmental Science Center (permitted as United States Geological Survey) (WI-00045756)", dated November 13, 2024.

Expiration Date:

December 31, 2029

Justification Of Any Waivers From Permit Application Requirements

None

Public Notice - La Crosse Tribune, 401 N. Third St., La Crosse, WI 54601-3281

Prepared By: Angela Parkhurst Wastewater Specialist Date: November 14, 2024

CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: April 15, 2024

TO: Holly Heldstab– WCR/Eau Claire

FROM: Benjamin Hartenbower – WCR/Eau Claire

SUBJECT: Water Quality-Based Effluent Limitations for the Upper Midwest Environmental Science Center (permitted as United States Geological Survey)
WPDES Permit No. WI-0045756

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 Upper Midwest Environmental Science Center in La Crosse County. This industrial discharge is to a backwater of the Black River, located in the Lower La Crosse River Watershed in the Upper Wisconsin 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 for the following Outfalls:

Outfall 001

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Flow Rate						1,2
BOD_5	40 mg/L			20 mg/L		1
TSS	40 mg/L			20 mg/L		1
pH	9.75 s.u.	6.00 s.u.				1
Dissolved Oxygen						1,2
Ammonia Nitrogen						2
Total Halogens	19 µg/L		7.3 µg/L	**7.3 µg/L**		3
Arsenic						2
PFOS and PFOA						4
Temperature			Variable			5
Phosphorus						2
Acute WET						6
Chronic WET				1.0 TUc		6,7

Footnotes:

1. No changes from the current permit.
2. Monitoring only.
3. Additional limits to comply with the expression of limits requirements in ss. NR 106.07 and NR 205.065(7), Wis. Adm. Codes, are included in bold.
4. Monthly monitoring is required in accordance with s. NR 106.98(2), Wis. Adm. Code.

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5. Temperature limits according to the following table are recommended.

Month	Calculated Effluent Limit Weekly Avg. Effluent Limit (°F)	Daily Max. Effluent Limit (°F)
APR	**57**	
MAY	**66**	
JUN	**76**	
SEP	**74**	
OCT	**62**	
NOV	**51**	

6. Three Acute and Annual Chronic WET tests are recommended in the reissued permit. Sampling WET concurrently with any chemical-specific toxic substances is recommended. Tests should be done in rotating quarters, to collect seasonal information about this discharge and should continue after the permit expiration date (until the permit is reissued).
7. 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% the dilution water used in WET tests conducted on Outfall 001 shall be a grab sample collected from the backwater on the Black River in an area outside the influence of the discharge from the outfall.

Outfall 002

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Flow Rate						1,2
BOD_5	40 mg/L			20 mg/L		1
TSS	40 mg/L			20 mg/L		1
pH						1,2
Dissolved Oxygen						1,2
Ammonia Nitrogen						1,2
Arsenic						2
Temperature	Variable		Variable			3
Phosphorus						2

Footnotes:

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

3. Temperature limits according to the following table are recommended.

Month	Calculated Effluent Limit Weekly Avg. Effluent Limit (°F)	Daily Max. Effluent Limit (°F)
JAN	**60**	
MAR	**62**	
APR	**60**	
MAY	**69**	
JUN	**78**	
JUL	**82**	**89**
AUG	**81**	
SEP	**78**	
OCT	**66**	
NOV	**57**	
DEC	**59**	

Outfall 005: Outfalls 001 and 002 combined

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Flow Rate						1,2
Phosphorus				0.300 mg/L	0.100 mg/L 1.00 lbs/day	

Footnotes:

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

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 (4) – Narrative, Thermal Tables, & Map

PREPARED BY: _____ Date: 04/15/2024

Benjamin Hartenbower, PE,
Water Resources Engineer

E-cc:

Geisa Thielen, Regional Wastewater Supervisor – WCR/Eau Claire
Diane Figiel, Water Resources Engineer – WY/3
Shawn Giblin, Water Quality Biologist – La Crosse
Kari Fleming, Environmental Toxicologist – WY/3
Michael Polkinghorn, Water Resources Engineer – NOR/Rhinelander
Laura Dietrich, Wastewater Specialist – WY/3

Attachment #1

Water Quality-Based Effluent Limitations for
Upper Midwest Environmental Science Center
WPDES Permit No. WI-0045756

Prepared by: Benjamin P. Hartenbower

PART 1 – BACKGROUND INFORMATION

Facility Description:
The United States Geological Survey (USGS) Biological Resources Division, Upper Midwest Environmental Sciences Center conducts research on methods to control and manage aquatic and terrestrial organisms, on the effects of contaminants on aquatic ecosystems, on large river ecology, and on chemicals showing potential for use in fisheries as toxicants, anesthetics, and therapeutants as part of the chemical registration process. The Center includes facilities for rearing fish and other aquatic organisms, laboratories, mapping and geographical information systems data acquisition, and office space. Outfall 001 is the lagoon effluent discharge located in a backwater of the west bank of the Black River 0.42 miles downstream from Fishermans Road. Outfall 002 is the storm water outfall located in a backwater on the west bank of the Black River 0.21 miles downstream from Fishermans Road. Outfall 005 is a virtual used to calculate composite values for total phosphorous discharge.

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

Existing Permit Limitations: The current permit, which expired on June 30, 2023, includes the following effluent limitations and monitoring requirements.
Outfall 001

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Flow Rate						1,2
BOD_5	40 mg/L			20 mg/L		1
TSS	40 mg/L			20 mg/L		1
pH	9.75 s.u.	6.00 s.u.				1
Dissolved Oxygen						1,2
Ammonia Nitrogen						2
Chlorine	38 µg/L		7.3 µg/L	**7.3 µg/L**		
Temperature						2
Phosphorus						2
Acute WET						3
Chronic WET						4

Footnotes:

1. These limitations are not being evaluated as part of this review. Because the water quality criteria (WQC), reference effluent flow rates, and receiving water characteristics have not changed, limitations for these water quality characteristics do not need to be re-evaluated at this time.
2. Monitoring only.
3. Acute WET Testing: July – September 2019 and January – March 2022.
4. IWC for chronic WET was 100%. Chronic WET Testing: July – September 2019, April – June 2021 and January – March 2022.

