

CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: June 16, 2020

TO: Lisa Creegan – SER

FROM: Wade Strickland – WY/3

Diane K. Gilford for US.

SUBJECT: Water Quality-Based Effluent Limitations for the Grafton Water & Wastewater Utility
 WPDES Permit No. WI-0020184-10

This is in response to your request for an evaluation of the need for water quality-based effluent limitations (WQBELs) using Chapters NR 102, 104, 105, 106, 207, 210, 212, and 217 of the Wisconsin Administrative Code (where applicable), for the discharge from the Grafton Water & Wastewater Utility in Ozaukee County. This municipal wastewater treatment facility (WWTF) discharges to the Milwaukee River, located in the Milwaukee River (South) Watershed in the Milwaukee River Basin. This discharge is included in the Milwaukee River TMDL as approved by EPA. 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
BOD ₅ November – April May – October			45 mg/L 33 mg/L	30 mg/L 30 mg/L		1
TSS November – January February – October			45 mg/L 12 mg/L	12 mg/L 12 mg/L		2
Ammonia Nitrogen Nov – March April May – September October	20 mg/L 20 mg/L		16 mg/L 10 mg/L 17 mg/L 14 mg/L	10 mg/L 6.3 mg/L 12 mg/L 9.0 mg/L		1
pH	9.0 s.u.	6.0 s.u.				1
Dissolved Oxygen May – October		6.0 mg/L				1
Bacteria						
Interim Limit Fecal Coliform				400 #/100 mL geometric mean		3
Final Limit <i>E. coli</i>				126 #/100 mL geometric mean		3
Mercury, Total Recoverable						6
Phosphorus AM Interim Limits				1.0 mg/L	0.6 mg/L	4,5
Nitrite + Nitrate						6,7
Nitrogen, Total Kjeldahl						6,7
Total Nitrogen						6,7
Acute WET						8,10
Chronic WET				2.6 TUc		8,9,10

Footnotes:

1. No changes from the current permit.
2. Additional TSS mass limitations are required in accordance with the waste load allocations specified in the Milwaukee River Basin TMDL. Additional information can be found in the TSS section of this memo.

Month	Weekly Ave TSS Effluent Limit (lbs/day)
Jan	261.38
Feb	-
Mar	-
Apr	-
May	-
Jun	-
Jul	-
Aug	-
Sep	-
Oct	-
Nov	298.49
Dec	251.78

3. 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
4. Under the phosphorus Adaptive Management (AM) Plan, the AM interim limits (and technology-based limit (TBL)) of 1.0 mg/L, monthly average and 0.6 mg/L, six-month average should be effective after a compliance schedule to allow for optimization. In the absence of adaptive management as a compliance option, the current total phosphorus TMDL limits would apply.
5. The monthly average phosphorus interim limit is a technology-based limit which also functions as an interim limit for the phosphorus compliance schedule.
6. Monitoring only.
7. As recommended in the Department's October 1, 2019 Guidance for Total Nitrogen Monitoring in Wastewater Permits, quarterly total nitrogen (total kjeldahl nitrogen and nitrate/nitrite) monitoring is recommended for all municipal major permittees. Total Nitrogen is the sum of nitrate (NO₃), nitrite (NO₂), and total kjeldahl nitrogen (all expressed as N).
8. A minimum of annual acute and chronic monitoring is recommended because Grafton WWTF is a major municipal discharger with a design flow greater than 1.0 MGD. Federal regulations at 40 CFR Part 122.21(j) require at least 4 acute and chronic WET tests with each permit application on samples collected since the previous reissuance.
9. 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. The Instream Waste Concentration (IWC) to assess chronic test results is 39%. 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% and the dilution water used in WET tests conducted on Outfall 001 shall be a grab sample collected from the Milwaukee River. See the WET section of Attachment #1 for more information.

10. 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).

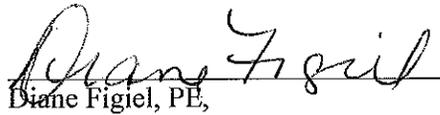
The recommended limits meet the expression of limits requirements in ss. NR 106.07 and NR 205.065(7) and additional limits are not required.

Please consult the attached report for details regarding the above recommendations. If there are any questions or comments, please contact Nicole Krueger at Nicole.Krueger@wisconsin.gov or Diane Figiel at Diane.Figiel@wisconsin.gov.

Attachments (4) – Narrative, Ammonia Calculations, Outfall Map, & Thermal Table

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Date: 4/16/2020

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Attachment #1
**Water Quality-Based Effluent Limitations for
 Grafton Water & Wastewater Utility**

WPDES Permit No. WI-0020184-10

Prepared by: Nicole Krueger

PART 1 – BACKGROUND INFORMATION

Facility Description:

The Village of Grafton Water & Wastewater Utility serves a population of approximately 11,400. The facility is a single-stage activated sludge wastewater treatment facility (WWTF) which underwent improvements in 2004 and led to an increase in the plant’s design flow. Preliminary treatment is achieved through mechanical bar screens, an aerated grit chamber, and addition of ferric chloride to the aerated grit chamber for phosphorus removal. Wastewater is then pumped to two primary clarifiers followed by fine bubble aeration and four final clarifiers. Two clarifiers are located within the compact plants and two are separate. Effluent is disinfected through an ultraviolet disinfection system.

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

Existing Permit Limitations: The current permit, expiring on 06/30/2020, includes the following effluent limitations and monitoring requirements.

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
BOD ₅ November – April May – October			45 mg/L 33 mg/L	30 mg/L 30 mg/L		1
TSS November – April May – October			45 mg/L 33 mg/L	30 mg/L 30 mg/L		2
Ammonia Nitrogen Nov – March April May – September October	20 mg/L 20 mg/L		16 mg/L 10 mg/L 17 mg/L 14 mg/L	10 mg/L 6.3 mg/L 12 mg/L 9.0 mg/L		
pH	9.0 s.u.	6.0 s.u.				1
Dissolved Oxygen May – October		6.0 mg/L				1
Fecal Coliform May – September				400#/100 mL geometric mean		
Mercury, Total Recoverable						3
Phosphorus, Total				1.0 mg/L		2
Temperature, Maximum						3
Acute WET Chronic WET						4

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Footnotes:

1. These limitations are not being evaluated as part of this review. Because the water quality criteria (WQC), reference effluent flow rates, and receiving water characteristics have not changed, limitations for these water quality characteristics do not need to be re-evaluated at this time.
2. This is an interim limit for phosphorus. The final TMDL limits shown in the table below were included during a permit modification. A compliance schedule is included in the permit to meet these limits by 07/01/2024. The fact sheet of the permit modification stated that the TSS TMDL limits would be included at the next permit reissuance.

