CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: October 2, 2014 FILE REF: 3200

TO: Laura Dietrich - SER

FROM: Adrian Stocks – WY/3 Diane Figiel for AS

SUBJECT: Water Quality-Based Effluent Limitations for the Delafield Hartland Pollution Control Commission WPDES Permit No. WI-0032026 (REVISED)

This is in response to your request for an evaluation of the need for water quality-based effluent limitations using Chapters NR 102, 105, 106, 207, 210 and 217 of the Wisconsin Administrative Code (where applicable), for the discharge from the Delafield Hartland Pollution Control Commission in Waukesha County. This municipal WWTF discharges to the Bark River, located in the Bark River Watershed in the Lower Rock River Basin. This discharge is included in the Rock River TMDL as approved by EPA. The evaluation of the permit recommendations is discussed in more detail in the attached report.

This memo uses updated low flows from USGS, and evaluates additional chromium +6 data submitted by the facility. Minor typographical errors from the previous memo have also been corrected. A review of the need for an increase of BOD effluent limitations has shown there is no need to increase BOD effluent limitations and (s. NR 207.04(1)(a)). *These recommendations should be used in place of the recommendations from the July 23, 2014 and the September 15, 2014 water quality-based effluent limitations memos.*

No changes are recommended in the permit limitations for Dissolved Oxygen, pH, Ammonia Nitrogen & Fecal Coliforms. BOD_5 effluent limitations stayed the same after (s. NR 207.04(1)(a)) was considered. That consideration is explained in Part 3. Based on our review, the following recommendations are made on a chemical-specific basis:

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Monthly Geometric Mean
BOD_5 May – Oct. Nov. – April Nov. – April			 7.0 mg/L 12 mg/L 302 lbs/day	 7.0 mg/L 12 mg/L	
TSS[1] Nov. – April May – Oct.			 14 mg/L 10 mg/L	 14 mg/L 10 mg/L	
pH	9.0 s.u.	6.0 s.u.			
Dissolved Oxygen		7.0 mg/L			
Fecal Coliforms (May – September)					400/100 mL
Residual Chlorine[3] (May – Sept)	38 µg/L		8.6 µg/L		
Chloride[4]			615 mg/L		

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Ammonia Nitrogen Nov. – March April May – Sept. October	 29 mg/L 29 mg/L		 11.4 mg/L 4.9 mg/L 3.6 mg/L 6.9 mg/L	 5.2 mg/L 2.2 mg/L 2.1 mg/L 3.2 mg/L	
Phosphorous[2]				1.0 mg/L (interim)	

1. See page 9 of Attachment #1 for additional weekly and monthly mass limitations for TSS based on the Rock River TMDL.
2. See page 8 of Attachment #1 for additional monthly mass limitations for phosphorus based on the Rock River TMDL.
3. Total residual chlorine limits apply May – September and whenever dechlorinating
4. This is a suggested interim concentration limit pending approval of a water quality variance, monitoring 4x/month on four consecutive days is also recommended. See page 6 for additional details.

Along with the chemical-specific recommendations mentioned above, the need for acute and chronic whole effluent toxicity testing is also evaluated for the discharge from Delafield Hartland Pollution Control Commission.

Following the guidance provided in the Department's January 27, 2014 *WET Program Guidance Document - Revision #10*, annual acute and chronic whole effluent toxicity test batteries are recommended. Sampling concurrently with any chemical-specific toxic substances is also recommended. The chronic testing shall be performed using a dilution series of 100%, 75%, 50%, 25% & 12.5%. The Instream Waste Concentration to assess chronic test results is 85%. The primary control and dilution water used in WET tests conducted on Outfall 001 shall be a grab sample collected from the Bark River, upstream of the influence of the mixing zone of Outfall 001.

Please consult the attached report for details regarding the above recommendations. If there are any questions or comments, please contact Diane Figiel at (608) 264-6274 or Diane.Figiel@wisconsin.gov.