Outfall 002

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Flow Rate						1
BOD_5	40 mg/L			20 mg/L		
TSS	40 mg/L			20 mg/L		
pH						1
Ammonia Nitrogen						1
Temperature						1
Phosphorus						1

Footnotes:

1. Monitoring only.

Outfall 005: Outfalls 001 and 002 combined

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Flow Rate						1
Phosphorus				0.300 mg/L	0.100 mg/L 1.00 lbs/day	

Footnotes:

1. Monitoring only.

Receiving Water Information

- Name: The backwater of the Black River
- Waterbody Identification Code (WBIC): 5590489
- Classification used in accordance with chs. NR 102 and 104, Wis. Adm. Code: Warm Water Sport Fish (WWSF) community, non-public water supply.
- Thermal effluent limits were calculated in accordance with s. NR 106.55(7), Wis. Adm. Code. Limits for all other parameters were based on low flows used in accordance with chs. NR 106 and 217, Wis. Adm. Code: The following $7\text{-}Q_{10}$ and $7\text{-}Q_2$ values used for the a backwater of the Black River, where Outfalls 001 and 002 are located.

  $7\text{-}Q_{10}$ = 0 cfs
  $7\text{-}Q_2$ = 0 cfs
  Harmonic Mean Flow = 0 cfs

- Outfall 001: Hardness = 142 mg/L as $CaCO_3$.
  Outfall 002: Hardness = 176 mg/L as $CaCO_3$.
  These values represent the geometric means of the effluent data. Effluent hardness is used in place of receiving water because there is no receiving water flow upstream of the discharge.
- % of low flow used to calculate limits in accordance with s. NR 106.06(4)(c)5., Wis. Adm. Code: Not applicable where the receiving water low flows are zero.
- Source of background concentration data: Background concentrations are not included because they do not impact the calculated WQBEL when the receiving water low flows are equal to zero.
- Multiple dischargers: There are several other dischargers to the Black 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 Black and Mississippi Rivers are listed as impaired for PCBs, Total Phosphorus, and Mercury.

Effluent Information:

Flow Rates(s):

Outfall 001:

Maximum Annual Average = 1.046 MGD (Million Gallons per Day)
Peak daily = 2.521 MGD
Peak weekly = 1.734 MGD
Peak monthly = 1.587 MGD
For reference, the actual average flow from July 2018 to April 2023 was 0.852 MGD.

Outfall 002:

Maximum Annual Average = 0.432 MGD
Peak daily = 1.023 MGD
Peak weekly = 0.704 MGD
Peak monthly = 0.528 MGD

For reference, the actual average flow from July 2018 to April 2023 was 0.197 MGD.

- Outfall 001: Hardness = 142 mg/L as $CaCO_3$. (n =4)
  Outfall 002: Hardness = 176 mg/L as $CaCO_3$. (n =4)
  These values represent the geometric means of effluent samples collected from 08/24/2022 to 09/14/2022.
- 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: Process wastewater from animal aquaculture and analytical testing of aquatic organisms.
- Additives: four biocides in use
- Effluent characterization: This facility is categorized as a secondary industry, so the permit application required effluent sample analyses for a limited number of common pollutants, as specified in s. NR 200.065, Table 1, Wis. Adm. Code, primarily metal substances plus Chloride and hardness. The permit-required monitoring for Ammonia, Chlorine, and Phosphorus from July 2018 to April 2023 is used in this evaluation.

Attachment #1

Chemical Specific Effluent Data

Sample Date	001: Copper µg/L	002: Copper µg/L
08/24/2022	<1.69	4.28
08/31/2022	<1.69	5.72
09/07/2022	2.01	4.96
09/14/2022	<1.69	<1.69
Mean	<1.69	3.74

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

Chemical Specific Effluent Data

Sample Date	001: Arsenic µg/L	002: Arsenic µg/L
08/24/2022	3.62	2.98
08/09/2023	2.64	5.55
08/16/2023	2.65	2.30
08/23/2023	2.94	2.44
09/28/2023	2.56	2.75
10/03/2023	2.19	2.60
10/10/2023	1.88	2.70
10/13/2023	2.15	3.19
10/17/2023	2.37	2.60
10/20/2023	2.51	2.46
10/24/2023	2.18	2.34
1-day P_{99}	3.81	5.68
4-day P_{99}	3.11	4.13
30-day P_{99}	2.72	3.31

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 Outfalls 001, 002, and 005 from July 2018 to April 2023 for all parameters with limits in the current permit to meet the requirements of s. NR 201.03(6):

Averages of Parameters with Limits

	Average Measurement (001)	Average Measurement (002)	Average Measurement (005)	Average Mass Discharged (005)
BOD_5	2.8 mg/L*	1.4 mg/L*		
TSS	2.8 mg/L*	3.1 mg/L*		
pH field	8.36 s.u.	7.91 s.u.		
Chlorine	<100 µg/L			
Phosphorus			0.0624 mg/L*	0.4875 lbs/day

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

PART 2 – WATER QUALITY-BASED Effluent Limitations for Toxic Substances – EXCEPT AMMONIA NITROGEN

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

1. The maximum effluent concentration exceeds the calculated limit (s. NR 106.05(3), Wis. Adm. Code)
2. If 11 or more detected results are available in the effluent, the upper 99th percentile (or 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 the Upper Midwest Environmental Science Center.

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)

(Outfall 001)

RECEIVING WATER FLOW = 0.00 cfs, (1-Q_{10} (estimated as 80% of 7-Q_{10})), 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_{99}	1-day MAX. CONC.
Chlorine		19.0		19.0	3.8	<100		
Arsenic		340		340			3.81	3.62
Cadmium	142	15.4		15	3.1	<0.084		
Chromium (+3)	142	2398		2398	480	<0.7		
Copper	142	21.6		22	4.3	<1.69		2.0
Lead	142	150		150	30	<1.08		
Nickel	142	630		630	126	<0.9		
Zinc	142	163		163	33	<26		
Chloride (mg/L)		757		757	151	21.3		

* * 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.

