CORRESPONDENCE/MEMORANDUM **State of Wisconsin**

DATE: February 12th, 2021 FILE REF: WQ Sampling

TO: Jason Knutson, Environmental Engineer Supervisor

FROM: Craig Helker, Water Resources Management Specialist

SUBJECT: 2020 WE Energies Tributary Sampling Summary— Updated

Overview

In 2020, the Department of Natural Resources undertook water quality monitoring efforts on intermittent and perennial streams draining to the Root River and Lake Michigan (MAP 1). The purpose of the water quality monitoring was to document low-level metals concentrations in five of these waterbodies and perform Whole Effluent Toxicity testing on stream water from three of the streams. One of the streams drains the WE Energies closed fly-ash landfill and stormwater pond, one drains the active fly-ash disposal site on WE Energies property, and one drains to the aforementioned stream. Additionally, two streams were chosen as control sites, with one within the same sub-watershed as WE Energies but not draining the property, and the other draining to the Root River near Racine.

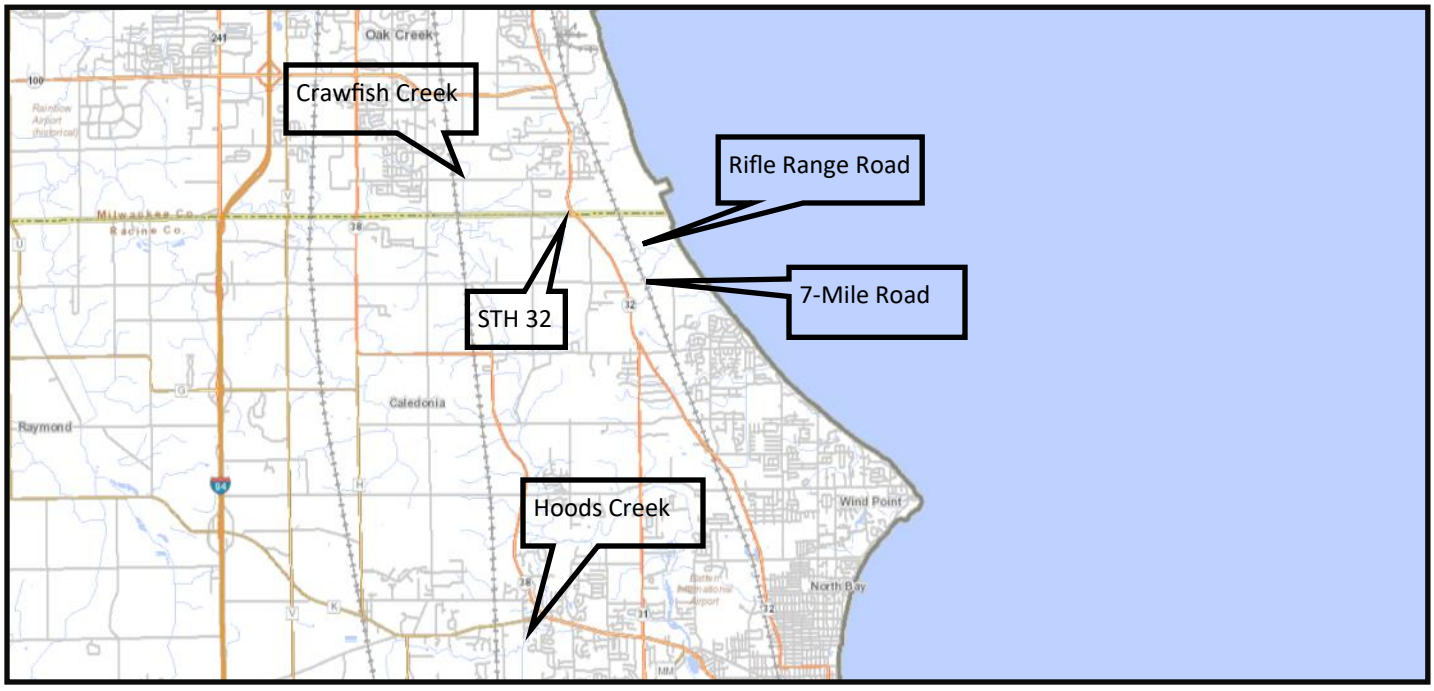
Water Quality Results and Discussion

Sampling Location and Lat/Long

- Hoods Creek, at CTH H 42.7512, -87.8984 (CONTROL LOCATION)
- Crawfish Creek, upstream of East Elm Road 42.8499, -87.8832 (CONTROL LOCATION)
- Unnamed Tributary to Lake Michigan, downstream of Rifle Range Road 42.8350, -87.8354
- Unnamed Tributary to Crawfish Creek, downstream of State Highway 32 42.8437, -87.8542
- Unnamed Tributary, tributary to tributary to Lake Michigan, upstream of 7-Mile Road 42.8278, -87.8318

The locations above were sampled August 4th, 2020 and September 14th, 2020 for hardness, nitrate-nitrogen, and metals concentrations. Water quality sampling followed standard DNR Water Quality Sampling protocols.