Attachments (2) – Narrative & Thermal Limit Calculations

PREPARED BY: Diane Figiel – WT/3

APPROVED BY: Diane Figiel date: 10/2/14
Diane Figiel, PE,
Water Resources Engineer

Cc: Amy Garbe - SCR
Timothy Thompson - SER

Attachment #1

Water Quality-Based Effluent Limitations for Delafield Hartland Pollution Control Commission

WPDES Permit No. WI-0032026

Prepared by: Diane Figiel

PART 1 – BACKGROUND INFORMATION

Facility Description:

Delafield-Hartland owns and operates a 3.23 MGD extended aeration activated sludge plant. Treatment processes include bar screening and grit removal, primary clarification, extended aeration activated sludge treatment, final clarification, and sand filtration. Seasonal disinfection is done by addition of liquid sodium hypochlorite and effluent dechlorination by addition of liquid magnesium bisulfite. Effluent is discharged into the Bark River at a point about four miles away from the wastewater plant. As part of a plant upgrade, Dela-Hart uses a temperature phased anaerobic digestion (TPAD) system to generate sludge that meets Class A requirements. Dela-Hart's facility is regional and serves the City of Delafield, the Villages of Hartland and Nashotah, and the Towns of Delafield and Summit.

Existing Permit Limitations: The current permit, which expired on March 31st, 2011, includes the following effluent limitations.

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Monthly Geometric Mean	Monitoring Only
BOD_5 * May – Oct. Nov. – April Nov. – April			 7.0 mg/L 12 mg/L 302 lbs/day	 7.0 mg/L 12 mg/L		
TSS Nov. – April May – Oct.			 14 mg/L 10 mg/L	 14 mg/L 10 mg/L		
pH*	9.0 s.u.	6.0 s.u.				
Dissolved Oxygen*		7.0 mg/L				
Fecal Coliforms* (May – September)					400/100 mL	
Residual Chlorine (May – Sept and whenever dechlorinating)	38 µg/L		8.0 µg/L			
Chloride			640 mg/L			
Mercury						X
Phosphorous				1.0 mg/L		

Ammonia Nitrogen						
Nov. – March	29 mg/L		11.4 mg/L	5.2 mg/L		
April	29 mg/L		4.9 mg/L	2.2 mg/L		
May – Sept.			3.6 mg/L	2.1 mg/L		
October			6.9 mg/L	3.2 mg/L		

*These limitations are not being evaluated as part of this review. Because the 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.

Receiving Water Information:

- Name: Bark River
- Classification: Warmwater sport fish community, non-public water supply.
- Previous Flows: $7\text{-}Q_{10}$ = 2 cfs (cubic feet per second)
  $7\text{-}Q_2$ = 6.4 cfs
  Harmonic Mean Flow = 10.7 cfs
- Updated Flows: The following $7\text{-}Q_{10}$ and $7\text{-}Q_2$ values provided by USGS for the Bark River (USGS Station # 05426078) are used to calculate revised effluent limitations. (letter from Rob Waschbusch, USGS, 08/27/2014). The Harmonic Mean has been estimated as recommended in *State of Wisconsin Water Quality Rules Implementation Plan* (Publ. WT-511-98)
  $7\text{-}Q_{10}$ = 3.6 cfs (cubic feet per second)
  $7\text{-}Q_2$ = 10 cfs
  Harmonic Mean Flow = $1.2(Q_{ave})^{0.5}({}_7Q_{10})^{0.5}$ = 12.76 cfs
  where Q_{ave} = 0.7x drainage area in square miles = 0.7x 44.9 = 31.43

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
$7\text{-}Q_{10}$ (cfs)	12	12	14	27	16	6.2	4.9	5.7	6.2	7.4	15	14
$7\text{-}Q_2$ (cfs)	23	25	36	48	36	21	15	17	16	19	25	24

- Hardness = 335 mg/L as $CaCO_3$. This value represents receiving water data from WET testing from 7/11/2006.
- % of Flow used to calculate limits: 25%
- Source of background concentration data: Metals data from DNR Water Quality Rules Implementation Plan, January, 1998; Rock River at Waupun, which is used for this evaluation because there is no data available for the Bark River. The Rock River at Waupun 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 metals results used in limit calculations:

Substance	Result
Cadmium	0.0165 µg/L
Copper	1.23 µg/L
Lead	0.037 µg/L
Mercury	4.74 ng/L
Zinc	1.9 µg/L

Effluent Information:

- Flow:
  Annual average = 3.23 MGD (Million Gallons per Day)
  Peak daily = 6.540 MGD
  Peak weekly = 3.868 MGD
  Peak monthly = 3.377 MGD
  For reference, the actual average flow from 4/1/2006 – 1/31/2014 was 1.885 MGD.
- Hardness = 414.8 mg/L as $CaCO_3$. This value represents the geometric mean of effluent data from 6/23/2010 – 7/2/2010.
- Acute dilution factor used: Not applicable – this facility does not have an approved Zone of Initial Dilution (ZID).
- Effluent characterization: This facility is categorized as a major municipal discharger so the permit application required effluent sample analyses for all of the "priority pollutants" except for the Dioxins and Furans, plus Chloride and Hardness.

