CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: January 24, 2023

TO: Holly Heldstab – WCR/Eau Claire

FROM: Benjamin Hartenbower – WCR/Eau Claire

SUBJECT: Water Quality-Based Effluent Limitations for Pinewood Properties LLC
WPDES Permit No. WI-0030911

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 Pinewood Properties LLC in La Crosse County. This municipal wastewater treatment facility (WWTF) discharges to Mormon Creek, located in the Coon Creek Watershed in the Bad Axe-La Crosse River Basin. The evaluation of the permit recommendations is discussed in more detail in the attached report.

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

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Footnotes
Flow Rate					1,2
BOD_5			45 mg/L	30 mg/L	1
TSS			45 mg/L	30 mg/L	1
pH	9.0 s.u.	6.0 s.u.			1
Ammonia Nitrogen	20 mg/L		**20 mg/L**	**20 mg/L**	1,4
E. coli May – September				126 #/100 mL geometric mean	3
Residual Chlorine	38 µg/L		**38 µg/L**	**38 µg/L**	1,4
Copper					2
Phosphorus					2
TKN, Nitrate+Nitrite, and Total Nitrogen					5
Acute WET					6

Footnotes:

1. No changes from the current permit.
2. Monitoring only.
3. Bacteria limits apply during the disinfection season of May through September. Additional limit: No more than 10 percent of *E. coli* bacteria samples collected in any calendar month may exceed 410 count/100 mL.
4. Additional limits to comply with the expression of limits requirements in ss. NR 106.07 and NR 205.065(7), Wis. Adm. Codes, are included in bold.
5. As recommended in the Department's October 1, 2019 Guidance for Total Nitrogen Monitoring in Wastewater Permits, annual total nitrogen monitoring is recommended for all minor municipal permittees. Total Nitrogen is the sum of nitrate (NO_3), nitrite (NO_2), and total kjeldahl nitrogen (TKN) (all expressed as N).
6. Two acute WET tests are recommended in the reissued permit. Sampling WET concurrently with any chemical-specific toxic substances is recommended. Tests should be done in rotating quarters, to collect seasonal information about this discharge and should continue after the permit expiration date (until the permit is reissued).

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Please consult the attached report for details regarding the above recommendations. If there are any questions or comments, please contact Benjamin Hartenbower at (715) 225-4705 or Benjamin.Hartenbower@wisconsin.gov or Diane Figiel at Diane.Figiel@wisconsin.gov.

Attachments (3) – Narrative, 2018 Ammonia Calculations, & Map

PREPARED BY: _____ Date: 01/24/2023

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Attachment #1

Water Quality-Based Effluent Limitations for Pinewood Properties LLC

WPDES Permit No. WI-0030911

Prepared by: Benjamin P. Hartenbower

PART 1 – BACKGROUND INFORMATION

Facility Description
The Pinewood Properties LLC Wastewater Treatment Facility treats domestic wastewater. The plant is an activated sludge system. Effluent is discharged to the south side of Mormon Creek.

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

Existing Permit Limitations
The current permit, expiring on December 31, 2022, includes the following effluent limitations and monitoring requirements.

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Footnotes
Flow Rate					1
BOD_5			45 mg/L	30 mg/L	2
TSS			45 mg/L	30 mg/L	2
pH	9.0 s.u.	6.0 s.u.			2
Ammonia Nitrogen	20 mg/L		**20 mg/L**	**20 mg/L**	3
Fecal Coliform May – September			**656#/100 mL geometric mean**	400#/100 mL geometric mean	3
Residual Chlorine	38 µg/L		**38 µg/L**	**38 µg/L**	3
Copper	91 µg/L 0.031 lbs/day		**91 µg/L**	**91 µg/L**	3
Hardness					1
Phosphorus					1
Acute WET	1.0 TUa				5