(Outfall 002)

RECEIVING WATER FLOW = 0.00 cfs, (1-Q_{10} (estimated as 80% of 7-Q_{10})), 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_{99}	1-day MAX. CONC.
Chlorine		19.0		19.0	3.8	<100		
Arsenic		340		340			5.68	5.55
Cadmium	176	19.8		20	4.0	<0.084		
Chromium (+3)	176	2871		2871	574	<0.7		
Copper	176	26.5		27	5.3	3.74		5.72
Lead	176	185		185	37	<1.08		
Nickel	176	759		759	152	1.4		
Zinc	176	198		198	40	<26		
Chloride (mg/L)		757		757	151	21.9		

* * 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)

(Outfall 001)

RECEIVING WATER FLOW = 0.00 cfs (¼ of the 7-Q_{10}), 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_{99}
Chlorine		7.3		7.3	1.5	<100	
Arsenic		152		152			3.11
Cadmium	142	3.2		3.2	0.6	<0.084	
Chromium (+3)	142	176		176	35	<0.7	
Copper	142	13.9		13.9	2.8	<1.69	
Lead	142	39		39	8	<1.08	

SUBSTANCE	REF. HARD. mg/L	CTC	MEAN BACK-GRD.	WEEKLY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	4-day P_{99}
Nickel	142	70.1		70.1	14.0	<0.9	
Zinc	142	163		163	33	<26	
Chloride (mg/L)		395		395	79	21.3	

(Outfall 002)
RECEIVING WATER FLOW = 0.00 cfs (¼ of the 7-Q_{10}), 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_{99}
Chlorine		7.3		7.3	1.5		
Arsenic		152		152			4.13
Cadmium	175	3.8		3.8	0.8	<0.084	
Chromium (+3)	176	210		210	42	<0.7	
Copper	176	16.8		16.8	3.4	3.74	
Lead	176	48		48	10	<1.08	
Nickel	176	84.4		84.4	16.9	1.4	
Zinc	176	198		198	40	<26	
Chloride (mg/L)		395		395	79	21.9	

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)
(Outfall 001)
RECEIVING WATER FLOW = 0.00 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.	30-day P_{99}
Cadmium	370		370	74	<0.084	
Chromium (+3)	3818000		3818000	763600	<0.7	
Lead	140		140	28	<1.08	
Nickel	43000		43000	8600	<0.9	

(Outfall 002)
RECEIVING WATER FLOW = 0.00 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.	30-day P_{99}
Cadmium	370		370	74	<0.084	
Chromium (+3)	3818000		3818000	763600	<0.7	
Lead	140		140	28	<1.08	
Nickel	43000		43000	8600	1.4	

Monthly Average Limits based on Human Cancer Criteria (HCC)
(Outfall 001)
RECEIVING WATER FLOW = 0.00 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.	30-day P_{99}
Arsenic	13.3		13.3			2.72

(Outfall 002)
RECEIVING WATER FLOW = 0.00 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.	30-day P_{99}
Arsenic	13.3		13.3			3.31

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 only one substance based on HCC was detected, 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 only required for Chlorine.

Total Residual Chlorine – Because chlorinated compounds are used as additives at Outfall 001, effluent limitations are recommended to assure proper de-chlorination. In order to not exceed water quality criteria specified in ch. NR 105, Wis. Adm. Code, a daily maximum limit of 19 µg/L (19.03, rounded to two significant figures) is 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 should be included in the permit because it is more restrictive than the daily maximum limit. Because halogenated compounds other than chlorine are included in the list of additives. The limits should be expressed in as Total Halogen limitations, which use the same analytical method. Additional limits are discussed in the expression of limits section of this memo.

PFOS and PFOA
The need for PFOS and PFOA monitoring is evaluated in accordance with s. NR 106.98, Wis. Adm. Code. Previous monitoring produced a PFOS result of 95.6 ng/L and a PFOA result of 17.7 ng/L. These results are greater than one fifth of the respective criteria for each substance. Based on the available PFOS/PFOA data, **monitoring is recommended at a monthly frequency**.

PART 3 – WATER QUALITY-BASED Effluent Limitations for AMMONIA NITROGEN

The State of Wisconsin promulgated revised water quality standards for ammonia nitrogen in ch. NR 105, Wis. Adm. Code, effective March 1, 2004 which includes criteria based on both acute and chronic toxicity to aquatic life. Given the fact that Upper Midwest Environmental Science Center does not currently have ammonia nitrogen limits, the need for limits is evaluated at this time.

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 Warm Water Sport fishery, and
pH (s.u.) = that characteristic of the <u>effluent.</u>

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_{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 effluent pH data was examined as part of this evaluation. For Outfall 001, a total of 248 sample results were reported from July 2018 to April 2023. The maximum reported value was 9.70 s.u. (Standard pH Units). The effluent pH was 9.60 s.u. or less 99% of the time. The 1-day P99, calculated in accordance with s. NR 106.05(5), Wis. Adm. Code, is 9.93 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 9.83 s.u. Therefore, a value of 9.93 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 9.93 s.u. into the equation above yields an ATC = 0.52 mg/L. The same procedure was used to select a pH value of 8.99 for Outfall 002, resulting in a calculated ATC of 1.34 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_{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 (001)	Ammonia Nitrogen Limit (002)
2×ATC	1.04 mg/L	2.69 mg/L
1-Q_{10}	0.52 mg/L	1.34 mg/L

The 1-Q_{10} method yields the most stringent limits for the Upper Midwest Environmental Science Center.

Presented below is a table of daily maximum limitations corresponding to various effluent pH values. Use of this table is not necessarily recommended in the permit, but it is presented herein for informational purposes.

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	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
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.

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

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

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

Where:

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

Data values for Temperature, pH, and background ammonica concentrations of the isolated backwaters of Pool 8 were used from the Long Term Resource Monitoring Program from 1993 to 1999. These values are shown in the table below, with the resulting criteria and effluent limitations.