Month	Monthly Ave Limit (lbs/day)
January	2.94
February	3.41
March	2.81
April	2.95
May	3.11
June	3.22
July	2.80
August	2.71
September	2.88
October	2.33
November	2.95
December	2.66

3. Monitoring only.
4. Annual acute and chronic WET testing is included in the permit. Chronic testing was performed using a dilution series of 100%, 75%, 50%, 25%, & 12.5%. The Instream Waste Concentration to assess chronic tests is 39%.

Receiving Water Information:

- Name: Milwaukee River, South Branch
- Classification used in accordance with chs. NR 102 and 104, Wis. Adm. Code: Warm water sport fish community, non-public water supply. (Coldwater and Public Water Supply criteria would be used for bioaccumulating compounds of concern, because the discharge is within the Great Lakes basin).
- Low Flows used in accordance with chs. NR 106 and 217, Wis. Adm. Code: The following 7-Q₁₀ and 7-Q₂ values are from USGS for Station M111, where Outfall 001 is located.
 - 7-Q₁₀ = 24 cfs (cubic feet per second)
 - 7-Q₂ = 52 cfs
 - 90-Q₁₀ = 44.2 cfs
 - Harmonic Mean Flow = 106 cfs using a drainage area of 467 mi²
- Hardness = 359 mg/L as CaCO₃. This value represents the geometric mean of data from 11/11/2014 to 02/13/2018 from permit required WET testing.
- % of low flow used to calculate limits in accordance with s. NR 106.06 (4) (c) 5., Wis. Adm. Code: 25%
- Source of background concentration data: Metals data from the Milwaukee River at Batavia is used for this evaluation. This data is from the '[DNR Water Quality Rules Implementation Plan](#)', Chapter 4, [January 1998; Background of the Milwaukee River at Batavia](#). 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

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ammonia nitrogen are described later.

- Multiple dischargers: There are several other dischargers to the Milwaukee 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 Milwaukee River at the point of discharge is listed as impaired for Total Phosphorus and PCBs.

Effluent Information:

- Design Flow Rate(s):
Annual average = 2.50 MGD (Million Gallons per Day)
For reference, the actual average flow from 06/01/2015 to 11/30/2019 was 1.57 MGD (this is equivalent to their average influent flow rate, because the effluent flow rate is not reported).
- Hardness = 391 mg/L as CaCO₃. This value represents the geometric mean of data from 09/30/2019 to 10/10/2019 on the permit application.
- Acute dilution factor used in accordance with s. NR 106.06 (3) (c), Wis. Adm. Code: Not applicable – this facility does not have an approved Zone of Initial Dilution (ZID).
- Water Source: Domestic wastewater with water supply from wells
- Additives: Ferric chloride is used for phosphorus removal.
- Effluent characterization: This facility is categorized as a major municipal, so the permit application required effluent sample analyses for all the “priority pollutants” except for the Dioxins and Furans as specified in s. NR 200.065, Table 1, Wis. Adm. Code. The permit-required monitoring for chloride from July 2015 to November 2019 and mercury from November 2006 to October 2019 is used in this evaluation.

	Copper µg/L	Mercury ng/L	Chloride mg/L
1-day P ₉₉	17	3.3	538
4-day P ₉₉	13	1.9	486
30-day P ₉₉	11	1.27	455
Mean	10	0.97	437
Std	2.4	0.64	39.8
Sample size	13	32	44
Range	6.5-15	0.13-3.6	355-517

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

The following table presents the average concentrations and loadings at Outfall 001 from 06/01/2015 to 11/30/2019 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	6.6 mg/L	
TSS	4.6 mg/L	
Dissolved Oxygen	8.8 mg/L	
pH field	7.3 s.u.	
Phosphorus	0.69 mg/L	7.0 lbs/day

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	Average Measurement	Average Mass Discharged
Ammonia Nitrogen	0.11 mg/L*	
Fecal Coliform	27.4 #/100 mL	

*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 P₉₉) value exceeds the comparable calculated limit (s. NR 106.05(4), Wis. Adm. Code)
3. If fewer than 11 detected results are available, the mean effluent concentration exceeds 1/5 of the calculated limit (s. NR 106.05(6), Wis. Adm. Code)

Acute Limits based on 1-Q₁₀

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

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

Where:

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

Q_s = average minimum 1-day flow which occurs once in 10 years (1-day Q₁₀)

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

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

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

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

As a rule of thumb, if the receiving water is effluent dominated under low stream flow conditions, the 1-Q₁₀ method of limit calculation produces the most stringent daily maximum limitations and should be used while making reasonable potential determinations. This is not the case for Grafton 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) and mercury (ng/L).

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Daily Maximum Limits based on Acute Toxicity Criteria (ATC)

RECEIVING WATER FLOW = 19.2 cfs, (1-Q₁₀ (estimated as 80% of 7-Q₁₀)), as specified in s. NR 106.06 (3) (bm), Wis. Adm. Code.

SUBSTANCE	REF. HARD.* mg/L	ATC	MAX. EFFL. LIMIT**	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	1-day P ₉₉	1-day MAX. CONC.
Arsenic		340	680	136	<2.2		
Cadmium	391	49.2	98.5	19.7	<0.19		
Chromium	301	4446	8892	1778	1.0		
Copper	391	56.2	112			17.0	
Lead	356	365	729	146	<4.3		
Mercury		830	1660	332		3.3	
Nickel	268	1080	2160	432	8.0		
Zinc	333	345	698	138	32		
Chloride (mg/L)		757	1514			538	517

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

** The 2 × ATC method of limit calculation yields a more restrictive limit than consideration of ambient concentrations and 1-Q₁₀ flow rates per the changes to s. NR 106.07(3), Wis. Adm. Code, effective 09/01/2016.