Footnotes:
1. Monitoring only
2. These limitations are not being evaluated as part of this review. Because the water quality criteria (WQC), reference effluent flow rates, and receiving water characteristics have not changed, limitations for these water quality characteristics do not need to be re-evaluated at this time.
3. Additional limits to comply with the expression of limits requirements in ss. NR 106.07 and NR 205.065(7), Wis. Adm. Codes, are included in bold.
4. Copper limits took effect 07/01/2019.
5. Acute WET Testing: October – December 2018, July – September 2019, April – June 2020, October – December 2021, April – June 2022, and January – March 2023

Receiving Water Information

- Name: Mormon Creek
- Waterbody Identification Code (WBIC): 1648300
- Classification used in accordance with chs.NR 102 and 104,Wis. Adm. Code: Coldwater (Category 5) community, non-public water supply.
- Low flows used in accordance with chs. NR 106 and 217, Wis. Adm. Code: The following 7-Q_{10} value is from USGS for Station 05386300 in Mormon Creek Outfall 001 is located.
  7-Q_{10} = 6.40 cfs (cubic feet per second)
  7-Q_2 = 7.30 cfs
  Harmonic Mean Flow = 12.72 cfs using a drainage area of 25.10 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 = 307 mg/L as $CaCO_3$. This value represents the geometric mean of SWIMS data taken from Dutch Creek at Russian Coulee Rd. (n = 3)
- % 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 Kickapoo River at Oil City is used for this evaluation because there is no data available for Mormon Creek. The Kickapoo River is within the same ecological landscape so ambient water quality characteristics are expected to be similar. The numerical values are shown in the tables below. If no data is available, the background concentration is assumed to be negligible and a value of zero is used in the computations. Background data for calculating effluent limitations for ammonia nitrogen are described later.
- Multiple dischargers: None
- Impaired water status: None

Effluent Information

- Design flow rate:
  Annual average = 0.02 MGD (Million Gallons per Day)
  Peak Daily = 0.18 MGD

  For reference, the actual average flow from June 2018 to October 2022 was 0.015 MGD.
- Hardness = 257 mg/L as $CaCO_3$. This value represents the geometric mean of effluent data collected 06/20/2018 to 10/19/2022. (n = 47)
- 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 from Brookview MHP and Golden Valley MHP with water supply from wells.
- Additives: Chlorination (biocide) and Dechlorination (water quality conditioner)
- 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 chloride and hardness.
- The permit-required monitoring for ammonia, chlorine, copper, and phosphorus from June 2018 to October 2022 is used in this evaluation.
- Effluent data for substances for which a single sample was analyzed is shown in the tables in Part 2 below, in the column titled “MEAN EFFL. CONC.”. Otherwise, substances with multiple effluent data are shown in the tables below or in their respective parts in this evaluation.

Attachment #1

	Copper µg/L
1-day P_{99}	14.49
4-day P_{99}	9.55
30-day P_{99}	7.02
Mean	5.81
Std	2.64
Sample size	47
Range	2.14 - 16.60

Sample Date	Chloride mg/L
07/06/2022	71.2
07/09/2022	58.2
07/12/2022	75.0
07/15/2022	48.3
Mean	63.2

The following table presents the average concentrations and loadings at Outfall 001 from June 2018 to October 2022 for all parameters with limits in the current permit to meet the requirements of s. NR 201.03(6), Wis. Adm. Code:

Averages of Parameters with Limits

	Average Measurement
BOD_5	14 mg/L*
TSS	12 mg/L
pH field	7.36 s.u.
Ammonia	2.26 mg/L*
Copper	5.81 µg/L
Fecal Coliforms	264 #/100 mL*
Residual Chlorine	<100 µg/L*

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

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

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

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

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

Daily Maximum Limit Calculation Method

Daily maximum effluent limitations for toxic substances are based on the acute toxicity criteria (ATC), listed in ch. NR 105, Wis. Adm. Code. In accordance with s. NR 106.06(3)(b), limitations based on acute toxicity are either set equal to two times the acute criteria (the final acute value) or calculated using the mass balance equation below, whichever is more restrictive.