Map 1. Sampling Locations



Water Quality Results and Discussion cont.

Table 1. shows results of metals, nitrate-nitrogen, and hardness collected during two sampling day events. Hoods Creek and Crawfish Creek are considered control locations, and the STH 32 and Rifle Range Road serving as representative contribution locations from WE Energies property. Finally, the 7-Mile Road location serves to represent mixed land use with agriculture drainage predominating.

Sampling on 8/04/2020 occurred two days after significant rainfall in the area, with the sampled streams evidencing high flows. The 9/14/2020 sampling events were representative of baseflow conditions. A field replicate sample was taken at the STH 32 location on 9/14/2021. Significantly more organic material was noted in the non-replicate sample, suggesting bottom disturbance during sampling. The field replicate sample is utilized in this report's analysis as the more representative of stream water concentrations.

In evaluating the results, three different approaches are taken. The first approach is based on noting the result exceedance of ch. NR 140, Wisconsin Administrative Code - Public Health Enforcement Standard. It is important to note that this is the Standard used for drinking water and hence are derived numbers for the protection of Human Health from direct daily consumption. These numbers are used for comparison only and are not to suggest fish and invertebrate toxicity effects. The second approach for evaluating these results is to note obvious outliers when compared to control sites or vice-versus. The final approach is to compare results with the Surface Water Quality Standards contained in ch. NR 105, Wis. Admin. Code.

Utilizing ch. NR 140 Wis. Admin. Code, Boron has a Public Health Standard for Drinking Water of 1000 ug/L. This was exceeded at STH 32 and Rifle Range Road sampling locations during both sampling events. The Standard of 300 ug/L for Manganese was exceeded at Rifle Range Road during the September sampling event. The Standard of 40 ug/L for Molybdenum was exceeded at STH 32 during the September sampling event. Finally, the Standard of 200 ug/L for Aluminum was exceeded at the Hoods Creek control location during both sampling events. Note that these waterbodies are not designated as public water supplies.

Noting obvious outliers in the sampling when compared amongst sites, the metals Boron, Sodium, and Manganese are noted at the Rifle Range Road and STH 32 sampling locations, as well as Lithium. Individually, elevated levels of Cadmium and Molybdenum are noted at STH 32. The Hoods Creek control site location has the highest hits for the metals Aluminum, Arsenic, Chromium, Copper, Cobalt, Iron, Vanadium, and Zinc. These results at Hoods Creek could be a function of the larger drainage area and increased development within, or inputs from an unknown source. Additional study is encouraged to look into this issue.

Ch. NR 105, Wis. Admin. Code establishes water quality criteria for toxic substances to protect public health and welfare, the present and prospective use of all surface waters for public and private water supplies, and the propagation of fish and aquatic life and wildlife. Utilizing ch. NR 105, Wis. Admin. Code as a basis of comparison, there were no exceedances of Acute or Chronic toxicity values contained in ch. NR 105 for metals sampled in 2020, with the exception of Mercury. Mercury results at all sampled locations during 2020 exceed the Wildlife Criteria and the Human Threshold Criteria. As a note, background Mercury concentrations of Wisconsin rivers and streams are typically above this threshold. See *https://dnr.wi.gov/Water/wsSWIMSDocument.ashx?documentSeqNo=73704740*. Additional metals monitoring is suggested going forward, as sample results collected by the Clean Power Coalition/UW-Parkside in 2018 showed exceedances of Acute (Cadmium, Chromium, Copper, Lead, Zinc) and Chronic (Cadmium, Chromium, Copper, Lead, Nickel, Zinc) Criteria from ch. NR 105, Wis. Admin. Code. These results were not duplicated in this study.

The results of sampling efforts in 2020 show that there are elevated concentrations of certain metals in waters downstream of the active fly-ash storage site upstream of Rifle Range Road and the fly-ash landfill location upstream of STH 32. Additionally, there is a clear trend of certain elevated metals in Hoods Creek compared with other locations in the study. Additional follow-up monitoring and further analysis of current data is recommended. Follow-up monitoring related to the WE Energies site should include Total Suspended Solids analysis as well as hardness, pH, and select metals associated with coal pile and fly-ash runoff. Other Wisconsin DNR programs may also have suggestions for additional monitoring efforts.

Table 1.