Weekly Average Limits based on Chronic Toxicity Criteria (CTC)

RECEIVING WATER FLOW = 6.0 cfs (¼ of the 7-Q₁₀), as specified in s. NR 106.06 (4) (c), Wis. Adm. Code

SUBSTANCE	REF. HARD.* mg/L	CTC	MEAN BACK-GRD.	WEEKLY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	4-day P ₉₉
Arsenic		152		388	77.7	<2.2	
Cadmium	175	3.82	0.21	9.43	1.9	<0.19	
Chromium	301	326	0.50	830	166	1.0	
Copper	359	30.9	1.26	76.9		13.3	
Lead	356	95.5	0.65	243	48.5	<4.3	
Mercury		440	4.11	1116			1.9
Nickel	268	120		307	61.3	8.0	
Zinc	333	345	2.61	875	175	32.0	
Chloride (mg/L)		395		1008			486

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

Monthly Average Limits based on Wildlife Criteria (WC)

RECEIVING WATER FLOW = 11.1 cfs (¼ of the 90-Q₁₀), as specified in s. NR 106.06 (4), Wis. Adm. Code

SUBSTANCE	WC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	30-day P ₉₉
Mercury (ng/L)	1.3	4.11	1.3			1.27

Monthly Average Limits based on Human Threshold Criteria (HTC)

RECEIVING WATER FLOW = 26.6 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.
Antimony	373		2940	587	0.22
Cadmium	370	0.21	2910	582	<0.19
Chromium (+3)	3818000	0.50	30040000	6008000	1.0
Lead	140	0.65	1097	219.4	<4.3
Nickel	43000		340000	68000	8.0
Silver	28000		220000	44000	0.92

Monthly Average Limits based on Human Cancer Criteria (HCC)

RECEIVING WATER FLOW = 26.6 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		105	20.9	<2.2

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 effluent data is available for only one substance for which Human Cancer Criteria exists, and it was not detected in the effluent, determination of the cumulative cancer risk is not needed per s. NR 106.06(8), Wis. Adm. Code.

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

Mercury – The WQBEL for total recoverable mercury is set equal to the most stringent criterion of 1.3 ng/L, according to s. NR 106.06 (6), Wis. Adm. Code, because the background concentration in the receiving water and similar inland streams is known to exceed 1.3 ng/L. The current permit requires annual monitoring of the influent and effluent for total recoverable mercury. A total of 32 effluent sampling results are available from 11/15/2006 to 10/31/2019 for total recoverable mercury. The average concentration was 0.97 ng/L, and the maximum was 3.6 ng/L. Because the 30-day P₉₉ of available data (1.27 ng/L) is less than the most stringent WQBEL of 1.3 ng/L, **no WQBEL for mercury is required however monitoring is recommended in the reissued permit.**

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

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

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

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.

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

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 1,643 sample results were reported from 06/02/2015 to 11/30/2019. The maximum reported value was 8.50 s.u. (Standard pH Units). The effluent pH was 7.70 s.u. or less 99% of the time. The 1-day P₉₉, calculated in accordance with s. NR 106.05(5), Wis. Adm. Code, is 7.64 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 7.64 s.u. Therefore, a value of 7.70 s.u. is believed to represent the maximum reasonably expected pH, and therefore most appropriate for determining daily maximum limitations for ammonia nitrogen. Substituting a value of 7.70 s.u. into the equation above yields an ATC = 14.4 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-Q₁₀ 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-Q₁₀ (estimated as 80 % of 7-Q₁₀) and the 2×ATC approach are shown below.

	Ammonia Nitrogen Limit mg/L
2×ATC	29
1-Q ₁₀	86

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

This limit is greater than the current daily maximum limit of 20 mg/L for November through April. If Grafton would like to request an increase to the existing permit limits, 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 must be continued in the reissued permit. Since the highest reported effluent concentration was 9.1 mg/L during the previous permit term, the Department would be unable to increase the limit due to the lack of need as shown via the antidegradation rule (ch. NR 207, Wis. Adm. Code). No changes are recommended in any of the permit limits for ammonia.

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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

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 Average & Monthly Average Limits based on Chronic Toxicity Criteria (CTC)

No changes are recommended to the current weekly and monthly average ammonia limits 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

The following table evaluates the statistics based upon ammonia data reported from 06/01/2015 to 11/30/2019, with those results being compared to the calculated limits to determine the need to include ammonia limits in Grafton’s permit for the respective month ranges. That need is determined by calculating 99th upper percentile (or P₉₉) values for ammonia during each of the month ranges and comparing the daily maximum values to the daily maximum limit.

Ammonia Nitrogen mg/L	April	May – September	October	November – March
1-day P ₉₉	1.3	3.1	0.5	1.5
4-day P ₉₉	0.60	1.8	0.2	0.80
30-day P ₉₉	0.27	0.73	0.11	0.34
Mean*	0.10	0.25	0.04	0.09
Std	0.46	1.0	0.15	0.73
Sample size	69	356	90	360
Range	<0.075 – 1.58	<0.075 – 9.06	<0.075 – 0.681	<0.075 4.17

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

Based on this comparison, no limits are required for any month based on a reasonable potential analysis.

Where there are existing ammonia nitrogen limits in the permit, the limits must be retained regardless of reasonable potential, consistent with s. NR 106.33(1)(b), Wis. Adm. Code:

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

Conclusions and Recommendations:

In summary, after rounding to two significant figures, the following ammonia nitrogen limitations are recommended. No mass limitations are recommended in accordance with s. NR 106.32(5), Wis. Adm Code.

	Daily Maximum mg/L	Weekly Average mg/L	Monthly Average mg/L
November – March	20	16	10
April	20	10	6.3
May – September	-	17	12
October	-	14	9.0

There are no recommended changes to the current ammonia nitrogen limits.