Sample Date	Cu - µg/L	Sample Date	Cu - µg/L	Sample Date	Cu - µg/L
6/23/2010	9	7/5/2010	9	7/17/2010	7
6/26/2010	5	7/8/2010	9	7/20/2010	10
6/29/2010	8	7/11/2010	11	7/23/2010	10
7/2/2010	10	7/14/2010	7		
1-Day P_{99} = 13.49 µg/L					
4 -Day P_{99} = 10.87 µg/L					

Because of the large amount of effluent data on chloride and mercury, statistics on this data are given below. Data from the last 5 years are used for evaluation as these values are considered most representatives of current conditions.

	Chloride mg/L	Mercury ng/L
# of results (# detected)	240	31
Maximum	800	2.9
Mean	518.26	0.69
1-day P99	724.57	2.42
4-day P99	614.92	1.42
30-day P99	552.06	0.92

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

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

The following tables list the water quality-based effluent limitations for this discharge along with the results of testing effluent samples. These tables include only those substances which were measured above the level of detection. All concentrations are expressed in term of micrograms per Liter (µg/L),

except for the Hardness values and the Chloride values (mg/L). Following the tables, permit recommendations are made where appropriate, based on a comparison between the effluent concentrations and the calculated limits pursuant to ss. NR 106.04 and 106.05.

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

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		339.80	679.60	135.92	1.6		
Chromium (+6)		16.02	32.04	6.41	< 4		
Copper	414.8	59.40	118.80			13.49	
Mercury		0.83	1.66			0.00242	
Nickel	268	1048.88	2097.76	419.55	1		
Zinc	333	344.68	689.36	137.87	25		
Chloride - mg/L		757	1514			724	

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

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

RECEIVING WATER FLOW = 0.9 cfs (¼ of the 7-Q_{10})

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		152.20		179.61	35.92	1.6	
Chromium (+6)		10.98		12.96	2.59	< 4	
Copper	335	29.12	1.23	34.36	6.87	1.23	
Mercury		0.44	0.00474	0.52			0.00142
Nickel	268	120.18		141.82	28.36	1	
Zinc	333	344.68	1.9	406.75	81.35	25	
Chloride - mg/L		**395**		**466**			**614.92**

* The indicated hardness may differ from the receiving water hardness because the receiving water hardness exceeded the maximum range in ch. NR 105 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 = 2.125 cfs (¼ of 85% of the 7-Q_2)

SUBSTANCE	WC	MEAN BACK-GRD.	MONTHLY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	30-day P_{99}
Mercury (ng/l)	1.30	4.70	1.30			0.92

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Monthly Average Limits based on Human Threshold Criteria (HTC):

RECEIVING WATER FLOW = 3.19 cfs (¼ of the Harmonic Mean)

SUBSTANCE	HTC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Chromium (+6)	7636		12510	2502	< 4
Mercury (ng/l)	1.5	4.70	1.5		0.92
Nickel	43,000		70447	14089	1

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

RECEIVING WATER FLOW = 3.19 cfs (¼ of the Harmonic Mean)

SUBSTANCE	HCC	MEAN BACK-GRD.	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Arsenic	13.3		21.8	4.4	1.6
Chlorodibromomethane	91.4*		150	30	0.21
Chloroform	1960		3211	642	1.6
Dichlorobromomethane	1960		3211	642	0.9
1,4-Dichloro-benzene	163		267	53	0.16

*Human cancer criteria for chlorodibromomethane are based on secondary values.

In addition to evaluating the need for limits for each individual substance for which HCC exist, s. NR 106.06(8) requires the evaluation of the cumulative cancer risk. That risk is considered additive, as represented in the table below. If the sum of the effluent concentration divided by the calculated limit is greater than 1.0, effluent limits for all substances that were detected may be considered. That sum is less than 1.0 as shown.

DETECTED CARCINOGEN	HCC-BASED EFFLUENT LIMIT	MEAN EFFLUENT CONC.	EFFLUENT CONC. ÷ LIMIT
Arsenic	21.8	1.6	0.0733945
Chlorodibromomethane	150	0.21	0.0014
Chloroform	3211	1.6	0.00049829
Dichlorobromomethane	3211	0.9	0.00028029
1,4-Dichloro-benzene	267	0.16	0.00059925
TOTAL (must be < 1.0) =			0.07617232

Permit Recommendations:

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

1. Maximum effluent concentration exceeds the limit (only applies to daily maximum unless there are at least 4 consecutive days with data, which isn't the case here.)
2. If 11 or more detected results are available in the effluent, the 99th upper percentile (or P99) value exceeds the comparable calculated limit.