Report Units	µg/L	µg/L	µg/L	µg/L	µg/L		µg/L	µg/L	µg/L	µg/L	µg/L
Collection Date	8/4/2020	8/4/2020	8/4/2020	8/4/2020	8/4/2020		9/14/2020	9/14/2020	9/14/2020	9/14/2020	9/14/2020
Site Name	Hoods Creek	Crawfish Creek	Rifle Range Road	STH 32	7-Mile Rd		Hoods Creek	Crawfish Creek	Rifle Range Road	STH 32	7-Mile Rd
Aluminum	986[1]	160	30.2	50.1	109		436[1]	84	55.4	54.5	58
Arsenic	1.40	0.94	1.36	0.80	0.84		1.68	0.97	1.89	1.16	0.99
Boron	82.4	39.0	1737[1]	1128[1]	57.7		88.2	47.7	2204[1]	2384[1]	68.6
Cadmium	0.050[3]	0.017	0.019	0.129	0.033		0.050	0.020	0.032	0.350	0.021
Chromium	1.63	0.322	0.155	0.175	0.272		0.85	0.308	0.170	0.199	0.161
Cobalt	0.832	0.159	0.126	0.159	0.222		0.819	0.260	0.300	0.271	0.307
Copper	3.32	1.81	0.51	1.30	2.00		2.00	1.12	0.34	0.50	0.92
Iron	1389	368	180	220	403		1505	529	738	288	259
Lead	1.29	0.234	0.045	0.075	0.214		0.64	0.130	0.133	0.128	0.089
Lithium	4.60	1.17	15.9	16.8	1.43		7.36	4.28	17.8	39.0	3.72
Manganese	67.6	29.9	129	104	59		118.1	67.8	918[1]	266	215
Mercury	0.005[2]	0.004[2]	0.0068[2]	0.0042[2]	0.0044[2]		0.0020[2]	0.0026[2]	0.0027[2]	0.0042[2]	0.0018[2]
Molybdenum	2.56	1.54	4.05	31.4	2.09		5.19	2.79	5.19	73.6[1]	2.20
Nickle	3.29	0.77	1.06	0.92	1.22		3.31	1.72	1.21	1.25	1.46
Selenium	0.971	0.402	1.58	1.34	0.794		1.304	1.010	1.55	2.41	0.906
Sodium	33321	20491	107021	42310	30726		69316	68412	74746	109847	47924
Vanadium	2.95	1.07	0.425	0.506	0.851		1.86	0.97	0.377	0.489	0.519
Zinc	6.89	2.68	1.69	1.77	1.55		4.01	1.06	3.02	1.18	0.67
[3]											
Hardness (mg/L)	208	85	291	228	215		264	228	414	350	318
N-N Diss. (mg/L as NO3)	4.53	0.085	nd	nd	0.042		2.47	0.211	nd	nd	0.107

[1]Exceeds Wisconsin ch. NR 140 Public Health Enforcement Standard. *https://dnr.wi.gov/topic/DrinkingWater/documents/HALtable.pdf*

[2]*Exceeds* Wisconsin ch. NR 105 Wildlife Criteria and Human Threshold Criteria

[3]Additional metals were analyzed, but not shown here for brevity sake. See report results for full list.

WET Results and Discussion

Sampling Location and Lat/Long

- Crawfish Creek, upstream of East Elm Road 42.8499, - 87.8832 (CONTROL LOCATION)
- Unnamed Tributary to Lake Michigan, downstream of Rifle Range Road 42.8350, -87.8354
- Unnamed Tributary to Crawfish Creek, downstream of State Highway 32 42.8437, -87.8542

The locations (MAP 2) above were sampled August 5th, 2020 and September 14th, 2020 for analysis at the State Lab of Hygiene Whole Effluent Toxicity (WET) Testing laboratory. Sample collection followed standard DNR Water Quality Sampling protocols.

Analysis at the WET laboratory consisted of raising Fathead Minnows (*Pimephales promelas*), Water fleas (*Ceriodaphnia dubia*), and green algae (*Selenastrum capricornutum*) within water collected from the sample locations and in laboratory control water. (For more information see *www.slh.wisc.edu/environmental/toxicology/whole-effluent-toxicity-tests-wet*)

Results from the August sampling event suggest no toxicity as represented by organisms raised within the collected sample water. Results from the September sampling event suggest some possible impact to *Ceriodaphnia dubia* raised within water collected at the STH 32 and Rifle Range Road locations. However, lab communication suggest mortality with the lab water control as well as variability within replicate samples eliminates making a definitive conclusion. The WET lab suggests that additional sampling may be an option to clarify results.

Map 2. WET Sampling Locations