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 Grafton’s permit requires weekly monitoring, the 410 counts/100 mL limit will effectively function as a daily maximum limit unless the facility performs additional monitoring. Any additional monitoring beyond what is required by the permit must also be reported on the DMR as required in the standard requirements section of the permit.

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

Attachment #1
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 Grafton WWTF 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.

Milwaukee River Basin TMDL

The Milwaukee River Basin TMDL was approved in by EPA in March 2018 which addresses total phosphorus (TP), total suspended solids (TSS), and fecal coliform. This was developed by the Milwaukee Metropolitan Sewerage District for the Milwaukee, Menomonee, and Kinnickinnic River watersheds and includes wasteload allocations (WLAs) for point source dischargers.

The Milwaukee River Basin TMDL was developed with a goal of meeting the phosphorus water quality criterion of all streams and rivers within the basin. Per s. NR 217.16 and 212.76, the TMDL-derived limits will be included in the reissued permit. If after two permit terms, the Department determines the nonpoint source load allocation has not been substantially reduced, the Department may impose the more stringent ch. NR 217.13, Wis. Adm. Code, WQBEL, or may include the TMDL-derived limit for an additional permit term if the Department determines there will be significant nonpoint source load reductions within the upcoming permit term.

The table below includes the monthly average total phosphorus limits to be included in the reissued permit (in bold). The Milwaukee River Basin TMDL includes maximum monthly phosphorus WLAs in pounds per month and the monthly average TP limits are derived from those.

Month	Monthly Maximum TP WLA ¹ (lbs/month)	Days Per Month	Monthly Average TP Effluent Limit ² (lbs/day)	Equivalent Monthly Average TP Effluent Conc. ³ at 2.5 MGD (mg/L)
Jan	91.29	31	2.94	0.141
Feb	95.53	28	3.41	0.164
Mar	87.07	31	2.81	0.135
Apr	88.55	30	2.95	0.142
May	96.38	31	3.11	0.149
Jun	96.49	30	3.22	0.154
Jul	86.83	31	2.80	0.134
Aug	84.04	31	2.71	0.130
Sep	86.50	30	2.88	0.138
Oct	72.21	31	2.33	0.112
Nov	88.49	30	2.95	0.141
Dec	82.55	31	2.66	0.128

Footnotes:

1. Monthly maximum TP WLAs are provided in Appendix A (Table A.17) in the Milwaukee River Basin TMDL.

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2. Monthly average TP effluent limit (lbs/day) = monthly maximum TP WLA (lbs/month) ÷ days per month
3. For informational purposes only – the equivalent concentrations shown were calculated by the following: mass limit (lbs/day) / (annual average design flow (2.5 MGD) * 8.34)

The equivalent monthly average concentrations range from 0.112 mg/L to 0.164 mg/L.

Effluent Data

The following table summarizes effluent total phosphorus monitoring data from 06/01/2015 to 11/30/2019.

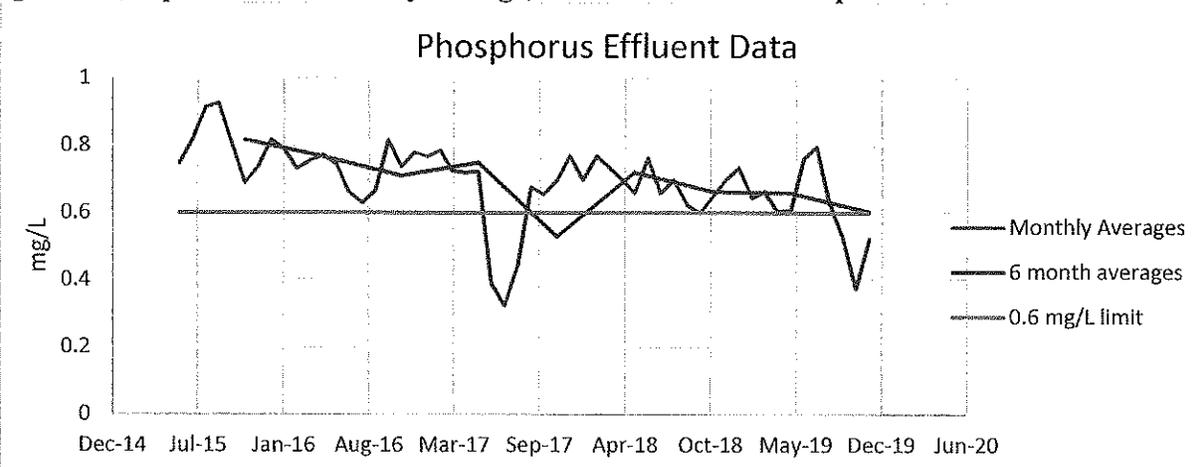
	Phosphorus mg/L	Phosphorus lbs/day
1-day P ₉₉	1.2	12.2
4-day P ₉₉	0.9	9.3
30-day P ₉₉	0.76	7.79
Mean	0.69	6.99
Std	0.17	1.79
Sample size	939	34
Range	0.13 – 1.66	4.4 – 12.5

Based on the effluent data, Grafton cannot currently consistently meet the TMDL-derived limits, and the permittee is pursuing Adaptive Management as their phosphorus compliance option.

Adaptive Management Interim Limit

Grafton WWTF intends to pursue adaptive management (AM) to comply with the phosphorus TMDL-derived limits. Because this is the first permit term in which AM is being pursued, the required interim limit is 0.6 mg/L, expressed as a 6-month average and 1.0 mg/L as a monthly average per s. NR 217. 18 (3) (e) 1, Wis. Adm. Code. The permittee may be allowed up to five years to meet this interim limit.

Grafton WWTF currently has not been able to show that they can consistently meet the required interim limit of 0.6 mg/L as a six-month average (data shown in the graph below). Because of this, a compliance schedule is recommended to allow for optimization. **Until the 0.6 mg/L limit becomes effective, a 1.0 mg/L limit, expressed as a monthly average, shall be included in the permit.**



PART 6 – TOTAL SUSPENDED SOLIDS

The current permit has a weekly average limit of 45 mg/L for November to April, a weekly average limit of 33 mg/L for May to October, and a monthly average limit of 30 mg/L year-round.

