

**CORRESPONDENCE/MEMORANDUM**

DATE: September 22, 2020

TO: Lisa Creegan – SER

FROM: Wade Strickland – WY/3 *Diane Figiel for US*

SUBJECT: Whole Effluent Toxicity for Hartford Water Pollution Control Facility  
WPDES Permit No. WI-0020192-09-1  
FIN 5815

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 Hartford Water Pollution Control Facility in Washington County. This municipal wastewater treatment facility (WWTF) discharges to the Rubicon River, located in the Rubicon River Watershed in the Upper Rock River Basin. The evaluation of the permit recommendations is discussed in more detail in the attached report.

The purpose of this memo is to update the Whole Effluent Toxicity (WET) monitoring requirements and limit based on updated receiving water low flows.

Based on our review, the following recommendations for WET requirements are made at Outfall 001:

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Footnotes
Acute WET					1,2
Chronic WET				1.1 TUc	1,3

Footnotes:

1. 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).
2. Acute WET tests should be done 1x yearly.
3. Chronic WET tests should be done 7x during the permit term. The Instream Waste Concentration (IWC) to assess chronic test results is 94%. According to the *State of Wisconsin Aquatic Life Toxicity Testing Methods Manual* (s. NR 219.04, Table A, Wis. Adm. Code), chronic testing shall be performed using a dilution series of 100%, 75%, 50%, 25% & 12.5% and the dilution water used in WET tests conducted on Outfall 001 shall be a grab sample collected from the Rubicon River.

The monitoring frequency is the same as in the current permit while the IWC changed from 98% to 94% and the chronic WET limit changed from 1.0 TUc to 1.1 TUc.

Please consult the attached report for details regarding the above recommendations. If there are any questions or comments, please contact Nicole Krueger at (414)-263-8650 (Nicole.Krueger@wisconsin.gov) or Diane Figiel at Diane.Figiel@wisconsin.gov.

Attachments (1) – WET Narrative

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APPROVED BY:



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Date: 09/22/2020

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**Water Quality-Based Effluent Limitations for  
Hartford Water Pollution Control Facility  
WPDES Permit No. WI-0020192-09-1**

Prepared by: Nicole Krueger

**PART 1 – BACKGROUND INFORMATION**

**Facility Description:** The City of Hartford operates a 3.6 million gallon per day (MGD) annual average design flow activated sludge wastewater treatment facility and serves approximately 17,000 people and seven significant industrial/commercial contributors: Grande Cheese, Hartford Finishing, Quad/Graphics, Broan Nutone, Signicast Corporation, Menasha Packaging and Helgesen. The facility also accepts hauled wastes.

Treatment consists of screening, grit removal, a three-ring oxidation ditch that was recently upgraded to allow for biological phosphorus removal, final clarification, anthracite filters, UV disinfection and post aeration. In order to meet the water quality-based effluent limit for total phosphorus, polyaluminum chloride (PAC) is currently used to enhance phosphorus removal before discharge to the Rubicon River.

**Existing whole effluent toxicity requirements:** The current permit, expiring on 09/30/2023, includes the following whole effluent toxicity requirements.

Parameter	Daily Maximum	Monthly Average	Footnotes
Acute WET			1
Chronic WET		1.0 TUc	2

Footnotes:

1. Acute tests are required 1x yearly
2. Chronic WET tests are required 7 times during the permit term in rotating quarters along with a chronic WET limit. The IWC for chronic testing is 98%.

**Receiving Water Information:**

- Name: Rubicon River
- Classification used in accordance with chs. NR 102 and 104, Wis. Adm. Code: Warm water sport fish community, non-public water supply.
- Low Flows used in accordance with chs. NR 106 and 217, Wis. Adm. Code: The following 7-Q<sub>10</sub> and 7-Q<sub>2</sub> values are from USGS for Station ID #05424097, upstream of where Outfall 001 is located. These were updated in January 2020.
  - 7-Q<sub>10</sub> = 1.3 cfs (cubic feet per second)
  - 7-Q<sub>2</sub> = 2.0 cfs
 The previous memo used the following low flows:
  - 7-Q<sub>10</sub> = 0.52 cfs
  - 7-Q<sub>2</sub> = 1.3 cfs
- % of low flow used to calculate limits in accordance with s. NR 106.06 (4) (c) 5., Wis. Adm. Code: 25%

**Effluent Information:**

- Design Flow Rate(s):  
Annual average = 3.6 MGD (Million Gallons per Day)
- 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).
- Additives: Polyaluminum chloride is added for phosphorus removal.