Weekly and Monthly Ammonia Nitrogen Limits – WWSF

		May-October (001)	November-April (001)	May-October (002)	November-April (002)
Effluent Flow	Qe (MGD)	1.046	1.046	0.432	0.432
Background Information	7-Q_{10} (cfs)	0	0	0	0
	7-Q_2 (cfs)	0	0	0	0
	Ammonia (mg/L)	0.080	0.210	0.080	0.210
	Temperature (°C)	24	1	24	1
	pH (s.u.)	7.40	7.30	7.40	7.30
	% of Flow used	100	25	100	25
	Reference Weekly Flow (cfs)	0	0	0	0
	Reference Monthly Flow (cfs)	0	0	0	0
Criteria mg/L	4-day Chronic				
	Early Life Stages Present	6.42	12.69	6.42	12.69
	Early Life Stages Absent	6.42	20.61	6.42	20.61
	30-day Chronic				
	Early Life Stages Present	2.57	5.08	2.57	5.08
	Early Life Stages Absent	2.57	8.24	2.57	8.24
Effluent Limitations mg/L	Weekly Average				
	Early Life Stages Present	6.4	12.7	6.4	12.7
	Early Life Stages Absent		20.6		20.6
	Monthly Average				
	Early Life Stages Present	2.6	5.1	2.6	5.1
	Early Life Stages Absent		8.2		8.2

Effluent Data

The following table evaluates the statistics based upon ammonia data reported from July 2018 to April 2023, with those results being compared to the calculated limits to determine the need to include ammonia limits in the Upper Midwest Environmental Science Center permit for the respective month ranges.

Attachment #1

Ammonia Nitrogen Effluent Data

	Outfall 001	Outfall 002
1-day P_{99}	N/A	1.06
4-day P_{99}	N/A	0.56
30-day P_{99}	N/A	0.25
Mean*	0.11	0.12
Std	0.19	0.29
Sample size	19	63
Range	<0.1 - 0.58	<0.1 - 1.47

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

Based on this comparison, there is no reasonable potential for either discharge to exceed any of the calculated ammonia nitrogen limits. The current **weekly monitoring frequency may continue at Outfall 002**, however the quarterly monitoring at **Outfall 001 should increase to a monthly** frequency so sufficient data is available for analysis at the next permit reissuance.

PART 4 – PHOSPHORUS

Water Quality-Based Effluent Limits (WQBEL)

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

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

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

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

Where:

WQC = 0.100 mg/L for the a backwater of the Black River.
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 = combined effluent flow rates of Outfalls 001 and 002 = 1.416 MGD = 1.219 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 the criterion.

The impaired water listing of the Black River also points towards the notion that effluent phosphorus limits equal to the water quality criterion are needed to prevent the discharge from contributing to further impairment of the receiving water. The Guidance for Implementing Wisconsin's Phosphorus Water Quality Standards for Point Source Discharges (2020) suggests setting effluent limits equal to the criterion in the absence of an EPA approved total maximum daily load for discharges of phosphorus to phosphorus impaired waters.

Effluent Data
The following table summarizes effluent total phosphorus monitoring data from July 2018 to April 2023.

	Phosphorus mg/L (001)	**Phosphorus mg/L (002)**	**Combined Outfall (005)**
1-day P_{99}	0.17	1.34	0.53
4-day P_{99}	0.11	0.77	0.30
30-day P_{99}	0.06	0.33	0.13
Mean	0.04	0.15	0.06
Std	0.04	0.33	0.12
Sample size	252	250	251
Range	<0.031 - 0.177	<0.047- 4.5	<0.086 - 1.43

Reasonable Potential Determination
Since the 30-day P_{99} of reported effluent total phosphorus data is greater than the calculated WQBEL, the discharge has reasonable potential to cause or contribute to an exceedance of the water quality criterion. Therefore, a WQBEL is required.

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 0.100 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 0.300 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
Because the discharge is to a surface water that is to or upstream of a phosphorus impaired water, a mass limit is also required, pursuant to s. NR 217.14(1)(a), Wis. Adm. Code. This final mass limit shall be 0.100 mg/L × 8.34 × 1.416 MGD = 1.20 lbs/day expressed as a six-month average.

This limit is greater than the current six-month average mass limit of 1.0 lbs/day. If the Upper Midwest Environmental Science Center would like to request an increase to the existing mass limit, an assessment of their effluent data consistent with the requirements of ss. NR 207.04(1)(a) and (c), Wis. Adm. Code, must be provided. This evaluation is on a parameter by parameter basis and includes consideration of operations, maintenance and temporary upsets. Without a demonstration of need for a higher limit in accordance with s. NR 207.04, Wis. Adm. Code, the current limits should be continued in the reissued permit.

PART 5 – WATER QUALITY-BASED Effluent Limitations for THERMAL

Surface water quality standards for temperature took effect on October 1, 2010. These regulations are detailed in 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 nature of the backwater location, temperature limitations were calculated in accordance with s. NR 106.55(7)(b), Wis. Adm. Code.

In accordance with s. NR 106.53(2)(b), Wis. Adm. Code, the highest daily maximum flow rate for a calendar month is used to determine the acute (daily maximum) effluent limitation. In accordance with s. NR 106.53(2)(c), Wis. Adm. Code, the highest 7-day rolling average flow rate for a calendar month is used to determine the sub-lethal (weekly average) effluent limitation. These values were based off actual flow reported from July 2018 to April 2023.

The table below summarizes the maximum temperatures reported during monitoring from September 2014 to August 2017.

Monthly Temperature Effluent Data & Limits (Outfall 001)

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	40	41	53	86
FEB	47	50	55	84
MAR	50	52	55	83
APR	63	65	**57**	85
MAY	69	72	**66**	87
JUN	78	79	**76**	87
JUL	80	82	81	88
AUG	79	82	80	88
SEP	75	77	**74**	86
OCT	64	65	**62**	84
NOV	53	56	**51**	82
DEC	44	46	53	84

The table below summarizes the maximum temperatures reported during monitoring from July 2018 to April 2023.

Monthly Temperature Effluent Data & Limits (Outfall 002)

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	68	69	**60**	103
FEB	60	67	61	104
MAR	65	82	**62**	91
APR	79	91	**60**	99
MAY	85	87	**69**	94
JUN	86	91	**78**	91
JUL	84	91	**82**	**89**
AUG	83	90	**81**	91
SEP	80	82	**78**	94
OCT	78	81	**66**	91
NOV	73	86	**57**	101
DEC	72	83	**59**	104

Reasonable Potential

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

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

Comparing the representative highest effluent temperature to the calculated effluent limits determines the reasonable potential of exceeding the effluent limits. The months in which limitations are recommended are shown in bold. Based on the analysis on Outfall 001, weekly average temperature limits are necessary for April through June and September through November. Outfall 002 requires weekly average temperature limits March through January and daily maximum temperature limits are needed for July. The complete thermal tables used for the limit calculation are attached.

