CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: June 26, 2020

TO: Logan Hacker – WCR/Eau Claire

FROM: Benjamin Hartenbower – WCR/Eau Claire

SUBJECT: Water Quality-Based Effluent Limitations for the Port Edwards Wastewater Treatment Facility
WPDES Permit No. WI-0020451

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 Port Edwards Wastewater Treatment Facility in Wood County. This municipal wastewater treatment facility (WWTF) discharges to the Wisconsin River, located in the Wisconsin Rapids Watershed in the Upper Wisconsin River Central Sub-Basin. This discharge is included in the Wisconsin River TMDL as approved by EPA on April 26, 2019. The evaluation of the permit recommendations is discussed in more detail in the attached report

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

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Flow Rate						1,2
BOD_5 May – October November – April	Variable		45 mg/L 45 mg/L	30 mg/L 30 mg/L		1,3
TSS			45 mg/L	30 mg/L		1,3
pH	9.0 s.u.	6.0 s.u.				1,3
Bacteria						
Interim Limit Fecal Coliform				400 #/100 mL geometric mean		4
Final Limit *E. coli*				126 #/100 mL geometric mean		
Phosphorus TBL Final				 1.0 mg/L 4.47 lbs/day	 1.49 lbs/day	5
Nitrite + Nitrate						2,6
Nitrogen, Total Kjeldahl						2,6
Total Nitrogen						2,6

Footnotes:

1. No changes from the current permit
2. Monitoring only
3. The BOD_5 mass limit of 251 lbs/day daily max for outfall 001 applies May – October, depending on the Wisconsin River temperature and flow conditions. The river temperature and flow will be monitored at Sample Point 601.

Daily Maximum Limitation BOD_5 (lbs/day)/May - June							
River Flow (cfs)	Previous Day Mean River Temperature[2] (°F)						
	69 >	65/68	61/65	57/60	56/53	52/49	48/45
000/999	251	251	251	251	251	251	251
1000/1199	251	251	251	251	251	251	
1200/1499	251	251	251	251	251		
1500/1999	251	251	251	251			
2000/2499	251	251					
Daily Maximum Limitation BOD_5 (lbs/day)/July - August							
River Flow (cfs)	Previous Day Mean River Temperature[2] (°F)						
	73 >	72/69	68/65	64/61			
0000/2499	251	251	251	251			
2500/2999	251	251	251				
3000/3999	251						
Daily Maximum Limitation BOD_5 (lbs/day)/September - October							
River Flow (cfs)	Previous Day Mean River Temperature[2] (°F)						
	69 >	65/68	61/65	57/60	56/53	52/49	48/45
000/1199	251	251	251	251	251	251	251
1200/1499	251	251	251	251	251	251	
1500/1999	251	251	251	251	251		
2000/2499	251	251	251	251			
2500/2999	251	251	251				
3000/3999	251						

4. Bacteria limits apply during the disinfection season of May through September. The fecal coliform interim limit will apply until the end of the compliance schedule when *E. coli* limits take effect. Additional final limit: No more than 10 percent of *E. coli* bacteria samples collected in any calendar month may exceed 410 count/100 mL.
5. The phosphorus mass limit is based on the Total Maximum Daily Load (TMDL) for the Wisconsin River Basin to address phosphorus water quality impairments within the TMDL area. The TMDL was approved by EPA on April 26, 2019. If SSC are approved prior to permit reissuance, the final limit TMDL will be 4.70 lbs/day as a monthly average limit instead of the listed monthly average and six-month average limits.
6. As recommended in the Department's October 1, 2019 Guidance for Total Nitrogen Monitoring in Wastewater Permits, annual total nitrogen (total kjeldahl nitrogen and nitrate/nitrite) monitoring is recommended for all minor municipal permittees. Total Nitrogen is the sum of nitrate (NO_3), nitrite (NO_2), and total kjeldahl nitrogen (all expressed as N).

Since this discharge is a minor municipal (< 1.0 MGD), Chapter 1.11 *WET Testing of Minor Municipal Discharges* in the WET Guidance Document (2019) was consulted. No WET testing is recommended because this discharge is comprised solely of domestic wastewater, with no history of WET failures and no toxic compounds detected at levels of concern.