Pursuant to s. NR 106.07, Wis. Adm. Code, total suspended solids (TSS) limits shall be expressed as weekly and monthly average limits for a municipal facility. The table below includes the weekly and monthly average TSS limits calculated as recommended in the *TMDL Development and Implementation Guidance: Integrating the WPDES and Impaired Waters Programs* (April 2020) and are based on the wasteload allocations (WLAs). The Milwaukee River Basin TMDL includes maximum monthly TSS WLAs in pounds per month and the weekly and monthly average TSS limits are derived from those.

Month	Monthly Maximum TSS WLA ¹ (lbs/month)	Days Per Month	Monthly Average TSS Effluent Limit ² (lbs/day)	Equivalent Monthly Average TSS Effluent Conc. ³ at 2.5 MGD (mg/L)	Weekly Average TSS Effluent Limit ⁴ (lbs/day)	Equivalent Weekly Average TSS Effluent Conc. ³ at 2.5 MGD (mg/L)
Jan	6,232.90	31	201.06	9.64	261.38	12.54
Feb	4,902.45	28	175.09	8.39	227.61	10.92
Mar	4,286.15	31	138.26	6.63	179.74	8.62
Apr	3,595.77	30	119.86	5.75	155.82	7.47
May	4,581.68	31	147.80	7.09	192.14	9.22
Jun	4,249.25	30	141.64	6.79	184.13	8.83
Jul	3,197.47	31	103.14	4.95	134.09	6.43
Aug	2,882.97	31	93.00	4.46	120.90	5.80
Sep	3,980.78	30	132.69	6.36	172.50	8.27
Oct	4,304.68	31	138.86	6.66	180.52	8.66
Nov	6,888.24	30	229.61	11.0	298.49	14.32
Dec	6,003.95	31	193.68	9.29	251.78	12.08

Footnotes:

1. Monthly maximum TSS WLAs are provided in Appendix A (Table A.19) in the Milwaukee River Basin TMDL.
2. Monthly average TSS effluent limit (lbs/day) = monthly maximum TSS WLA (lbs/month) ÷ days per month
3. For informational purposes only – the equivalent concentrations shown were calculated by the following: mass limit (lbs/day) / (annual average design flow (2.5 MGD) * 8.34)
4. Weekly average effluent limit (lbs/day) = monthly average limit (lbs/day) * multiplier

The multiplier used in the weekly average mass limit calculation was determined according to implementation guidance. A coefficient of variation (CV) was calculated, based on TSS mass monitoring data, to be 0.5. This was calculated by dividing the standard deviation of the TSS mass data by the average of the TSS mass data. The CV that was used in the previous evaluation was also 0.5.

The CV of 0.5 and the monitoring frequency of 4x/week was used to select the multiplication factor according to Sections 5.4 and 5.5 in the Technical Support Document for Water Quality-based Toxics Control (EPA/505/2-90-001). **The monitoring frequency for TSS is specified as 4x/week in the**

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current permit and it is believed this frequency will stay the same. Based on these two variables, the multiplication factor is 1.3 which is equivalent to the multiplication factor that was used in the previous WQBEL memo, so **the calculated weekly TSS limits remain the same.** If there is a change in monitoring frequency, the stated limits should be reevaluated.

The Milwaukee River Basin TMDL provides TSS WLAs for point and nonpoint source dischargers to the Milwaukee River Basin and established that the water quality target of 12 mg/L, expressed as the median of monthly data collected between May and October. Standard wastewater treatment processes such as grit removal and primary and secondary clarification, which are necessary to reduce wastewater TSS levels to 12 mg/L, will have removed settleable material that would contribute to sedimentation. Wastewater which discharges at or below 12 mg/L will not contribute to sediment impairments. According to section 6.4.1 of the TMDL, wastewater dischargers won't be required to meet limits lower than 12 mg/L, including equivalent mass limits.

The equivalent concentration limits were also calculated and included in the table above. Consistent with Section 6.4.2 of the TMDL, because the equivalent monthly average concentrations are all less than 12 mg/L, **it is recommended that the monthly average limits be equal to 12 mg/L, and not the TMDL monthly mass limits. The equivalent weekly average concentrations are less than 12 mg/L from February to October, so it is recommended that the weekly average limits for those months also be 12 mg/L. January, November, and December have equivalent weekly average concentrations of greater than 12 mg/L, so it is recommended that the weekly mass TMDL limits for those months be included in the reissued permit.** There is no recommended change in the weekly average concentration limits for January, November, and December.

The table below is a summary of the effluent TSS concentration from the current permit term (06/01/2015 to 11/30/2019).

	TSS mg/L	TSS lbs/day
1-day P ₉₉	13.3	169
4-day P ₉₉	8.3	106
30-day P ₉₉	5.77	74.4
Mean	4.60	59.6
Std	2.51	31.9
Sample size	939	939
Range	1 – 29	10.7 – 312

Grafton has demonstrated that they can currently meet the limits, so a compliance schedule is not recommended in the reissued permit.

PART 7 – 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.

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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 06/01/2015 to 12/31/2019.

The table below summarizes the maximum temperatures reported during monitoring from 01/01/2019 to 12/31/2019.

Month	Representative Highest Monthly Effluent Temperature		Calculated Effluent Limit	
	Weekly Maximum	Daily Maximum	Weekly Average Effluent Limitation	Daily Maximum Effluent Limitation
	(°F)	(°F)	(°F)	(°F)
JAN	52	53	78	120
FEB	50	51	83	120
MAR	51	56	71	120
APR	54	55	66	120
MAY	58	61	76	107
JUN	65	67	95	105
JUL	70	71	109	115
AUG	71	72	100	97
SEP	70	71	89	104
OCT	65	68	77	109
NOV	58	60	67	120
DEC	55	55	74	120

Reasonable Potential

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

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

Based on the available effluent data **no effluent limits or monitoring are recommended for temperature**. The complete thermal limit calculation table is in Attachment #4.

PART 8 – 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).