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

Where:

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

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

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

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

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

In this case, limits set equal to two times the acute criteria are more restrictive and this method is used to calculate the daily maximum limits shown in the table below.

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

Daily Maximum Limits based on Acute Toxicity Criteria (ATC)

RECEIVING WATER FLOW = 5.12 cfs, (1-Q_{10} (estimated as 80% of 7-Q_{10})), as specified in s. NR 106.06(3)(bm), Wis. Adm. Code.

SUBSTANCE	REF. HARD. mg/L	ATC	MEAN BACK-GRD.	MAX. EFFL. LIMIT**	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	1-day P_{99}	1-day MAX. CONC.
Chlorine		19.0		38.1	7.61	<100		
Arsenic		340		680	136	<0.77		
Cadmium	257	12.8	0.0253	25.7	5.1	<0.084		
Chromium	257	3902	0.836	7804	1561	<0.07		
Copper	257	37.8	1.093	75.5			14.5	16.6
Lead	257	266	0.950	532	106	<1.084		
Nickel	257	1041		2083	417	<0.9		
Zinc	257	274	2.935	549	110	72		
Chloride (mg/L)		757		1514	303	63		75

* * 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.

Weekly Average Limits based on Chronic Toxicity Criteria (CTC)

RECEIVING WATER FLOW = 1.60 cfs (¼ of the 7-Q_{10}), as specified in s. NR 106.06(4)(c), Wis. Adm. Code

SUBSTANCE	REF. HARD.* mg/L	CTC	MEAN BACK-GRD.	WEEKLY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	4-day P_{99}
Chlorine		7.28		383.69	76.74	<100	
Arsenic		148		7800	1560	<0.77	
Cadmium	175	3.82	0.0253	200.0	40.0	<0.084	
Chromium	301	213	0.836	11160	2232	<0.07	
Copper	307	27.0	1.093	1366			9.5
Lead	307	83	0.950	4308	861.69	<1.084	
Nickel	268	120		6334	1267	<0.9	
Zinc	307	321	2.935	16750	3350	72	
Chloride (mg/L)		395		20818	4164	63	

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

Monthly Average Limits based on Wildlife Criteria (WC)

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

Monthly Average Limits based on Human Threshold Criteria (HTC)

RECEIVING WATER FLOW = 3.18 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	0.0253	38404	7681	<0.084
Chromium (+3)	3818000	0.8360	396315696	79263139	<0.07
Lead	140	0.9500	14435	2887	<1.084
Nickel	43000		4463483	892697	<0.9

Monthly Average Limits based on Human Cancer Criteria (HCC)

RECEIVING WATER FLOW = 3.18 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		1381	276	<0.77

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
Effluent limitations are required for Chlorine.

Total Residual Chlorine – Because chlorine is added as a disinfectant, effluent limitations are recommended to assure proper operation of the de-chlorination system. Section NR 210.06(2)(b), Wis. Adm. Code, states, "When chlorine is used for disinfection, the daily maximum total residual chlorine concentration of the discharge may not exceed 0.10 mg/L." Because the WQBELs are more restrictive, they are recommended instead. Specifically, a daily maximum limit of 38 µg/L is required. Due to revisions to s. NR 106.07(2), Wis. Adm. Code, mass limitations are no longer required.

Weekly average limitations are not needed based on reasonable potential as the daily maximum limitations will provide adequate protection of the resource; however, ss. NR 106.07(3) and NR 205.067(7), Wis. Adm. Code, require WPDES permits contain weekly average and monthly average limitations for municipal dischargers whenever practicable and necessary to protect water quality. **Therefore, weekly average and monthly average limits of 38 µg/L are required** to meet expression of limits requirements in addition to the daily max limit.

Copper **–** Considering available effluent data from the current permit term (June 2018 to October 2022), the 1-day P_{99} copper concentration is 14.49 mg/L, and the 4-day P_{99} of effluent data is 9.55 mg/L.