3. If fewer than 11 detected results are available, the mean effluent concentration exceeds 1/5 of the calculated limit.

With that in mind, the following permit limits are recommended.

Conclusions and Recommendations: Based on a comparison of the effluent data and calculated effluent limitations, effluent limitations are apparently needed for Chloride. In addition limitations are needed for chlorine as it is being used for disinfection.

Chloride – The 1-day P99 for chloride was under the applicable ATC-based limit of 1514 mg/l. The 4-day P99 of 614.92 mg/l was over the CTC-based effluent limit of 466 mg/l, so a chronic (weekly average) limit needs to be continued for the proposed permit.

Subchapter VII of ch. NR 106 provides for a variance from water quality standards for this substance, and Delafield Hartland Pollution Control Commission has requested such a variance. That variance may be granted subject to the following conditions:

1) The permit shall include an "Interim" limitation intended to prevent an increase in the discharge of Chlorides;
2) The permit shall specify "Source Reduction Measures" to be implemented during the course of the permit term, with periodic progress reports; and
3) The permit shall include a "Target Limit" or "Target Value" to gage the effectiveness of the Source Reduction Measures, and progress toward the water quality-based effluent limitations. A target value is suggested for the first iteration of a permit with such a variance.

Interim Limit for Chloride: Section NR 106.82(9) defines a "Weekly average interim limitation" as either the 4-Day P_{99} concentration or no more than 105% of the highest weekly average concentration of the representative data. The 4-Day P_{99} concentration is 614.92 mg/L for chloride data for the past five years. Using the same set of data, 105% of the highest weekly average concentration is 724.5 mg/L. This is based on the highest calculated weekly average of 690 mg/L which occurred in March 2012. The current weekly average interim limit for chloride is 640 mg/L, monitored four times per week. Based on these values, **it is recommended that a weekly average interim limit of 615 mg/L equal to 4-Day P_{99} be included in the reissued permit**.

A target limit and permit language for Source Reduction Measures are not recommended as part of this evaluation. These should follow contact with Delafield Hartland Pollution Control Commission, though it should be understood that if the department and Delafield Hartland Pollution Control Commission are unable to reach agreement on all the terms of a Chloride Variance, the calculated limits described earlier should be included in the permit, in accordance with s. NR 106.83(3).

Chloride monitoring recommendations: Four samples per month (on consecutive days) are recommended. This allows for averaging of the results to compare with the interim limit, and also allows the use of the average in determining future interim limits, and degree of success with chloride reduction measures.

In the absence of a variance, Delafield-Hartland would be subject to the water quality-based effluent limit of 466 mg/l as a weekly average; the weekly average mass limit of 12,500 lbs/day (466 mg/L x 3.23 mgd x 8.34); and an alternative wet weather mass limit.

Total Residual Chlorine – Because chlorine is added as a disinfectant, effluent limitations are recommended to continue to assure proper operation of the dechlorination system. Specifically, a daily maximum limit of 38 µg/L and a weekly average limit of 8.6 µg/L (rounded to two significant figures) are recommended to be retained in the reissued permit. Due to revisions to s. NR 106.07(2) mass limitations are no longer required.

Chromium +6 – An additional effluent sample for chromium +6 on 08/13/2014 was submitted which was not detected at a limit of detection (LOD) of 4 µg/L. In the permit application chromium +6 was reported at 10.9 µg/L while total chromium which was not detected at a LOD of 1 µg/L. Therefore the previous value was not believed to be representative and this value was used in its place.

PART 3 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR BOD, TSS AND AMMONIA NITROGEN

BOD, TSS and ammonia limits could potentially increase with the increase in the receiving water low flows. However in order to allow an increase limit in a limit above an existing limit the facility must demonstrate the need for the higher limits consistent with s. NR 207.04(1).

If Delafield-Hartland would like to request an increase to the existing permit limits for BOD_5, TSS, or Ammonia Nitrogen an assessment of their effluent data consistent with the requirements of ss. NR 207.04(1)(a) and (c) must be provided. This evaluation is on a parameter by parameter basis and includes consideration of operations, maintenance and temporary upsets. If the facility can successfully demonstrates the need for increased effluent limitations required in NR 207, then a recalculation of the specific effluent limitation will be provided.