**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 LC<sub>50</sub> (Lethal Concentration to 50% of the test organisms) greater than 100% effluent, according to s. NR 106.09 (2) (b), Wis. Adm Code.
- Chronic tests predict the concentration that interferes with the growth or reproduction of test organisms during a seven-day exposure. To assure that a discharge is not chronically toxic to organisms in the receiving water, WET tests must produce a statistically valid IC<sub>25</sub> (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 94% 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 = 3.6 MGD = 5.57 cfs

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

$Q_s$  =  $\frac{1}{4}$  of the 7- $Q_{10}$  = 1.3 cfs  $\div$  4 = 0.325 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

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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 <sub>50</sub> % (% survival in 100% effluent)				Chronic Results IC <sub>25</sub> %				Footnotes or Comments
	<i>C. dubia</i>	Fathead minnow	Pass or Fail?	Used in RP?	<i>C. dubia</i>	Fathead Minnow	Pass or Fail?	Use in RP?	
02/19/2002	>100	>100	Pass	No	>100	>100	Pass	No	1
04/24/2003	>100	>100	Pass	No	76	>100	Fail	No	1
07/24/2003					>100	>100	Pass	No	1
09/16/2004	>100	>100	Pass	No	>100	>100	Pass	No	1
11/03/2005	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
02/09/2006	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
01/30/2007	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
09/20/2007					>100	>100	Pass	Yes	
05/01/2008	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
04/27/2010					>100	>100	Pass	No	2
08/18/2010	>100	>100	Pass	No	>100	>100	Pass	No	2
11/09/2010	>100	>100	Pass	No	>100	>100	Pass	No	2
01/18/2011	>100	>100	Pass	No	>100	>100	Pass	No	2
09/13/2011					76.2	>100	Fail	Yes	
10/25/2011					76	>100	Fail	Yes	
12/06/2011					>100	>100	Pass	Yes	
02/28/2012	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
07/23/2013	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
06/10/2014	>100	>100	Pass	Yes	76.1	>100	Fail	Yes	
07/08/2014					>100	>100	Pass	Yes	
09/09/2014					>100	>100	Pass	Yes	
01/27/2015	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
08/16/2016	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
05/02/2017	>100	>100	Pass	Yes	>100	>100	Pass	Yes	
11/06/2018	>100	>100	Pass	Yes	88.4	>100	Fail	No	3
12/04/2018					>100	>100	Pass	Yes	4
08/13/2019	>100	>100	Pass	Yes	>100	>100	Pass	Yes	4
01/28/2020	>100	>100	Pass	Yes	82	>100	Fail	Yes	
03/03/2020					>100	>100	Pass	Yes	4
03/17/2020					>100	>100	Pass	Yes	4

## Footnotes:

1. *Data Not Representative.* Significant changes were made to WET test methods in 2004 and these changes were assumed to be fully implemented by certified labs by no later than June 2005. Data collected before July 1, 2005 was excluded in the reasonable potential calculations.
2. *Tests done by S-F Analytical, July 2008 – March 2011.* The DNR has reason to believe that WET tests completed by SF Analytical Labs from July 2008 through March 31, 2011 were not performed using proper test methods. Therefore, WET data from this lab during this period has been disqualified and was not included in the analysis.
3. *Qualified or Inconclusive Data.* Data quality concerns were noted during testing which calls into question the reliability of the test results.

4. Retest following a WET failure. These do not count towards number of required testing in permit term.
- 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  $LC_{50}$ ,  $IC_{25}$  or  $IC_{50} \geq 100\%$ ).