These effluent concentrations are below the calculated WQBELs for copper, therefore no effluent limits are needed. The current limits may be removed in accordance with s. NR 207.12(3)(a), Wis. Adm. Code. To ensure that representative sample results are available at the next permit issuance, **copper monitoring is recommended to continue.**

Mercury – The permit application did not require monitoring for mercury because the Pinewood Properties LLC 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)." However, sludge sampling is not available because the sludge is hauled by another facility that has a WPDES permit allowed for the disposal of sludge produced at Pinewood Properties LLC. It is not expected that there are exceedances of the high-quality mercury concentration based on similar municipal treatment plants and the lack of industries. **No monitoring is recommended.**

PFOS and PFOA – The need for PFOS and PFOA monitoring is evaluated in accordance with s. NR 106.98, Wis. Adm. Code. Based on the annual design flow and lack of nondomestic contributions, it is unlikely that the effluent will contain PFOS or PFOA. **Therefore, monitoring is not recommended**. If future sampling information of the effluent or source water indicates the presence of PFOS or PFOA, the monitoring requirements may change.

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

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

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

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 Cold-Water Category 5 fishery, and
pH (s.u.) = that characteristic of the <u>effluent.</u>

The effluent pH data was examined as part of this evaluation. A total of 1614 sample results were reported from June 2018 to October 2022. The maximum reported value was 7.80 s.u. (Standard pH Units). The effluent pH was 7.70 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 7.56 s.u. The mean plus the standard deviation multiplied by a factor of 2.33, an estimate of the upper ninety ninth percentile for a normally distributed dataset, is 7.56 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 = 14.44 mg/L.

Daily Maximum Ammonia Nitrogen Effluent Limitations Calculation Method

In accordance with s. NR 106.32(2), Wis. Adm. Code daily maximum ammonia limitations are either set equal to two times the acute criteria (the final acute value) or calculated using the mass balance equation in s. NR 106.32(2)(e), Wis. Adm. Code.

In this case, limits set equal to two times the acute criteria are more restrictive. This method is used to calculate the daily maximum limit of **29 mg/L.**

This limit is greater than the current daily maximum limit of 20 mg/L. If Pinewood Properties LLC 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.

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

The following table evaluates the statistics based upon ammonia data reported from June 2018 to October 2022, with those results being compared to the calculated limits to determine the need to include ammonia limits in the Pinewood Properties LLC permit. That need is determined by calculating 99th upper percentile (or P_{99}) values for ammonia during each of the month ranges and comparing the daily maximum values to the daily maximum limit.

Ammonia Nitrogen Effluent Data

	Ammonia mg/L
1-day P_{99}	21.84
4-day P_{99}	13.07
30-day P_{99}	5.51
Mean	2.26
Std	5.53
Sample size	226
Range	<0.06 - 37.8

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

Based on this comparison, there is not reasonable potential to exceed any of the calculated limits.

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

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

Conclusions and Recommendations

In summary, the current ammonia nitrogen limitations are recommended to continue. No mass limitations are recommended in accordance with s. NR 106.32(5), Wis. Adm Code.

Final Ammonia Nitrogen Limits

Daily Maximum mg/L	Weekly Average mg/L	Monthly Average mg/L
20 mg/L	**20 mg/L**	**20 mg/L**

PART 4 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR BACTERIA

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

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

E. coli monitoring is recommended at the same frequency that fecal coliform monitoring is required in the current permit. Because Pinewood Properties LLC Wastewater Treatment Facility'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.

Effluent Data

Pinewood Properties LLC has monitored effluent *E. coli* from June 2022 to September 2022 for a total of 17 results. A geometric mean of 126 counts/100 mL was never exceeded. The maximum monthly geometric mean was 25 counts/100 mL. Effluent data did not exceed 410 counts/100 mL and the maximum reported value was 39 counts/100 mL. Based on this effluent data it appears that the facility can meet new *E. coli* limits and a compliance schedule is not needed in the reissued permit.