The Upper Midwest Environmental Science Center has selected the following option to explore potential relief from the temperature limits:

- Collection of site-specific ambient temperature: default background temperatures for streams in Wisconsin, so actual data from the direct receiving water may provide for relaxed thermal limits but only if the site-specific temperatures are lower than the defaults used in the above tables.

This options is explained in additional detail in the August 15, 2013 Department *Guidance for Implementation of Wisconsin's Thermal Water Quality Standards*
http://dnr.wi.gov/topic/surfacewater/documents/ThermalGuidance2edition8152013.pdf

PART 6 – WHOLE EFFLUENT TOXICITY (WET)

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

- 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:

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

Where:

Q_e = annual average flow = 1.046 MGD = 1.622 cfs
f = fraction of the Q_e withdrawn from the receiving water = 0
Q_s = ¼ of the 7-Q_{10} = 0.00 cfs ÷ 4 = 0.00 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.

- 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 or Comments
	C. dubia	Fathead minnow	Pass or Fail?	Used in RP?	*C. dubia*	Fathead Minnow	Algae (IC_{50})	Pass or Fail?	Use in RP?	
04/24/1996	>100	>100	Pass	Yes						
10/30/1996	>100	>100	Pass	Yes						
07/30/1997	>100	>100	Pass	Yes						
01/14/1998	>100	>100	Pass	Yes						
12/01/1999	>100	>100	Pass	Yes						
05/10/2001	>100	>100	Pass	Yes	>100	>100		Pass	No	1
07/31/2001					>100	>100		Pass	No	1
07/16/2002	>100	>100	Pass	Yes	>100	>100		Pass	No	1
10/31/2002					>100	>100		Pass	No	1
02/06/2003					>100	>100		Pass	No	1
11/04/2003	>100	>100	Pass	Yes	>100	>100		Pass	No	1
05/04/2004	>100	>100	Pass	Yes	9.99	89.54		Fail	No	1
02/08/2005					>100	>100		Pass	No	1
05/03/2005					>100	69.2		Fail	No	1
07/19/2005						>100		Pass	Yes	
08/16/2005					>100	>100		Pass	Yes	
05/11/2006					>100	>100		Pass	Yes	
11/02/2006					>100	>100		Pass	Yes	
02/08/2007					>100	>100		Pass	Yes	
07/10/2007					>100	>100		Pass	Yes	
04/08/2008					>100	>100		Pass	Yes	
11/18/2008					>100	>100		Pass	No	2
02/03/2009					>100	>100		Pass	No	2
08/18/2009					>100	>100		Pass	No	2
05/04/2010					>100	>100		Pass	No	2
11/30/2010					>100	>100		Pass	No	2
12/11/2012					>100	>100		Pass	Yes	
06/22/2021					65.2	>100		Fail	Yes	
08/03/2021					>100	>100		Pass	Yes	
08/25/2021					>100	>100		Pass	Yes	

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.
2. *Tests done by S-F Analytical, July 2008 – March 2011*. The DNR has reason to believe that WET tests completed by SF Analytical Labs from July 2008 through March 31, 2011 were not performed using proper test methods. Therefore, WET data from this lab during this period has been disqualified and was not included in the analysis.

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

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

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

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

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

Chronic WET Limit Parameters

TUc (maximum) $100/IC_{25}$	**B** (multiplication factor from s. NR 106.08(6)(c), Wis. Adm. Code, Table 4)	IWC
100/65.2= 1.53 TU_c	6.2 Based on 1 detect	100%

[(TUc effluent) (B)(IWC)] = 9.5 > 1.0

Therefore, reasonable potential is shown chronic WET limits using the procedures in s. NR 106.08(6) and representative data from 2005 to 2021.

<u>Expression of WET limits</u>
Chronic WET limit = [100/IWC] TU_c = 1.0 TU_c expressed as a monthly average

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

Attachment #1

WET Checklist Summary

	Acute	Chronic
AMZ/IWC	Not Applicable. **0 Points**	IWC = 100%. **15 Points**
Historical Data	9 tests used to calculate RP. No data available in past 5 years.(5 pts) **5 Points**	11 tests used to calculate RP. One test failed. **0 Points**
Effluent Variability	Little variability, no violations or upsets, consistent WWTF operations. **0 Points**	Same as Acute. **0 Points**
Receiving Water Classification	WWSF (5 pts) **5 Points**	Same as Acute. **5 Points**
Chemical-Specific Data	Reasonable potential for limits for Chlorine based on ATC; (5 pts) Arsenic, Copper, and Chloride detected. (3 pts) Additional Compounds of Concern: None **8 Points**	Reasonable potential for limits for Chlorine based on CTC; (5 pts) Arsenic, Copper, and Chloride detected. (3 pts) Additional Compounds of Concern: None **8 Points**
Additives	4 Biocides (12 pts) and one Water Quality Conditioner added. (1 pt) P chemicals not in use. **13 Points**	All additives used more than once per 4 days. **13 Points**
Discharge Category	Fish Hatchery **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:	**31 Points**	**41 Points**
Recommended Monitoring Frequency (from Checklist):	3 tests during permit term	1x yearly
Limit Required?	No	Yes Limit = 1.0 TU_c
TRE Recommended? (from Checklist)	No	No

- After consideration of the guidance provided in the Department's WET Program Guidance Document (2022) and other information described above three acute and annual chronic WET tests are recommended in the reissued permit. Tests should be done in rotating quarters to collect seasonal information about this discharge. WET testing should continue after the permit expiration date (until the permit is reissued).

- According to the requirements specified in s. NR 106.08, Wis. Adm. Code, a chronic WET limit is required. The chronic WET limit shall be expressed as 1.0 TUc as a monthly average in the effluent limits table of the permit.

- A minimum of annual chronic monitoring is required because a chronic WET limit is required. Federal regulations in 40 CFR Part 122.44(i) require that monitoring occur at least once per year when a limit is present.

PART 7 – EXPRESSION OF LIMITS

Revisions to chs. NR 106 and 205, Wis. Adm. Code, align Wisconsin's WQBELs with 40 CFR 122.45(d), which requires WPDES permits contain the following concentration limits, whenever practicable and necessary to protect water quality:

- Weekly average and monthly average limitations for continuous discharges subject to ch. NR 210.
- Daily maximum and monthly average limitations for all other discharges.