An initial review by department staff concluded that the requirements of s. NR 207.04(1)(a) do not appear to be met based on Delafield-Hartland's BOD_5, TSS, and Ammonia Nitrogen effluent concentrations from March 2010-June 2014 discharge monitoring reports. **Therefore Delafield Hartland's current limits for BOD, TSS and Ammonia Nitrogen are recommended to be retained in the reissued permit consistent with s. NR 207.04(2).**

Although an increase to the ammonia limits are not recommended, the daily maximum ammonia limit is reevaluated as it is based on the effluent pH and could potentially decrease. The current ammonia limits were based on an effluent pH of 7.7 as a 99th upper percentile value from the previous permit term. A total of 2,891 results were reported during the most recent permit term, and only 16 of those values (or 0.8%) were above 7.7. The one-day P_{99} for this new data, calculated in accordance with s.NR 106.05(5), is 7.711 s.u.. An estimate of the upper ninety ninth percentile for a normally distributed dataset, the mean plus the standard deviation multiplied by a factor of 2.33, is 7.71 s.u.. A value of 7.7 is still believed to represent the maximum reasonably expected pH, and therefore no changes are recommended in any of the permit limits for ammonia.

PART 4 –PHOSPHORUS AND TSS IN THE ROCK RIVER TMDL

Technology Based Effluent Limit (TBEL)

Wisconsin Administrative Code, ch. NR 217, 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. Since Delafield Hartland Pollution Control Commission currently has an existing technology based 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.

Water Quality Based Limit – Phosphorus

Revisions to the administrative rules for phosphorus discharges took effect on December 1, 2010. These rule revisions include additions to ch. NR 102 (s. NR 102.05), which establish phosphorus standards for surface waters. Revisions to ch. NR 217 (s. NR 217, Subchapter III) establish procedures for determining water quality based effluent limits for phosphorus, based on the applicable standards in ch. NR 102.

The Department has developed a TMDL for the Upper and Lower Rock River Basins. The US EPA approved the Rock River TMDL on September 28, 2011. The document, along with the referenced appendices can be found at:
http://dnr.wi.gov/topic/TMDLs/RockRiver/Final_Rock_River_TMDL_Report_with_Tables.pdf

Section NR 217.16, Wis. Adm. Code, states that the Department may include a TMDL-derived water quality based effluent limit (WQBEL) for phosphorus in addition to, or in lieu of, a s. NR 217.13 WQBEL in a WPDES permit. Because the Rock River Basin TMDL was developed to protect and improve the water quality of phosphorus impaired waters within the basin and the discharge from Delafield Hartland Pollution Control Commission flows directly into the Bark River, which is listed as phosphorus impaired downstream of the facility, the TMDL-based limit can be included in the WPDES permit absent the s. NR 217.13 WQBEL. This limit should be expressed in a manner consistent with the wasteload allocation and assumptions of the TMDL. If after two permit terms, the Department determines the nonpoint source load allocation has not been substantially reduced, the Department may include the s. NR 217.13 WQBEL unless these reductions are likely to occur.

TMDL Limits – Phosphorus

The monthly average total phosphorus (Total P) effluent limits in lbs/day are calculated based on the monthly phosphorus wasteload allocation (WLA) given in pounds per month as suggested in the *TMDL Development and Implementation Guidance: Integrating the WPDES and Impaired Waters Programs* dated April 15, 2013. The WLA for this facility is found in the *Total Maximum Daily Loads for Total Phosphorus and Total Suspended Solids in the Rock River Basin* report dated July 2011. The limits are equivalent to concentrations ranging 0.12 – 0.28 mg/L at the facility design flow of 3.23 MGD. **Monthly average mass effluent limits in accordance with the following table are recommended for this discharge.**

Attachment #1

Total Phosphorus Effluent Limitations

Month	Monthly Total P WLA[1] (lbs/month)	Days Per Month	Monthly Ave Total P Effluent Limit[2] (lbs/day)
Jan	129.89	31	**4.19**
Feb	198.21	28	**7.08**
March	207.67	31	**6.70**
April	257.50	30	**8.58**
May	227.26	31	**7.33**
June	225.57	30	**7.52**
July	176.19	31	**5.68**
Aug	154.03	31	**4.97**
Sept	122.43	30	**4.08**
Oct	99.81	31	**3.22**
Nov	104.15	30	**3.47**
Dec	129.78	31	**4.19**

Footnotes:

1- Rock River TMDL Appendix P. Monthly Total Phosphorus Allocations by Wastewater Treatment Facility (p. 147)

2- Monthly average Total P effluent limit (lbs/day) = monthly Total P WLA (lbs/month) ÷ days per month

Interim Limit - Phosphorus

The table below shows data from effluent monitoring at the facility, reported from 3/1/2001 – 2/27/2014. The data suggests that a compliance schedule will be necessary in order for the facility to meet the given phosphorus limits.