PART 5 – PHOSPHORUS

Technology-Based Effluent Limit

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

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

Annual Average Mass Total Phosphorus Loading

Month	Average Phosphorus Concentration (mg/L)	Total Effluent Flow (Million Gallons)	Calculated Mass (lbs/month)
January 2022		0.495	
February 2022	4.81	0.413	16.57
March 2022		0.426	
April 2022		0.471	
May 2022		0.433	
June 2022	2.97	0.403	9.98
July 2022	5.36	0.376	16.83
August 2022		0.347	
September 2022		0.359	
October 2022		0.425	
November 2022		0.422	
December 2022	4.16	0.559	19.40
Average	4.325	0.427	**15.69**

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

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

Water Quality-Based Effluent Limits (WQBEL)

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

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

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

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

Where:

WQC = 0.075 mg/L for Mormon Creek
Qs = 100% of the 7-Q_2 of 7.30 cfs
Cs = background concentration of phosphorus in the receiving water pursuant to s. NR 217.13(2)(d), Wis. Adm. Code
Qe = effluent flow rate = 0.020 MGD = 0.031 cfs
f = the fraction of effluent withdrawn from the receiving water = 0

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

A previous evaluation resulted in a WQBEL of 6.7 mg/L using a background concentration of 0.047 mg/L. Section NR 217.13(2)(d), Wis. Adm. Code, states that the determination of upstream concentrations shall be evaluated at each permit reissuance.

In stream total phosphorus data upstream of the discharge is not available however the following downstream data were considered in estimating the background phosphorus concentration:

SWIMS ID	323088
Station Name	Monitoring station at Mormon Coulee Creek at Cth Nn
Waterbody	Mormon Creek
Sample Count	8
First Sample	10/17/2000
Last Sample	10/17/2001
Mean	0.0496 mg/L
Median	0.0450 mg/L

Substituting a median value of 0.045 mg/L into the limit calculation equation above, the calculated limit is 7.2 mg/L.

Effluent Data
The following table summarizes quarterly effluent total phosphorus monitoring data from September 2018 to December 2022.

Total Phosphorus Effluent Data

	Phosphorus mg/L
1-day P_{99}	6.90
4-day P_{99}	5.56
30-day P_{99}	4.82
Mean	4.42
Std	0.89
Sample size	18
Range	2.68 - 5.87

Reasonable Potential Determination
The discharge does not have reasonable potential to cause or contribute to an exceedance of the water quality criterion because the 30-day P_{99} of reported effluent total phosphorus data is less than the calculated WQBEL. Therefore, **a WQBEL is not required. Quarterly phosphorus monitoring is recommended to continue.**

PART 6 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR THERMAL

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

Due to the amount of upstream flow available for dilution in the limit calculation (Qs:Qe >30:1), 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, no temperature limits or monitoring are recommended.**

PART 7 – WHOLE EFFLUENT TOXICITY (WET)

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

- Acute tests predict the concentration that causes lethality of aquatic organisms during a 48 to 96-hour exposure. To assure that a discharge is not acutely toxic to organisms in the receiving water, WET tests must produce a statistically valid LC_{50} (Lethal Concentration to 50% of the test organisms) greater than 100% effluent, according to s. NR 106.09(2)(b), Wis. Adm Code.

- Chronic testing is usually not recommended where the ratio of the 7-Q_{10} to the effluent flow exceeds 100:1. For the Pinewood Properties LLC Wastewater Treatment Facility, that ratio is approximately 207:1. With this amount of dilution, there is believed to be little potential for chronic toxicity effects in Mormon Creek associated with the discharge from the Bostwick Valley Mobile Home Park Wastewater Treatment Facility, so the need for chronic WET testing will not be considered further.

- According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), a synthetic (standard) laboratory water may be used as the dilution water and primary control in acute WET tests, unless the use of different dilution water is approved by the Department prior to use. The primary control water must be specified in the WPDES permit.