- Acute tests predict the concentration that causes lethality of aquatic organisms during a 48 to 96-hour exposure. To assure that a discharge is not acutely toxic to organisms in the receiving water, WET tests must produce a statistically valid LC₅₀ (Lethal Concentration to 50% of the test organisms) greater than 100% effluent, according to s. NR 106.09 (2) (b), Wis. Adm Code.
- Chronic tests predict the concentration that interferes with the growth or reproduction of test organisms during a seven-day exposure. To assure that a discharge is not chronically toxic to organisms in the receiving water, WET tests must produce a statistically valid IC₂₅ (Inhibition Concentration) greater than the instream waste concentration (IWC), according to s. NR 106.09 (3) (b), Wis. Adm Code. The IWC is an estimate of the proportion of effluent to total volume of water (receiving water + effluent). The IWC of 39% 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 = 2.5 MGD = 3.87 cfs

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

Q_s = ¼ of the 7- Q_{10} = 24 cfs ÷ 4 = 6 cfs

- According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), a synthetic (standard) laboratory water may be used as the dilution water and primary control in acute WET tests, unless the use of different dilution water is approved by the Department prior to use. The primary control water must be specified in the WPDES permit.
- According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), receiving water must be used as the dilution water and primary control in chronic WET tests, unless the use of different dilution water is approved by the Department prior to use. The dilution water used in WET tests conducted on Outfall 001 shall be a grab sample collected from the receiving water location, upstream and out of the influence of the mixing zone and any other known discharge. The specific receiving water location must be specified in the WPDES permit.
- Shown below is a tabulation of all available WET data for Outfall 001. Efforts are made to ensure that decisions about WET monitoring and limits are made based on representative data, as specified in s. NR 106.08 (3), Wis. Adm Code. Data which is not believed to be representative of the discharge was not included in reasonable potential calculations. A major plant upgrade was completed in 2005, so data before then is not considered representative and therefore not included in the table below.

Attachment #1

WET Data History

Date Test Initiated	Acute Results				Chronic Results				Footnotes or Comments
	LC ₅₀ % (% survival in 100% effluent)				IC ₂₅ %				
	<i>C. dubia</i>	Fathead minnow	Pass or Fail?	Used in RP?	<i>C. dubia</i>	Fathead Minnow	Pass or Fail?	Use in RP?	
04/11/2006					>100	>100	Pass	Yes	
11/09/2006	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
01/23/2007					>100	>100	Pass	Yes	
09/22/2009	>100	>100	Pass	No	>100	>100	Pass	No	1
06/22/2010	>100	>100	Pass	No	>100	>100	Pass	No	1
03/03/2011	>100	>100		No	>100	>100		No	1
12/04/2012	>100	>100	Pass	Yes	81	>100	Pass	Yes	
06/25/2013	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
09/24/2013	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
11/11/2014	>100	>100	Pass	Yes	39.4	>100	Pass	Yes	
09/20/2016	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
05/16/2017	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
02/13/2018	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
10/15/2019	>100	>100	Pass	Yes	91.6	>100	Pass	Yes	

Footnotes:

1. *Tests done by S-F Analytical, July 2008 – March 2011.* The DNR has reason to believe that WET tests completed by SF Analytical Labs from July 2008 through March 31, 2011 were not performed using proper test methods. Therefore, WET data from this lab during this period has been disqualified and was not included in the analysis.
- According to s. NR 106.08, Wis. Adm. Code, WET reasonable potential is determined by multiplying the highest toxicity value that has been measured in the effluent by a safety factor, to predict the likelihood (95% probability) of toxicity occurring in the effluent above the applicable WET limit. The safety factor used in the equation changes based on the number of toxicity detects in the dataset. The fewer detects present, the higher the safety factor, because there is more uncertainty surrounding the predicted value. **WET limits must be given, according to s. NR 106.08(6), Wis. Adm. Code, whenever the applicable Reasonable Potential equation results in a value greater than 1.0.**

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

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

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

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

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

TU _c (maximum) 100/IC ₂₅	B (multiplication factor from s. NR 106.08(6)(c), Wis. Adm. Code, Table 4)	IWC
100/39.4= 2.54	3.0 Based on 3 detects	39%

Attachment #1

$$[(TU_c \text{ effluent}) (B)(IWC)] = 2.9 > 1.0$$

Therefore, reasonable potential is shown for chronic WET using the procedures in s. NR 106.08(6) and representative data from 04/11/2006 to 10/15/2019.

Expression of WET limits

$$\text{Chronic WET limit} = 100/IWC = 100/39 = 2.6 TU_c \text{ (monthly average)}$$

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: <http://dnr.wi.gov/topic/wastewater/WETguidance.html>.

WET Checklist Summary

	Acute	Chronic
AMZ/IWC	Not Applicable. 0 Points	IWC = 39 %. 10 Points
Historical Data	9 tests used to calculate RP. No tests failed. 0 Points	11 tests used to calculate RP = 2.970. No tests failed. 0 Points
Effluent Variability	Little variability, no violations or upsets, consistent WWTF operations. 0 Points	Same as Acute. 0 Points
Receiving Water Classification	Warm water sport fish 5 Points	Same as Acute. 5 Points
Chemical-Specific Data	Limits for zero substances based on ATC; ammonia, chloride, chromium, copper, mercury, nickel, and zinc detected. Additional Compounds of Concern: antimony and silver 5 Points	Limits for zero substances based on CTC; ammonia, chloride, chromium, copper, mercury, nickel, and zinc detected. Additional Compounds of Concern: antimony and silver 5 Points
Additives	0 Biocides and 1 Water Quality Conditioners added. P treatment chemical other than Ferric Chloride (FeCl), Ferrous Sulfate (FeSO ₄), or alum used: No 1 Point	All additives are used more than once per 4 days. 1 Point
Discharge Category	No Industrial Contributors. 0 Points	Same as Acute. 0 Points
Wastewater Treatment	Secondary or Better 0 Points	Same as Acute. 0 Points

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	Acute	Chronic
Downstream Impacts	No impacts known 0 Points	Same as Acute. 0 Points
Total Checklist Points:	11 Points	21 Points
Recommended Monitoring Frequency (from Checklist):	1x yearly in rotating quarters	1x yearly in rotating quarters
Limit Required?	No	Limit = 2.6 TU _c
TRE Recommended? (from Checklist)	No	No

- After consideration of the guidance provided in the Department's WET Program Guidance Document (2019) and other information described above annual acute and 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).
- A minimum of annual chronic monitoring is required because a chronic WET limit is required. Federal regulations in 40 CFR Part 122.44(i) require that monitoring occur at least once per year when a limit is present.
- A minimum of annual acute and chronic monitoring is recommended because Grafton WWTF is a major municipal discharger with a design flow greater than 1.0 MGD. Federal regulations at 40 CFR Part 122.21(j) require at least 4 acute and chronic WET tests with each permit application on samples collected since the previous reissuance. Therefore, annual monitoring is recommended in the permit term, so that data will be available for the next permit application.