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

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

TU <sub>c</sub> (maximum) 100/IC <sub>25</sub>	<b>B</b> (multiplication factor from s. NR 106.08(6)(c), Wis. Adm. Code, Table 4)	IWC
100/76 = 1.316	2.6 Based on 4 detects	94%

$$[(TU_c \text{ effluent}) (B)(IWC)] = 3.22 > 1.0$$

Therefore, reasonable potential is shown for chronic WET using the procedures in s. NR 106.08(6) and representative data from 11/03/2005 to 03/17/2020.

#### Expression of WET limits

$$\text{Chronic WET limit} = 100/IWC = 1.1 TU_c \text{ (monthly average)}$$

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**

	<b>Acute</b>	<b>Chronic</b>
<b>AMZ/IWC</b>	Not Applicable. <b>0 Points</b>	IWC = 94%. <b>15 Points</b>
<b>Historical Data</b>	13 tests used to calculate RP. No tests failed. <b>0 Points</b>	22 tests used to calculate RP. 4 tests failed. <b>0 Points</b>
<b>Effluent Variability</b>	Little variability, no violations or upsets, consistent WWTF operations. <b>0 Points</b>	Same as Acute. <b>0 Points</b>
<b>Receiving Water Classification</b>	Warmwater sport fishery <b>5 Points</b>	Same as Acute. <b>5 Points</b>
<b>Chemical-Specific Data</b>	Limits for no substances based on ATC; ammonia, chromium (+3), copper, mercury, nickel, zinc, and chloride detected. 3 pts Additional Compounds of Concern: pyrene, phenanthrene, and Bis(2-ethylhexyl)phthalate. 2 pts <b>5 Points</b>	Limits for chloride based on CTC; ammonia, chromium (+3), copper, mercury, nickel, and zinc detected. 3 pts. Additional Compounds of Concern: pyrene, phenanthrene, and Bis(2-ethylhexyl)phthalate. 2 pts <b>10 Points</b>
<b>Additives</b>	0 Biocides and 0 Water Quality Conditioners added. P treatment chemical other than Ferric Chloride (FeCl), Ferrous Sulfate (FeSO <sub>4</sub> ), or alum used: Yes, polyaluminum chloride is used <b>15 Points</b>	All additives used more than once per 4 days. <b>15 Points</b>
<b>Discharge Category</b>	7 Industrial Contributors. <b>11 Points</b>	Same as Acute. <b>11 Points</b>
<b>Wastewater Treatment</b>	Secondary or Better <b>0 Points</b>	Same as Acute. <b>0 Points</b>
<b>Downstream Impacts</b>	No impacts known <b>0 Points</b>	Same as Acute. <b>0 Points</b>
<b>Total Checklist Points:</b>	<b>36 Points</b>	<b>56 Points</b>
<b>Recommended Monitoring Frequency (from Checklist):</b>	1x yearly	2x yearly
<b>Limit Required?</b>	No	Yes Limit = 1.1 TU <sub>c</sub>
<b>TRE Recommended? (from Checklist)</b>	No	No

- After consideration of the guidance provided in the Department's WET Program Guidance Document (2019) and other information described above 1x yearly acute and 7x during the permit term chronic WET tests (see "deviation from checklist" note below) 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). This is consistent with the January 4, 2018 WQBEL memo.

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- According to the requirements specified in s. NR 106.08, Wis. Adm. Code, a chronic WET limit is required. The chronic WET limit shall be expressed as 1.1 TUc as a monthly average in the effluent limits table of the permit. The WET limit is revised from the previous recommendation due to the change in receiving water low flows.
- 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 Hartford 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.

**Deviation from the checklist:** As stated in the January 4, 2018 WQBEL memo, 15 points from the checklist are included from the additives section because Hartford adds polyaluminum chloride (PAC) for phosphorus removal. The facility has had one chronic WET test failure on 01/28/2020 since starting the addition of PAC in 2016. The 6 other chronic WET tests since beginning PAC have had no detects of toxicity and it is unlikely that the PAC caused the one chronic failure. Because of this, the monitoring frequency in the current permit is recommended to continue which is 7 times during the permit term rather than 2x annually. The current schedule is: October – December 2018; July – September 2019; January – March 2020; April – June 2021; October – December 2021; July – September 2022; and January – March 2023. This is recommended to continue.