- Shown below is a tabulation of all available WET data for Outfall 001. Efforts are made to ensure that decisions about WET monitoring and limits are made based on representative data, as specified in s. NR 106.08(3), Wis. Adm Code. Data which is not believed to be representative of the discharge was not included in reasonable potential calculations. The table below differentiates between tests used and not used when making WET determinations.

WET Data History

Date Test Initiated	Acute Results LC_{50} %				Footnotes or Comments
	C. dubia	Fathead minnow	Pass or Fail?	Used in RP?	
09/25/2013	>100	>100	Pass	No	1
07/29/2015	**<6.25**	>100	Fail	No	1
11/04/2015	**<6.25**	>100	Fail	No	1
06/22/2016	>100	>100	Pass	Yes	
09/07/2016	>100	>100	Pass	Yes	
11/28/2018	>100	>100	Pass	Yes	
09/25/2019	>100	>100	Pass	Yes	
08/12/2020	>100	>100	Pass	Yes	
12/15/2021	>100	>100	Pass	Yes	

1. *Data Not Representative*. A TRE was successfully completed, which identified and fixed copper contributions as the source of toxicity. Data from 2015 and before are no longer be representative of the discharge.

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

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

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

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

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

WET Checklist Summary

	Acute
AMZ/IWC	Not Applicable. **0 Points**
Historical Data	Six tests used to calculate RP. Two tests failed. **0 Points**
Effluent Variability	Ammonia, BOD5, TSS, and Fecal Coliform exceedances **5 Points**
Receiving Water Classification	Coldwater (5 pts) **5 Points**
Chemical-Specific Data	Reasonable potential for limits for Chlorine based on ATC; (5 pts) Ammonia, Chloride, Copper, and Zinc detected. (3 pts) Additional Compounds of Concern: None **8 Points**
Additives	One Biocide (3 pts) and One Water Quality Conditioners added. (1 pt) P chemical not in use. **4 Points**
Discharge Category	No Industrial Contributors. **0 Points**
Wastewater Treatment	Secondary or Better **0 Points**
Downstream Impacts	No impacts known (0 pts) **0 Points**
Total Checklist Points:	**22 Points**
Recommended Monitoring Frequency (from Checklist):	Two tests during the permit term
Limit Required?	No
TRE Recommended? (from Checklist)	No