Ammonia Calculations from 2008

Overview of Ammonia Rule Changes: The changes to ch. NR 105 establish acute (daily) and chronic (weekly and monthly) criteria for ammonia in-stream, based on updated information on ammonia toxicity. Acute criteria are dependent on the classification of the receiving water and on the pH of the discharge. Chronic criteria are dependent on the classification, temperature and pH of the receiving water. In addition, the chronic criteria for most classifications of receiving water are dependent on the presence or absence of early life stages of fish. For fish species other than burbot, the presence of early life stages is assumed in April and when the average temperature is equal to or greater than 14.6 degrees Celsius. Burbot are known to reproduce in colder water beginning in January of the year. There have been a large number of surveys in the Southeastern Wisconsin river basins over the years, and no burbot have been found (communication with Sue Beyler, SER Fisheries Biologist). In addition, the Department's Master Fish file and Becker's Fishes of Wisconsin have no record of burbot in the Milwaukee River basin. Therefore, the criteria will not be determined to protect the early life stages of burbot.

The changes to ch. NR 106 establish procedures for determining effluent limitations. For acute (daily maximum) limits, the limit equals twice the acute criterion established in conformance with ch. NR 105, unless a zone of initial dilution has been approved for a discharger. The acute limit is dependent on the maximum effluent pH, which in this case is represented by the 99th percentile of 7.9 s.u. (based on effluent data from 1/1999 through 8/2008).

Section NR 106.32(3)(c)1. specifies that for weekly average (4-day chronic) limits, the limit is a mass balance based on the average annual design flow of the plant and the average minimum 7-day flow that occurs once every ten years (7-Q₁₀). For monthly average (30-day chronic) limits, the limit is a mass balance based on the average annual design flow of the plant and the average minimum 30-day flow that occurs once in five years (30Q₅) or 85% of the average minimum 7-day flow that occurs once every two years (7Q₂). Per s. NR 106.32(3)(c)3. and 4. (also in s. NR 106.06(4)(c)3. and 4.), the percentage of stream flow used is related to the temperature of the stream, unless the permittee has made a demonstration of a zone of free passage or rapid dilution, so that the mixing zone is minimized. In the case of a zero-flow stream, however, the percentage of dilution is not relevant.

Receiving Water Temperature:

May – September = 23 degrees C
April and October = 9 degrees C.
November – March = 3 degrees C.

(based on default temperature data for small streams in Wisconsin)

Background Ammonia Levels:

April = 0.04 mg/L
May – September = 0.03 mg/l
October = 0.05 mg/l
November – March = 0.11 mg/l

(based on ambient ammonia concentrations for the Milwaukee River Basin)

River pH (based on stream default pH data) :

May – September = 8.21 s.u.
Other months = 7.97 s.u.

Attachment #2

Based on the limit determination procedures in ch. NR 106 and the information given above, the calculated ammonia limits are:

Calculated Ammonia Limits for Grafton (in mg/l)			
Month(s)	Daily Maximum	Weekly Average	Monthly Average
April	20.3	10.5	6.3
May – September	20.3	17.1	11.6
October	20.3	15.0	9.0
November – March	20.3	17.0	10.0

Ch. NR 207 and other conditions in NR 106: The weekly average limits given above represent an increase from limits in the current permit for Grafton because of the change in criterion and because of the increase in plant design flow. In accordance with s. NR 106.34 and with s. NR 207.03, any increases in weekly effluent limitations for ammonia are not subject to the provisions in ch. NR 207 due to the change in criteria, but the increases in the weekly average limits attributable to the design flow change would be subject to the provisions of NR 207. Since this is the initial proposal for daily and monthly ammonia limits, these limits are exempt from ch. NR 207.

The current permit includes mass as well as concentration limitations for ammonia. An increase in calculated mass that is solely due to change in the criterion can be determined by the calculation of weekly concentrations and masses based on the former design flow of 2.15 MGD. In the table below, these are the results under the heading ‘Old Flow (2.15 MGD)’. The results under the heading ‘New Flow (2.5 MGD)’ are the concentrations determined for the new design flow and using the updated criteria, along with calculated masses. Under the Header ‘NR 207’ the 1/3 mass increase represents the mass of the discharge using the old design flow plus one third of the additional assimilative capacity, in accordance with the definition of ‘No significant lowering of Water Quality’ in NR 207. ‘NSLOWQ Limits’ are a back calculation from the 1/3 mass increase. Since the Grafton plant is capable of meeting the ‘NSLOWQ Limits’, these limits will apply.