The recommended limits meet the expression of limits requirements in ss. NR 106.07 and NR 205.065(7) and additional limits are not required.

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 (Benjamin.Hartenbower@wisconsin.gov) or Diane Figiel at (Diane.Figiel@wisconsin.gov).

Attachments (3) – Narrative, 2015 Ammonia Limits & Map

PREPARED BY: _____ Date: 6/26/2020

Benjamin Hartenbower, PE,
Water Resources Engineer

E-cc: Pete Pfefferkorn, Wastewater Engineer – Wisconsin Rapids
Geisa Thielen, Regional Wastewater Supervisor – Eau Claire
Diane Figiel, Water Resources Engineer – WY/3
Scott Provost, Water Quality Biologist– Wisconsin Rapids

Attachment #1

Water Quality-Based Effluent Limitations for
Port Edwards Wastewater Treatment Facility

WPDES Permit No. WI-0020451

Prepared by: Benjamin P. Hartenbower

PART 1 – BACKGROUND INFORMATION

Facility Description:
The Port Edwards Wastewater Treatment Facility treats domestic wastewater from the Village of Port Edwards. Treatment consists of two oxidation ditches, two clarifiers, one digester, and one sludge storage tank. Discharge is to the south bank of the Wisconsin River, 3 miles upstream from the Domtar dam.

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

Existing Permit Limitations: The current permit, expiring on September 30, 2020, includes the following effluent limitations and monitoring requirements.

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Flow Rate						1,2
BOD_5 May – October November – April	Variable		45 mg/L 45 mg/L	30 mg/L 30 mg/L		1,3
TSS			45 mg/L	30 mg/L		1
pH	9.0 s.u.	6.0 s.u.				1
Fecal Coliform May – September				400#/100 mL geometric mean		
Phosphorus Interim Final				 1.0 mg/L 0.300 mg/L	 0.100 mg/L 0.45 lbs/day	 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. The BOD_5 mass limit of 251 lbs/day daily max for outfall 001 applies May-October, depending on the Wisconsin River temperature and flow conditions. The river temperature and flow will be monitored at Sample Point 601.
4. A compliance schedule is in the current permit to meet the final WQBEL by September 30, 2024.

Receiving Water Information:

- Name: Wisconsin River
- Classification used in accordance with chs. NR 102 and 104, Wis. Adm. Code: Warm water sport fish community, non-public water supply.
- Low Flows used in accordance with chs. NR 106 and 217, Wis. Adm. Code: The following 7-Q_{10} and 7-Q_2 values are from USGS for Station 05400800, upstream of where Outfall 001 is located.
  7-Q_{10} = 1230 cfs (cubic feet per second)
  7-Q_2 = 1860 cfs
  90-Q_{10} = 1590 cfs
  Harmonic Mean Flow = 2595 cfs using a drainage area of 5430 mi^2

  The Harmonic Mean has been estimated based on average flow and the 7-Q_{10} using an equation from U.S. EPA's *Technical Support Document for Water Quality-Based Toxics Control* (March 1991, EPA/505/2-90-001, pgs. 88-89).
- Hardness = 68 mg/L as $CaCO_3$. This value represents the geometric mean of data from 41 samples of the Wisconsin River at State Hwy 73 in Nekoosa from 12/14/1988 to 04/05/2001.
- % of low flow used to calculate limits in accordance with s. NR 106.06 (4) (c) 5., Wis. Adm. Code: 25%
- Source of background concentration data: Metals data from the Wisconsin River at Biron is used for this evaluation. The numerical values are shown in the tables below. If no data is available, the background concentration is assumed to be negligible and a value of zero is used in the computations. Background data for calculating effluent limitations for ammonia nitrogen are described later.
- Multiple dischargers: There are several other dischargers to the Wisconsin River, however they do not impact this evaluation.
- Impaired water status: The Wisconsin River at point of discharge is listed as impaired due to Mercury and PCBs. This discharge is located within the WI River TMDL for phosphorus.