An interim limit is needed when a compliance schedule is included in the permit. This limit should reflect a value which the facility is able to currently meet; however, it should also consider the receiving water quality, keeping the water from further impairment. After review **it is recommended that the current technology based limit of 1.0 mg/L be considered for use as an interim limit** and should be expressed as a monthly average concentration.

Total Phosphorus Statistics, mg/L	
1-day P_{99}	1.16
4-day P_{99}	0.99
30-day P_{99}	0.89
Mean	0.84
Std	0.12
Sample Size	784
Range	0.5 – 2.1

TMDL Limits – TSS

The Rock River TMDL also has wasteload allocations (WLA) for total suspended solids (TSS). For a municipal facility the limits for TSS must be expressed as weekly and monthly averages. The current

permit includes monthly and weekly TSS limits of 14 mg/L for November through April, which equates to 380 lbs/day at the facility's design flow of 3.23 mgd. The permit also includes monthly and weekly TSS limits of 10 mg/L for May through October, which equates to 270 lbs/day using the facility's design flow.

Monthly average and weekly average mass effluent limitations should be included in the permit according to the table below, along with the currently imposed concentration limit. For reference, the mass limits shown are equivalent to concentrations ranging from 3.9 – 9.8 mg/L as a monthly average and 5.0 – 13 mg/L as a weekly average at the facility design flow of 3.23 mgd.

Total Suspended Solids Effluent Limitations

Month	Monthly TSS WLA[1] (tons/month)	Days Per Month	Monthly Ave TSS Effluent Limit[2] (lbs/day)	Weekly Ave TSS Effluent Limit[3] (lbs/day)
Jan	3.50	31	**226**	**289**
Feb	3.69	28	**264**	**338**
March	3.85	31	**248**	**317**
April	3.16	30	**211**	**270**
May	2.68	31	**173**	**221**
June	2.71	30	**181**	**232**
July	2.10	31	**135**	**173**
Aug	1.98	31	**128**	**164**
Sept	1.58	30	**105**	**134**
Oct	1.98	31	**128**	**164**
Nov	3.05	30	**203**	**260**
Dec	3.61	31	**233**	**298**

Footnotes:
1- Rock River TMDL Appendix Q. Monthly Total Suspended Solids Allocations by Wastewater Treatment Facility (p. 149)
2- Monthly average TSS effluent limit (lbs/day) = maximum monthly TSS WLA (tons/month) ÷ days per month x 2,000 lbs/ton
3- Weekly average effluent limit (lbs/day) = monthly average limit (lbs/day) x multiplier

The multiplier used in the weekly average limit calculation was determined according to implementation guidance. A coefficient of variation was calculated, based on TSS mass monitoring data, to be 1.7. However, it is believed that the optimization of the wastewater treatment system to achieve the WLA-derived TSS and phosphorus permit limits will reduce effluent variability. Thus, the maximum anticipated coefficient of variation expected by any facility is 0.6. This value, along with monitoring frequency, is used to select the multiplier. **Monitoring for TSS is specified as daily in the current permit and it is believed this monitoring frequency will remain the same.** Based on these two variables, Table 3 of the implementation guidance is used to select the multiplier of 1.28. **If there is a change in monitoring frequency, the stated limits should be reevaluated.**

Limits based on a WLA should be given in a permit regardless of reasonable potential. However, for informational purposes, the following table lists the statistics for Total Suspended Solids discharge as both a concentration and a mass, from 3/1/2011 – 2/27/2014. TSS effluent concentration data and data

flow records were used to approximate daily TSS mass loadings.

	TSS (mg/L)	TSS (lbs/day)
1-day P_{99}	2.09	36.47
4-day P_{99}	1.34	22.44
30-day P_{99}	0.96	15.36
Mean	0.78	12.10
Std	0.39	6.98
Sample Size	1096	1096
Range	0.1 – 4.8	1.37 – 117.17

PART 5 – THERMAL

New surface water quality standards for temperature took effect on October 1, 2010. These new regulations are detailed in Chapter NR 102 (Subchapter II – Water Quality Standards for Temperature) and NR 106 (Subchapter V – Effluent Limitations for Temperature) of the Wisconsin Administrative Code. In accordance with s. NR 106.53(2)(b), 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), 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 of actual flow reported from 3/01/2010 – 2/28/2014.