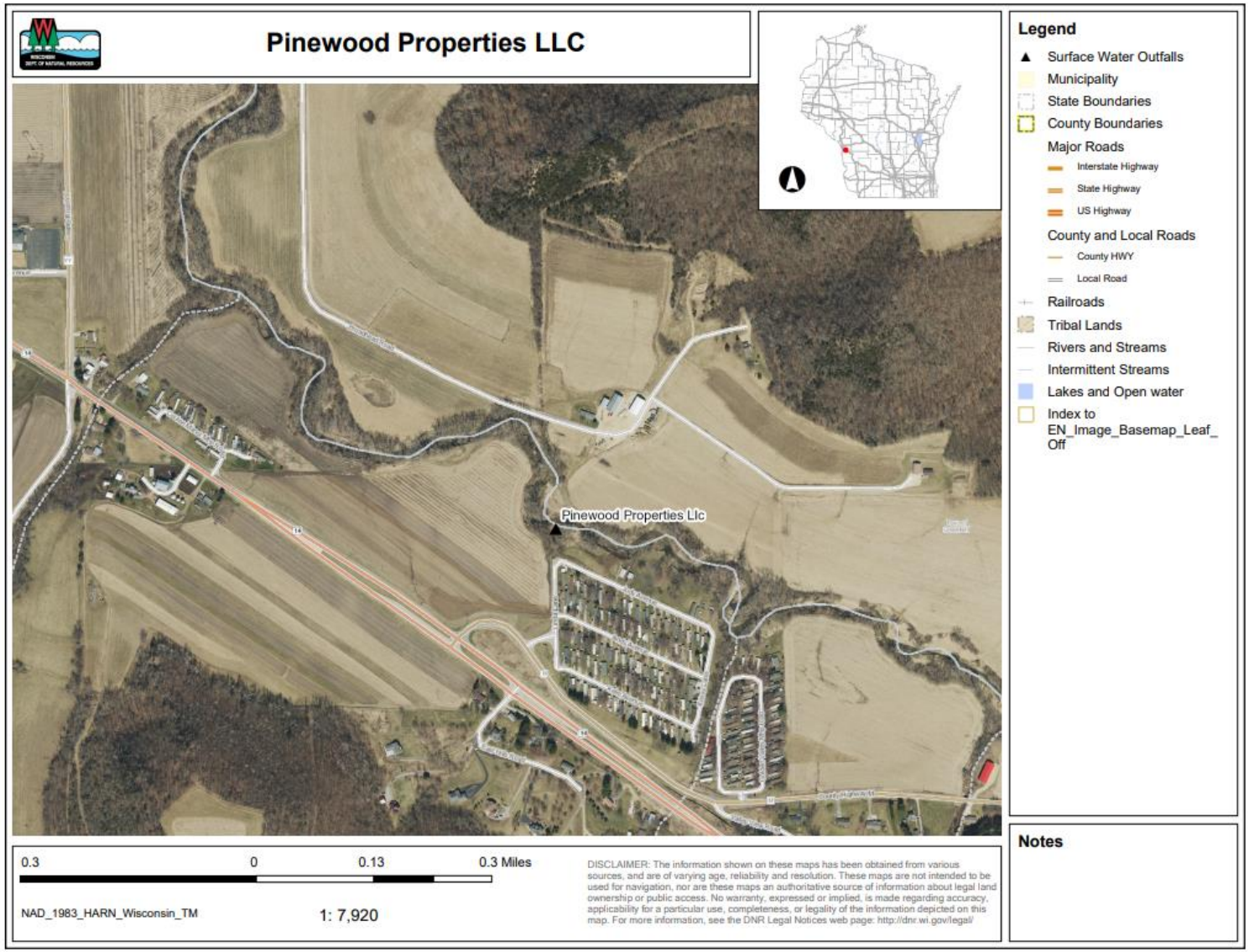
- After consideration of the guidance provided in the Department's *WET Program Guidance Document* (2022) and other information described above, two acute WET tests are recommended in the reissued permit. Tests should be done in rotating quarters to collect seasonal information about this discharge.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

Ammonia Nitrogen Calculations from the March 9, 2018 WQBEL Memo

AMMONIA (as N) LIMITS	
Effluent Flow (mgd):	0.02
Effluent Flow (cfs):	0.031
Effluent pH data:	
Begin Date	01-May-13
End Date	28-Dec-17
# of Samples	1407
Maximum	7.9
Average	7.55
Standard Deviation	0.137
Estimated 99th Percentile	7.87
Max. Effluent pH (s.u.):	7.90

BACKGROUND INFORMATION:

	summer	***winter***	***spring***	***fall***
4Q3 (cfs)				
7Q10 (cfs)	6.4	6.4		
30Q5 (cfs)				
7Q2 (cfs)	7.3	7.3		
Ammonia (mg/L) (1)	0.1	0.1		
Temperature (deg C) (2)	20	5		
pH (std. units) (3)	8.21	7.97		
% of river flow used:	100	25		
Reference weekly flow:	6.4	1.6		
Reference monthly flow:	6.205	1.55125		
CRITERIA (in mg/L):				
Acute (@ effl. pH):	10.13	10.13		
4-day Chronic (@ backgrd. pH):				
early life stages present	3.10	6.35		
early life stages absent	3.10	10.31		
30-day Chronic (@ backgrd. pH)				
early life stages present	1.24	2.54		
early life stages absent	1.24	4.12		
EFFLUENT LIMITS (in mg/L):				
Daily maximum	20	20		
Weekly average				
early life stages present	623	330		
early life stages absent		538		
Monthly average				
early life stages present	230	125		
early life stages absent		206		

(1) Default Data
(2) Default Data
(3) Default Data

Attachment #3