Upper Midwest Environmental Science Center is an industrial discharge and is therefore subject to daily maximum and monthly average limitations whenever limitations are determined to be necessary.

This evaluation provides additional limitations necessary to comply with the expression of limits in ss. NR 106.07 and NR 205.065(7), Wis. Adm. Code. Pollutants already compliant with these rules or that have an approved impracticability demonstration, are excluded from this evaluation including water-quality based effluent limitations for phosphorus, temperature, pH, and *E. coli* among other parameters. Mass limitations are not subject to the limit expression requirements if concentrations limits are given.

Method for Calculation

The methods for calculating limitations for industrial discharges to conform to 40 CFR 122.45(d) are specified in s. NR 106.07(4), Wis. Adm. Code, as follows:

1. Whenever a daily maximum limitation is determined necessary to protect water quality, a 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.
2. Whenever a weekly average limitation is determined necessary to protect water quality:
    - A monthly average limitation shall also be included in the permit and set equal to the weekly average limit unless a more restrictive limit is already determined necessary to protect water quality.
    - A daily maximum limitation shall also be included in the permit and set equal to the daily maximum WQBEL calculated under s. NR 106.06, Wis. Adm. Code, or a daily maximum limitation calculated using the following procedure, whichever is more restrictive:

      Daily Maximum Limitation= WQBELc × DMF

    Where:

      DMF = Daily Multiplication Factor as defined in Table 2

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

s. NR 106.07 (4) (e). Table 2 — Daily Multiplication Factor

CV	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
DMF	1.114	1.235	1.359	1.460	1.557	1.639	1.712	1.764	1.802	1.828

CV	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0
DMF	1.842	1.849	1.851	1.843	1.830	1.815	1.801	1.781	1.751	1.744

3. Whenever a monthly average limitation is determined necessary to protect water quality, a daily maximum limit shall be calculated using the following procedure and included in the permit unless a more restrictive limit is already determined necessary to protect water quality:

   Daily Maximum Limit = (Monthly Average Limitation × MF)

   Where:

   MF= Multiplication factor as defined in Table 1

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

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

s. NR 106.07(3)(e)4, Table 1, Wis. Adm. Code — Multiplication Factor (for CV = 0.6)

CV	n=1	n=2	n=3	n=4	n=8	n=12	n=16	n=20	n=24	n=30
0.6	1.00	1.31	1.51	1.64	1.95	2.12	2.23	2.30	2.36	2.43

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

Summary of Additional Limitations:

In conclusion, the following additional limitations are required to comply with ss. NR 106.07 and NR 205.065(7), Wis. Adm. Code.

Expression of Limits Summary (Outfall 001)

Parameter	Daily Maximum	Weekly Average	Monthly Average	Multiplication Factor (CV)	Assumed Monitoring Frequency (n)
Total Halogens	19 µg/L	7.3 µg/L	**7.3 µg/L**		

PART 8 – ADDITIVE REVIEW

Unlike the metals and toxic substances evaluated in Part 2, most additives have not undergone the amount of toxicity testing needed to calculate water quality criteria. Instead, in cases where the minimum data requirements necessary to calculate a WQC are not met, a secondary value can be used to regulate the substance, according to s. NR 105.05, Wis. Adm. Code. Whenever an additive is discharged directly into a surface water without receiving treatment or an additive is used in the treatment process and is not expected to be removed before discharge, a review of the additive is needed. Secondary values should be derived according to s. NR 105.05, Wis. Adm. Code. Guidance related to conducting an additive review can be found in *Water Quality Review Procedures for Additives* (2019) (http://dnr.wi.gov/topic/wastewater/Guidance.html).

Additive Parameters

Additive Name	Purpose of Additive	Frequency of Use	Max Usage Rate	Max Effluent Concentration (mg/L)	Use Restriction (mg/L)	Authorized in Current Permit?[2]
Aquashade	dye for algae control	>4 days/week	2.5 L/day	0.098	16	
Chloramine T	disinfectant	>4 days/week	0.060 kg/day	0.002	N/A	
Calcium hypochlorite	disinfectant	>4 days/week	1.95 kg/day	0.017	N/A	Yes (90 kg/yr)
Citric acid	tank cleaning	>4 days/week	15 kg/day	1.176	N/A	Yes (125 kg/yr)
Cutrine-Plus	algaecide	>4 days/week	3 kg/day	0.137	N/A	Yes (40 L/yr)
Finquel (MS-222)	euthanize fish	>4 days/week	2 g/day	7.40741×10^{-5}	0.02	
Parasite-S (formalin)	disease control	>4 days/week	0.9 L/day	3.63×10^{-8}		
Hydrogen peroxide 35%	disease control	>4 days/week	2.4 L/day	1.004×10^{-7}	0.016	
Iodis (Iodine)	disinfectant	>4 days/week	1.2 L/day	7.02×10^{-8}	N/A	
Pennox 343	disease control and fish marking	>4 days/week	0.100 kg/day	0.004		Yes (4000 g/yr)
Potassium permanganate	disease control	>4 days/week	4.4 kg/day	0.164	**0.00077**	
Sodium chloride	disease control	>4 days/week	79.38 kg/day	2.94	400	Yes (1497 kg/yr)
Sodium thiosulfate	neutralize chlorine	>4 days/week	14 kg/day	0.519	N/A	Yes (275 kg/yr)
Virkon Aquatic	disinfectant	>4 days/week	0.250 kg/day	0.009		
Reward Aquatic Diquat	disinfectant	>4 days/week	3.0 L/day	0.134	**0.0044**	

The discharge of chloramine T, calcium hypochlorite, and iodine will be regulated indirectly by limits for total halogens.

Usage of citric acid is adequately addressed through pH limitations.

The usage of sodium thiosulfate is not directly regulated, and the major concern would be low dissolved oxygen levels associated with over-application. Dissolved oxygen monitoring data collected during the permit term indicates that this is not an issue.

Potassium permanganate is **not approved** at the proposed usage rate. Dosage will have to be adjusted to ensure a maximum discharge **concentration below 0.77 µg/L**.

Reward Aquatic Diquat is **not approved** at the proposed usage rate. Dosage will have to be adjusted to ensure a maximum discharge c**oncentration below 4.4 µg/L**.

Sufficient toxicity information for **Cutrine-Plus, Parasite-S, Pennox 343, and Virkon Aquatic**, have not been submitted. Therefore secondary toxicity values have not been calculated the these **additives are not approved**.