Month	Representative Highest Monthly Effluent Temperature		Calculated Effluent Limits	
	Weekly Ave (°F)	Daily Max (°F)	**Weekly Ave Limit (°F)**	**Daily Max Limit (°F)**
JAN	51	53	65	112
FEB	51	52	67	115
MAR	52	53	67	111
APR	54	55	66	120
MAY	59	61	73	106
JUN	61	64	80	90
JUL	65	66	84	88
AUG	66	67	86	90
SEP	65	67	79	92
OCT	63	64	68	98
NOV	61	61	61	120
DEC	57	58	66	120

The table above summarizes the maximum temperatures reported during monitoring from11/01/2010 – 12/31/2013. Comparing the representative highest effluent temperature to the calculated effluent limits

determines if there is reasonable potential of exceeding the calculated effluent limits. Temperature limits are not needed for any of the months using the updated monthly receiving water flows. The complete thermal table used for calculation is attached as the last page of this memo.

PART 6 – WHOLE EFFLUENT TOXICITY

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.

- Acute tests predict the concentration that causes lethality of aquatic organisms during a 48 to 96-hour exposure. In order 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.
- Chronic tests predict the concentration that interferes with the growth or reproduction of test organisms during a seven-day exposure. In order to assure that a discharge is not chronically toxic to organisms in the receiving water, WET tests must produce a statistically valid IC_{25} (25% Inhibition Concentration) greater than the instream waste concentration (IWC). Chronic testing is not recommended where the ratio of the $7\text{-}Q_{10}$ to the effluent flow exceeds 100:1. For Delafield Hartland Pollution Control Commission that ratio is approximately 1.2:1. With this little amount of dilution, there is believed to be potential for chronic toxicity problems in the Bark River associated with the discharge from Delafield Hartland Pollution Control Commission, so the need for chronic WET testing must be considered.
- The IWC is an estimate of the proportion of effluent to total volume of water (receiving water + effluent). The IWC of 85% shown in the WET Checklist summary below was calculated according to the following equation, as specified in s. NR 106.03(6):

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

Where:

Q_e = annual average design flow = 3.23 MGD = 5.0 cfs
f = fraction of the Q_e withdrawn from the receiving water = 0
Q_s = ¼ of the $7\text{-}Q_{10}$ = 3.6 cfs ÷ 4 = 0.9 cfs

- According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (referenced in s. NR 219.04, Wis. Adm. Code), the default acute dilution series is: 6.25, 12.5, 25, 50, 100%, and the default chronic dilution series is 12.5, 25, 50, 75, 100%. The permittee or Department staff may choose other dilution series, but alternate dilution series must be specified in the WPDES permit. For guidance on selecting an alternate dilution series, see Chapter 2.11 of the WET Guidance Document.
- Also according to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual*, receiving water must be used as the dilution water and primary control in 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 Bark River, upstream of the influence of the mixing zone. The receiving water location must be specified in the WPDES permit.
- Below is a tabulation of all available WET data for Outfall 001. Efforts are made to insure that decisions about WET monitoring and limits are made based on representative data. Data which is no longer believed to be representative of the discharge is not included in Reasonable Potential Factor (RPF) calculations. The table below differentiates between tests used and not used in RPF calculations.

Attachment #1

Date Initiated	Acute Results LC_{50} % (% survival in 100% effluent)				Chronic Results IC_{25} %				Footnotes
	C. dubia	Fathead minnow	Pass or Fail?	Use in RPF?	*C. dubia*	Fathead Minnow	Pass or Fail?	Use in RPF?	
7/11/2006	X		Pass	Yes	X		Pass	Yes	
6/5/2007		X	Pass	Yes		X	Pass	Yes	
7/29/2008	X		Pass	No	X		Pass	No	1
3/10/2009		X	Pass	No			Pass	No	1
10/12/2010	X		Pass	No			Pass	No	1

1- The DNR has reason to believe that whole effluent toxicity (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 Reasonable Potential Factor (RPF) analysis

The WET Checklist has been developed to assist DNR staff when deciding whether WET limits and monitoring are needed. The Checklist recommends acute and chronic WET limits (as needed) based on the Reasonable Potential Factor (RPF), as required by s. NR 106.08, Wis. Adm. Code. Monitoring frequencies are based on points accumulated during the Checklist analysis. As toxicity potential increases, more points accumulate and more monitoring is needed to insure that toxicity is not occurring. The completed WET Checklist and monitoring recommendations are summarized in the table below. (For more on the RPF and WET Checklist, see Chapter 1.3 of the WET Guidance Document, at: http://dnr.wi.gov/topic/wastewater/documents/Chap1x3MonitoringLimits.pdf).