Effluent Information:

- Design Flow Rate(s):
  Annual average = 0.538 MGD (Million Gallons per Day)

  For reference, the actual average flow from October 2015 to April 2020 was 0.403 MGD.
- Hardness = 92 mg/L as $CaCO_3$. This value represents the geometric mean of data submitted with the permit application from four samples collected from to 10/11/2019 to 10/20/2019.
- Acute dilution factor used in accordance with s. NR 106.06 (3) (c), Wis. Adm. Code: Not applicable – this facility does not have an approved Zone of Initial Dilution (ZID).
- Water Source: Domestic wastewater with water supply from municipal wells
- Additives: Alum for phosphorus removal.
- Total Phosphorus Wasteload Allocation:
  - Current criteria: 335 lbs/year = 0.917 lbs/day
  - Site-specific criteria: 599 lbs/year = 1.64 lbs/day

  The wasteload allocations (WLA) found in Appendices J and K of the *Total Maximum Daily Loads for Total Phosphorus in the Wisconsin River Basin (WRB TMDL)* report dated April 26, 2019
- Effluent characterization: This facility is categorized as a minor municipality, so the permit application required effluent sample analyses for a limited number of common pollutants, as specified in s. NR 200.065, Table 1, Wis. Adm. Code, primarily metal substances plus Ammonia, Chloride, and Hardness. The permit-required monitoring for Phosphorus from October 2015 to April 2020 is used in this evaluation.

Attachment #1

Sample Date	Copper µg/L	Chloride mg/L
10/11/2019	9	64
10/14/2019	10	73
10/17/2019	8	68
10/20/2019	7	70
10/23/2019	6	
10/26/2019	5	
10/29/2019	6	
11/01/2019	4	
11/04/2019	4	
11/07/2019	6	
11/10/2019	7	
Mean	6.6	68.8
1-day P_{99}	12.2	
4-day P_{99}	9.1	

The following table presents the average concentrations and loadings at Outfall 001 from October 2015 to April 2020 for all parameters with limits in the current permit to meet the requirements of s. NR 201.03(6):

	Average Measurement	Average Mass Discharged
BOD_5	5.1 mg/L*	14.3 lbs/day
TSS	8.3 mg/L*	
pH field	6.79 s.u.	
Phosphorus	0.25 mg/L*	
Fecal Coliform	440 #/100 mL	

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

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.".

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. Adm. Code (September 1, 2016) require the Department to calculate acute limitations using the same mass balance equation as used for other limits along with the 1-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.

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

Where:

WQC =Acute toxicity criterion or secondary acute value according to ch. NR 105

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

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

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

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

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

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

Daily Maximum Limits based on Acute Toxicity Criteria (ATC)

RECEIVING WATER FLOW = 984 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	MAX. EFFL. LIMIT**	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	1-day P_{99}	1-day MAX. CONC.
Arsenic		340	679.6	135.9	<1.0		
Cadmium	92	9.4	18.7	3.7	<3		
Chromium	92	1684	3367	673	<6		
Copper	92	14.3	28.7			12.2	10.0
Lead	92	99	197.2	39.4	<1		
Nickel	92	437	874.2	175	<6		
Zinc	92	112	223.7	44.7	10		
Chloride (mg/L)		757	1514	303	68.8		

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

Attachment #1

Weekly Average Limits based on Chronic Toxicity Criteria (CTC)

RECEIVING WATER FLOW = 307.5 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}
Arsenic		152.2		56375	11275	<1.0	
Cadmium	68	1.82	0.018	667.5	133.5	<3	
Chromium	68	96.30	0.320	35551	7110	<6	
Copper	68	7.44	1.230	2301			9.1
Lead	68	19.29	0.626	6914	1383	<1	
Nickel	68	37.65		13946	2789	<6	
Zinc	68	85.89	2.060	31053	6211	10.0	
Chloride (mg/L)		395		146308	29262	68.8	

Monthly Average Limits based on Wildlife Criteria (WC)

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

Monthly Average Limits based on Human Threshold Criteria (HTC)

RECEIVING WATER FLOW = 648.7 cfs (¼ of Harmonic Mean), as specified in s. NR 106.06 (4), Wis. Adm. Code.

SUBSTANCE	HTC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Cadmium	370	0.018	288677	57735	<3
Chromium (+3)	3818000	0.320	2978979279	595795856	<6
Lead	140	0.626	108747	21749	<1
Nickel	43000		33550581	6710116	<6

Monthly Average Limits based on Human Cancer Criteria (HCC)

RECEIVING WATER FLOW = 648.7 cfs (¼ of Harmonic Mean), as specified in s. NR 106.06 (4), Wis. Adm. Code.