Grafton Weekly Ammonia Limits - Antidegradation Review						
Month(s)	Old flow (2.15 MGD)		New Flow (2.5 MGD)		NR 207	
	Conc (mg/l)	Mass (lbs/day)	Conc (mg/l)	Mass (lbs/day)	1/3 Mass Increase (lbs/day)	NSLOWQ Limits (mg/l)
May – September	19.45	348.76	17.06	355.70	351.07	16.84
Oct	16.46	295.14	14.98	312.33	300.87	14.43
November – March	18.63	334.05	16.96	353.62	340.58	16.33
April	11.52	206.57	10.48	218.51	210.55	10.10

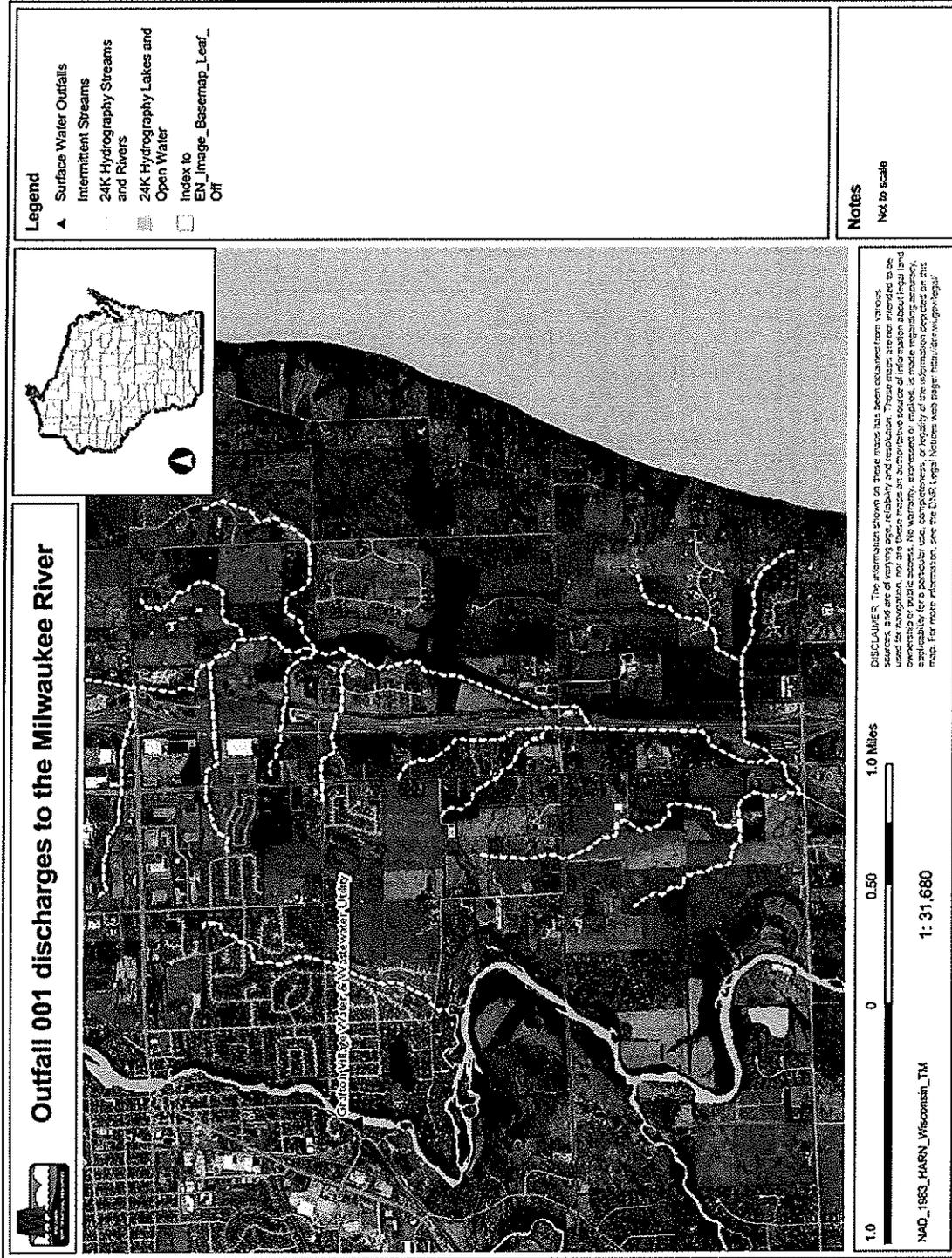
Section NR 106.33(2) indicates that effluent limitations greater than or equal to 20 mg/l will not apply to treatment works subject to the requirements of ch. NR 210 for the months of May through October; therefore, the calculated daily maximum limits would not apply for these months.

Here is a summary of recommended limitations for ammonia (rounded to two significant figures):

Attachment #2

Recommended Ammonia Limits for Grafton (in mg/l)			
Month(s)	Daily Maximum	Weekly Average	Monthly Average
April	20	10	6.3
May – September	No Limit	17	12
October	No Limit	14	9
November – March	20	16	10

In accordance with ch. NR 106.32(5)(b), no mass limitations are recommended.



Thermal Table

Temperature limits for receiving waters with unidirectional flow

(calculation using default ambient temperature data)

Facility: Grafton WWTF **7-Q₁₀:** 24.0 cfs **Temp Dates:** 01/01/19 11/30/19
Outfall(s): 001 **Dilution:** 25% **Start:** 01/01/19 06/01/15
Date Prepared: 01/21/2019 **f:** 0 **End:** 12/31/19 11/30/19
Design Flow (Qe): 2.50 MGD **Stream type:** Small warm water sport or forage fish co
Storm Sewer Dist. 0 ft **Qs:Qe ratio:** 1.6 :1 **Calculation Needed?** YES

Month	Water Quality Criteria		Receiving Water Flow Rate (Qs) (cfs)	Representative Highest Effluent Flow Rate (Qe) (MGD)		Representative Highest Monthly Effluent Temperature (°F)	Calculated Effluent Limit (°F)	
	Ta (default) (°F)	Sub-Lethal WQC (°F)		Acute WQC (°F)	7-day Rolling Average (Qesl) (MGD)		Daily Maximum Flow Rate (Qea) (MGD)	Weekly Average Effluent Limitation (°F)
JAN	33	49	76	2.125	3.227	52	78	120
FEB	34	50	76	1.899	2.435	50	83	120
MAR	38	52	77	2.791	3.440	51	71	120
APR	48	55	79	2.405	2.920	54	66	120
MAY	58	65	82	2.529	3.662	58	76	107
JUN	66	76	84	2.003	3.247	65	95	105
JUL	69	81	85	1.687	2.102	70	109	115
AUG	67	81	84	2.856	5.117	71	100	97
SEP	60	73	82	3.218	3.896	70	89	104
OCT	50	61	80	2.674	3.975	65	77	109
NOV	40	49	77	1.944	2.680	58	67	120
DEC	35	49	76	2.199	3.328	55	74	120