Whole Effluent Toxicity (WET) Checklist Summary

	Acute	Chronic
1. IWC	Not Applicable. **0 Points**	IWC = 85%. **15 Points**
2. Historical Data	2 Tests used to calculate RPF = 0. **0 Points**	2 Tests used to calculate RPF = 0. **0 Points**
3. Effluent Variability	Little variability, no violations or upsets, consistent WWTF operations. **0 Points**	Same as Acute. **0 Points**
4. Receiving Water Classification	Warm Water Sport Fish Community **5 Points**	Same as Acute. **5 Points**
5. Chemical Specific Data	Limits for Chlorine based on ATC; Ammonia, Chloride, As, Cu, Hg, Ni & Zn detected, as well as 4 additional compounds of concern. **10 Points**	Limits for Chlorine and Chloride based on CTC; Ammonia As, Cu, Hg, Ni & Zn detected, as well as 4 additional compounds of concern. **11 Points**
6. Additives	1 Biocide (Sodium Hypochlorite) and 1Water Quality Conditioner (Magnesium Bisulfite) added. **4 Points**	All additives used more than once per 4 days. **4 Points**
7. Discharge Category	1 Industrial Contributor. **5 Points**	Same as Acute. **5 Points**

8. Wastewater Treatment	Secondary Treatment. **0 Points**	Same as Acute. **0 Points**
9. Downstream Impacts	None attributable to this discharge. **0 Points**	Same as Acute. **0 Points**
Total Points	**24**	**40**

- Annual acute and chronic WET testing is recommended because Delafield Hartland is a major municipal discharger with a design flow in excess of 1.0 MGD. Federal regulations at 40 CFR Part 122.21(j) requires at least 4 acute and chronic WET tests with each permit application on samples collected since the previous reissuance. Based upon the federal requirements along with the point totals generated by the WET Checklist, other information given above, and Chapter 1.3 of the WET Guidance Document, annual acute and chronic monitoring is recommended in the permit term. Tests should be done in rotating quarters to collect seasonal information about this discharge.

Attachment #2

Temperature limits for receiving waters with unidirectional flow

(calculation using default ambient temperature data)

Facility:	Dela-Hart	**Data Range**	**7Q10 or 4Q3:**	3.6	cfs
Outfall(s):	001	**Start:** 03/01/10	**Dilution:**	25%	
Date Prepared:	29-Aug-14	**End:** 06/30/14	**f:**	0	
Design Flow (Qe):	3.23 mgd		**Stream type:**	Small warm water sport or forage fish community	
Region:	SC		**Qs:Qe ratio:**	0.2 :1	
			Calculation Needed?	YES	

Month	Water Quality Criteria			Receiving Water Flow Rate (Qs)	Representative Highest Effluent Flow Rate (Qe)		Representative Highest Monthly Effluent Temperature		99th Percentile of Representative Data		**Calculated Effluent Limits**	
	Ta (default)	Sub-Lethal WQC	Acute WQC		7-day Rolling Ave (Qesl)	Daily Max Flow Rate (Qea)	Weekly Ave	Daily Max	Weekly Ave	Daily Max*	**Weekly Ave Limit**	**Daily Max Limit**
	(°F)	(°F)	(°F)	(cfs)	(mgd)	(mgd)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)
JAN	33	49	76	12.00	1.893	2.328	51	53	51	53	65	112
FEB	34	50	76	12.00	1.868	2.114	51	52	51	52	67	115
MAR	38	52	77	14.00	2.181	2.599	52	53	52	53	67	111
APR	48	55	79	27.00	2.726	3.238	54	55	54	56	66	120
MAY	58	65	82	16.00	2.191	2.581	59	61	59	62	73	106
JUN	66	76	84	6.20	2.544	2.930	61	64	62	64	80	90
JUL	69	81	85	4.90	3.554	4.594	65	66	65	67	84	88
AUG	67	81	84	5.70	2.423	2.635	66	67	66	67	86	90
SEP	60	73	82	6.20	2.009	2.192	65	67	66	68	79	92
OCT	50	61	80	7.40	1.854	1.999	63	64	63	65	68	98
NOV	40	49	77	15.00	1.790	1.905	61	61	60	NA	61	120
DEC	35	49	76	14.00	1.838	2.001	57	58	55	NA	66	120

*NA - Indicates that there are greater than 100 daily maximum values, therefore 99th percentile would be a value less than the recorded daily maximum.