SUBSTANCE	HCC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Arsenic	13.3		10377	2075	<1.0

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

Conclusions and Recommendations: Based on a comparison of the effluent data and calculated effluent limitations, effluent limitations are not required for toxic substances.

Mercury – The permit application did not require monitoring for mercury because the Port Edwards Wastewater Treatment Facility is categorized as a minor facility as defined in s. NR 200.02(8), Wis. Adm. Code. In accordance with s. NR 106.145(3)(a)3., Wis. Adm. Code, a minor municipal discharger shall monitor, and report results of influent and effluent mercury monitoring once every three months if, "there are two or more exceedances in the last five years of the high-quality sludge mercury concentration of 17 mg/kg specified in s. NR 204.07(5)." A review of the past five years of sludge characteristics data reveals that all the sample results are within expected analytical ranges and well below the 17 mg/kg level. The average concentration in the sludge from 2015 to 2019 was 0.93 mg/kg, with a maximum reported concentration of 1.57 mg/kg. Therefore, no mercury monitoring is recommended at Outfall 001.

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

The State of Wisconsin promulgated revised water quality standards for ammonia nitrogen in ch. NR 105, Wis. Adm. Code, effective March 1, 2004 which includes criteria based on both acute and chronic toxicity to aquatic life. Given the fact that the Port Edwards Wastewater Treatment Facility 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 effluent.

The effluent pH data was examined as part of this evaluation. A total of 1095 sample results were reported from October 2015 to April 2020. The maximum reported value was 7.00 s.u. (Standard pH Units). The effluent pH was 6.90 s.u. or less 99% of the time. The 1-day P_{99}, calculated in accordance with s. NR 106.05(5), Wis. Adm. Code, is 6.92 s.u. and 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 6.92 s.u. Therefore, a value of 6.92 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 6.92 s.u. into the equation above yields an ATC = 38.42 mg/L.

Potential changes to daily maximum Ammonia Nitrogen effluent limitations:
Subchapter IV of ch. NR 106, Wis. Adm. Code (effective September 1, 2016) specifies methods for the use of the 1-Q_{10} receiving water low flow to calculate daily maximum ammonia nitrogen limits 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.

	Ammonia Nitrogen Limit mg/L
2×ATC	77
1-Q_{10}	45,295

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

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, WWFF & LFF

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

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

The weekly and monthly average ammonia nitrogen limits calculation from the previous memo do not change because there have been no changes in the effluent and receiving water flow rates. The calculations from the previous WQBEL memo are shown in attachment #2.

Effluent Data
Four samples for ammonia nitrogen were taken in October 2019, and their results were as follows:

Sample Date	Ammonia Nitrogen mg/L
10/11/2019	<0.1
10/14/2019	<0.1
10/17/2019	<0.1
10/20/2019	<0.1

Conclusions and Recommendations:
In summary, ammonia nitrogen limitations are not required because the substance was not detected in the effluent.

PART 4 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR BACTERIA

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

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

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

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

Interim Limit

At this time, there is no effluent *E. coli* data available to determine if these limits are currently met. The permit will include a compliance schedule to meet these limits. During the compliance schedule, an interim limit applies to prevent back-sliding from the current level of disinfection during the compliance schedule period. Therefore, the current **fecal coliform limit shall be included in the reissued permit as an interim limit of 400 counts/100 mL as a monthly geometric mean**. Any weekly geometric mean limit which was included in the current permit for expression of limits purposes does not need to be included in the permit as an interim limit.

PART 5 – PHOSPHORUS

Technology Based Phosphorus Limit

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

Because the Port Edwards Wastewater Treatment Facility currently has a limit of 1.0 mg/L, this limit should be included in the reissued permit. This limit remains applicable unless a more stringent water quality-based concentration limit is given.