Attachment #2

Temperature limits for receiving waters without unidirectional flow

(calculation using default ambient temperature data)

Facility:	UMESC
Outfall(s):	001
Date Prepared:	06/26/2023
Design Flow (Qe):	1.046 MGD

Lake Type:	Southern Inland Lakes
Discharge Type:	Inland lake or impoundment shore discharge

Maximum area of mixing zone allowed (coefficient "A"): 15,708 ft^2

Temp Dates	**Flow Dates**
09/01/14	07/01/18
08/31/17	04/30/23

Month	Water Quality Criteria (Mississippi River)			Representative Highest Effluent Flow Rate (Qe)					Representative Highest Monthly Effluent Temperature		**Calculated Effluent Limit**	
	Ta (default) (°F)	Sub-Lethal WQC (°F)	Acute WQC (°F)	7-day Rolling Average (Qesl) (MGD)	Daily Maximum Flow Rate (Qea) (MGD)	B	e^{-a} (for SL-WQBEL)	e^{-a} (for A-WQBEL)	Weekly Average (°F)	Daily Maximum (°F)	**Weekly Average Effluent Limitation** (°F)	**Daily Maximum Effluent Limitation** (°F)
JAN	32	49	75	0.94	0.96	0.405	0.794	0.798	40	41	53	86
FEB	33	50	76	0.91	1.30	0.405	0.789	0.846	47	50	55	84
MAR	36	52	76	1.10	1.33	0.405	0.821	0.849	50	52	55	83
APR	47	55	79	1.20	1.36	0.405	0.834	0.852	63	65	**57**	85
MAY	60	65	82	1.05	1.34	0.555	0.781	0.823	69	72	**66**	87
JUN	72	75	85	1.23	2.03	0.667	0.789	0.867	78	79	**76**	87
JUL	76	80	86	1.23	1.76	0.667	0.788	0.848	80	82	81	88
AUG	76	79	86	1.40	1.91	0.667	0.812	0.859	79	82	80	88
SEP	67	73	84	1.47	2.52	0.555	0.838	0.902	75	77	**74**	86
OCT	54	61	81	1.73	1.88	0.405	0.882	0.891	64	65	**62**	84
NOV	40	50	77	1.57	1.69	0.405	0.871	0.880	53	56	**51**	82
DEC	33	49	76	1.04	1.27	0.405	0.811	0.843	44	46	53	84

Attachment #3

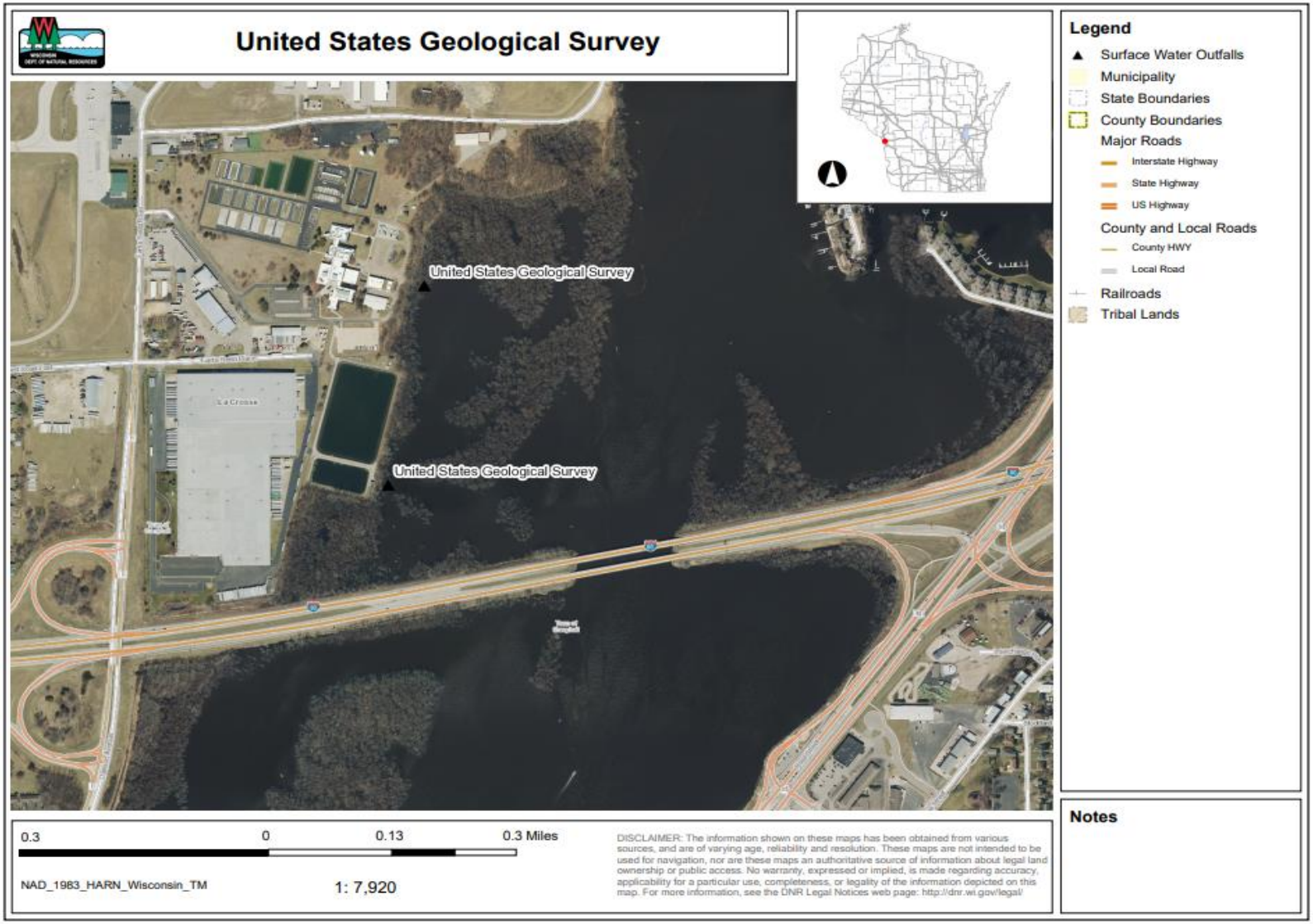
Temperature limits for receiving waters without unidirectional flow