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

TMDL Limits – Phosphorus

Total phosphorus (TP) effluent limits in lbs/day are calculated as recommended in the *TMDL Development and Implementation Guidance: Integrating the WPDES and Impaired Waters Programs (*November 16, 2013). The wasteload allocations (WLA) found in Appendix J of the *Total Maximum Daily Loads for Total Phosphorus in the Wisconsin River Basin (WRB TMDL)* report dated April 26, 2019 are expressed as maximum annual loads (lbs/year) and maximum daily loads (lbs/day). The daily WLAs in the WRB TMDL equals the annual WLA divided by the number of days in the year. Therefore, the daily WLA is an annual average. Since the derivation of daily WLAs from annual WLAs does not take effluent variability or monitoring frequency into consideration, maximum daily WLAs from the WRB TMDL should not be used directly as permit effluent limits.

For the reasons explained in the April 30, 2012 paper entitled *Justification for Use of Monthly, Growing Season and Annual Average Periods for Expression of WPDES Permit Limits for Phosphorus Discharges in Wisconsin*, WDNR has determined that the phosphorus WQBELs set equal to WLAs would not be consistent with the assumptions and requirements of the TMDL.

Therefore, limits given to continuously discharging facilities covered by the WRB TMDL are given monthly average mass limits. If the equivalent effluent concentration is less than or equal to 0.3 mg/L, six-month average mass limits are also included. The following equation shows the calculation of equivalent effluent concentration:

$$\text{TP Equivalent Effluent Concentration} = \text{Daily WLA} \div (\text{Flow Rate} * \text{Conversion Factor})$$
$$= 0.917 \text{ lbs/day} \div (0.538 \text{ MGD} * 8.34)$$
$$= 0.20 \text{ mg/L}$$

Since this value is less than 0.3 mg/L, both a six-month average mass limit and a monthly average mass limit are applicable for total phosphorus. The monthly average limit is set equal to three times the six-month average limit.

$$\text{TP 6-Month Average Permit Limit} = \text{Daily WLA} * \text{6-monthly average multiplier}$$
$$= 0.917 \text{ lbs/day} * 1.62$$
$$= 1.49 \text{ lbs/day}$$

$$\text{TP Monthly Average Permit Limit} = \text{TP 6-Month Average Permit Limit} * 3$$
$$= 1.49 \text{ lbs/day} * 3$$
$$= 4.47 \text{ lbs/day}$$

The multiplier used in the six-month average calculation was determined according to TMDL implementation guidance. A coefficient of variation was calculated, based on phosphorus mass monitoring data, to be 1.95. The facility is able to meet the permit limits based on the WLA so the current CV is used. This value, along with monitoring frequency, is used to select the multiplier. The current permit specifies phosphorus monitoring as thrice weekly; if a different monitoring frequency is used, the stated limits should be reevaluated.

The WRB TMDL establishes TP wasteload allocations to reduce the loading in the entire watershed including WLAs to meet water quality standards for tributaries to the Wisconsin River. Therefore, WLA-based WQBELs are protective of immediate receiving waters and TP WQBELs derived according to s. NR 217.13, Wis. Adm. Code are not required.

Since wasteload allocations are expressed as annual loads (lbs/yr), permits with TMDL-derived monthly average permit limits should require the permittee to calculate and report rolling 12-month sums of total monthly loads for TP. Rolling 12-month sums can be compared directly to the annual wasteload allocation. Six-month average limits apply in the periods May – October and November – April.

Proposed Site-Specific Criteria for Phosphorus

The WRB TMDL report includes two sets of wasteload allocations. The WLA in Appendix J of the report are based on the current promulgated water quality criteria and the allocations in Appendix K are based on proposed site-specific criteria (SSC) for Lakes Petenwell, Castle Rock, and Wisconsin. If the total phosphorus limits were to be calculated based on the proposed SSC in Appendix K, this would result in phosphorus limits that are different from those calculated above.

If the WLA presented in Appendix K based on the proposed SSC were used, the annual allocation would be 599 lbs/year and the equivalent concentration would be 0.37 mg/L at the facility design flow of 0.538 MGD. Because this equivalent concentration is greater than 0.3 mg/L, only a monthly average limit will be required. Using the same calculation methods as above along with the monthly multiplier, the recommended mass effluent limit would be a monthly average of 4.70 lbs/day.

TP Monthly Average Permit Limit = daily WLA * monthly average multiplier
= 1.64 lbs/day * 2.87
= 4.70 lbs/day

It is important to note that implementation of the WLA contained in Appendix K can only occur if the SSC are promulgated by the State of Wisconsin and approved by USEPA. If this occurs, WDNR will notify stakeholders that adoption of the SSC has occurred and submit the necessary documentation to USEPA to confirm that the SSC-based WLAs will be implemented in future WPDES permits. From that point forward, SSC WLAs would be implemented in WPDES permits via permit modification or reissuance.

The WLAs contained in Appendix K only apply to the proposed SSC values in the WRB TMDL report; if SSC values other than those proposed in the WRB TMDL report are approved, then the WLA in Appendix K cannot be used and a new set of WLA would have to be calculated and documented in an updated version of the TMDL. A revised TMDL would have to go through the public approval process outlined in ch. NR 212.77, Wis. Adm. Code, and be re-submitted for USEPA approval.

Interim Limit – Phosphorus

An interim limit is needed when a compliance schedule is included in the permit to meet the TMDL limits. This limit should reflect a value which the facility is able to currently meet; however, it should also consider the receiving water quality, keeping the water from further impairment. It is recommended that the interim limit be set equal to the current interim limit of 1.0 mg/L. The following table lists the statistics for effluent phosphorus levels from October 2015 to April 2020 for informational purposes. In the cases where reporting the mass discharge is not required in the current permit, the mass is calculated using the reported phosphorus concentration and the effluent flow rate for that day.

Total Phosphorus Statistics		
	Concentration (mg/L)	Mass Discharge (lbs/day)
1-day P_{99}	1.9	7.7
4-day P_{99}	1.03	4.4
30-day P_{99}	0.48	1.9
Mean	0.25	0.9
Std	0.42	1.8
Sample Size	719	719
Range	<0.05 - 5.05	0.071 - 22.5

Conclusions:

In summary, the following limits are recommended by this evaluation:

- Monthly average Total Phosphorus mass limit of 4.47 lbs/day. If the SSC
- Six-month average Total Phosphorus mass limit of 1.49 lbs/day
- If the SSC are approved, the above monthly average and six-month average limits will be replaced with a 4.70 lbs/day monthly average limit
- Monthly average Total Phosphorus concentration limit of 1.0 mg/L

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

Attachment #1

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 WET Program Guidance Document (October 29, 2019).

Guidance in Chapter 1.11 of the WET Guidance Document (WET Testing of Minor Municipal Discharges) was consulted. This is a minor municipal discharge (< 1.0 MGD) comprised solely of domestic wastewater, with no history of WET failures and no toxic compounds detected at levels of concern. Because there is a very low risk of toxicity, no WET testing is recommended at this time.

Attachment #2

Ammonia Nitrogen Limit Calculations from the April 1, 2015 WQBEL Memo

AMMONIA (as N) LIMITS				
Effluent Flow (mgd):	0.583			
Effluent Flow (cfs):	0.902			
Effluent pH data:				
Begin Date	01-Dec-10			
End Date	30-Nov-13			
# of Samples	1096			
Maximum	7			
Average	6.79			
Standard Deviation	0.074			
Estimated 99th Percentile	6.97			
Max. Effluent pH (s.u.):	7.00			
BACKGROUND INFORMATION:				
	summer	***winter***	***spring***	***fall***
4Q3 (cfs)				
7Q10 (cfs)	999	999		
30Q5 (cfs)				
7Q2 (cfs)	1880	1880		
Ammonia (mg/L) (1)	0.05	0.12		
Temperature (deg C) (2)	25	3		
pH (std. units) (3)	7.72	7.67		
% of river flow used:	100	25		
Reference weekly flow:	999	249.75		
Reference monthly flow:	1598.0	399.5		
CRITERIA (in mg/L):				
Acute (@ effl. pH):	36.09	36.09		
4-day Chronic (@ backgrd. pH):				
early life stages present	4.45	9.24		
early life stages absent	4.45	15.01		
30-day Chronic (@ backgrd. pH)				
early life stages present	1.78	3.70		
early life stages absent	1.78	6.00		
EFFLUENT LIMITS (in mg/L):				
Daily maximum	72	72		
Weekly average				
early life stages present	4877	2536		
early life stages absent		4138		
Monthly average				
early life stages present	3067	1588		
early life stages absent		2612		

(1) Default Data

(2) Default Data

(3) Wisconsin River at Biron Data

Attachment #3