(calculation using default ambient temperature data)

Facility:	UMESC	**Lake Type:**	Southern Inland Lakes	**Temp Dates**	**Flow Dates**
Outfall(s):	002	**Discharge Type:**	Inland lake or impoundment shore discharge	07/01/18	07/01/18
Date Prepared:	06/26/2023			04/30/23	04/30/23
Design Flow (Qe):	0.432 MGD	**Maximum area of mixing zone allowed (coefficient "A"):**	15,708 ft^2		

Month	Water Quality Criteria (Mississippi River)			Representative Highest Effluent Flow Rate (Qe)					Representative Highest Monthly Effluent Temperature		**Calculated Effluent Limit**	
	Ta (default) (°F)	Sub-Lethal WQC (°F)	Acute WQC (°F)	7-day Rolling Average (Qesl) (MGD)	Daily Maximum Flow Rate (Qea) (MGD)	B	e^{-a} (for SL-WQBEL)	e^{-a} (for A-WQBEL)	Weekly Average (°F)	Daily Maximum (°F)	**Weekly Average Effluent Limitation (°F)**	**Daily Maximum Effluent Limitation (°F)**
JAN	32	49	75	0.43	0.43	0.405	0.605	0.605	68	69	**60**	103
FEB	33	50	76	0.43	0.43	0.405	0.605	0.605	60	67	61	104
MAR	36	52	76	0.43	0.68	0.405	0.605	0.725	65	82	**62**	91
APR	47	55	79	0.43	0.45	0.405	0.605	0.615	79	91	**60**	99
MAY	60	65	82	0.43	0.58	0.555	0.548	0.641	85	87	**69**	94
JUN	72	75	85	0.48	0.80	0.667	0.543	0.694	86	91	**78**	91
JUL	76	80	86	0.68	1.02	0.667	0.651	0.752	84	91	**82**	**89**
AUG	76	79	86	0.70	0.78	0.667	0.661	0.689	83	90	**81**	91
SEP	67	73	84	0.43	0.57	0.555	0.548	0.636	80	82	**78**	94
OCT	54	61	81	0.43	0.72	0.405	0.605	0.738	78	81	**66**	91
NOV	40	50	77	0.43	0.43	0.405	0.605	0.605	73	86	**57**	101
DEC	33	49	76	0.43	0.43	0.405	0.605	0.605	72	83	**59**	104

Attachment #4



CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: November 14, 2024

TO: Angela Parkhurst– WCR/Eau Claire

FROM: Benjamin Hartenbower – WCR/Eau Claire

SUBJECT: Updated Additive Review for the Upper Midwest Environmental Science Center (permitted as United States Geological Survey)
WPDES Permit No. WI-0045756

This is in response to your request for an updated additive review for the Upper Midwest Environmental Science Center in La Crosse County. This industrial discharge is to a backwater of the Black River, located in the Lower La Crosse River Watershed in the Upper Wisconsin River Basin. This evaluation provides an update to Part 8 of Attachment #1 in the water quality-based effluent limitations (WQBEL) memo, dated April 15, 2024.

ADDITIVE REVIEW

In cases where the minimum data requirements necessary to calculate a WQC are not met, a secondary value can be used to regulate the substance, according to s. NR 105.05, Wis. Adm. Code. Whenever an additive is discharged directly into a surface water without receiving treatment or an additive is used in the treatment process and is not expected to be removed before discharge, a review of the additive is needed. Secondary values should be derived according to s. NR 105.05, Wis. Adm. Code. Guidance related to conducting an additive review can be found in *Water Quality Review Procedures for Additives* (2019) (http://dnr.wi.gov/topic/wastewater/Guidance.html).

Additive Parameters

Additive Name	Purpose of Additive	Frequency of Use	Max Usage Rate	Max Effluent Concentration (mg/L)	Use Restriction (mg/L)
Aquashade	dye for algae control	>4 days/week	5 L/day	0.07125	16
Chloramine T	disinfectant	>4 days/week	75 g/day	0.00130	N/A
Calcium hypochlorite	disinfectant	>4 days/week	2000 g/day	0.03427	N/A
Citric acid	tank cleaning	>4 days/week	31,000 g/day	0.55810	N/A
Cutrine-Plus	algaecide	>4 days/week	Not Approved	Not Approved	N/A
Syncaine (MS-222)	euthanize fish	>4 days/week	240 g/day	0.00422	0.015
Parasite-S (formalin)	disease control	>4 days/week	311.02 mg/L	0.03104	0.095
Hydrogen peroxide 35%	disease control	>4 days/week	1.6 L/day	0.01147	0.016
Iodis (Iodine)	disinfectant	>4 days/week	1.2 L/day	0.03333	N/A
Pennox 343	disease control and fish marking	>4 days/week	25.36 mg/L	0.00169	0.866
Potassium permanganate	disease control	>4 days/week	1650 g/day	0.00059	0.00077
Sodium chloride	disease control	>4 days/week	79.38 kg/day	1.39511	400
Sodium thiosulfate	neutralize chlorine	>4 days/week	14 kg/day	0.24605	N/A
Virkon Aquatic	disinfectant	>4 days/week	Not Approved	Not Approved	N/A
Reward Aquatic Diquat	disinfectant	>4 days/week	150 mL/day	0.00271	0.0044
Ovadine	disinfectant	>4 days/week	0.196 kg/day	0.00344	N/A

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The discharge of chloramine T, calcium hypochlorite, iodine, and ovadine will be regulated indirectly by permit limits for total halogens.

Usage of citric acid is adequately addressed through pH limitations.

The usage of sodium thiosulfate is not directly regulated, and the major concern would be low dissolved oxygen levels associated with over-application. Dissolved oxygen monitoring data collected during the permit term indicates that this is not an issue.

Approval of Virkon Aquatic will require an Standard Operating Proceedure (SOP) to be submitted that will support the expectation that the product will not to be present at the discharge location.

Sufficient toxicity information for **Cutrine-Plus** has not been submitted. Therefore, secondary toxicity values have not been calculated and these **additives are not approved**. If the Department receives sufficient toxicity information, a separate document will be provided to the facility at that time.

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.

PREPARED BY: _____ Date: 11/14/2024

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