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FROM: Madeline Roberts, Stream Biologist; Kristi Minahan, Water Quality Standards; Diane Figiel, Limit Calculator Coordinator

SUBJECT: Crystal Lake SD, Unnamed tributary (WBIC 3000244) to Lightning Creek (to Groundwater), Barron County

### Overview of issue

In preparation for reissuance of the Crystal Lake Sanitary District permit, staff were requested to do a site visit to determine the appropriate stream classifications for the receiving waters. Crystal Lake SD is a noncontinuous discharger, with a permitted daily maximum flow of 0.07 MGD (0.108 cfs). They discharge continuously from April-May and Oct-Nov.

The immediate receiving water is an unnamed tributary to Lightning Creek. The receiving waters are not listed in ch. NR 104 as LAL or LFF. However, in 2003 it was proposed to list the extent above the Section line between S3 and S10 as LAL, and below that line as LFF (Map 1) for a short distance until the confluence with Lightning Creek. Lightning Creek is a Class 2 Trout Water so should be a Coldwater classification. The facility's previous permit limits were based on the 2003 recommendations (LAL flowing into LFF), but with Warmwater for Lightning Cr. The permit included phosphorus limits for downstream protection of the LFF.

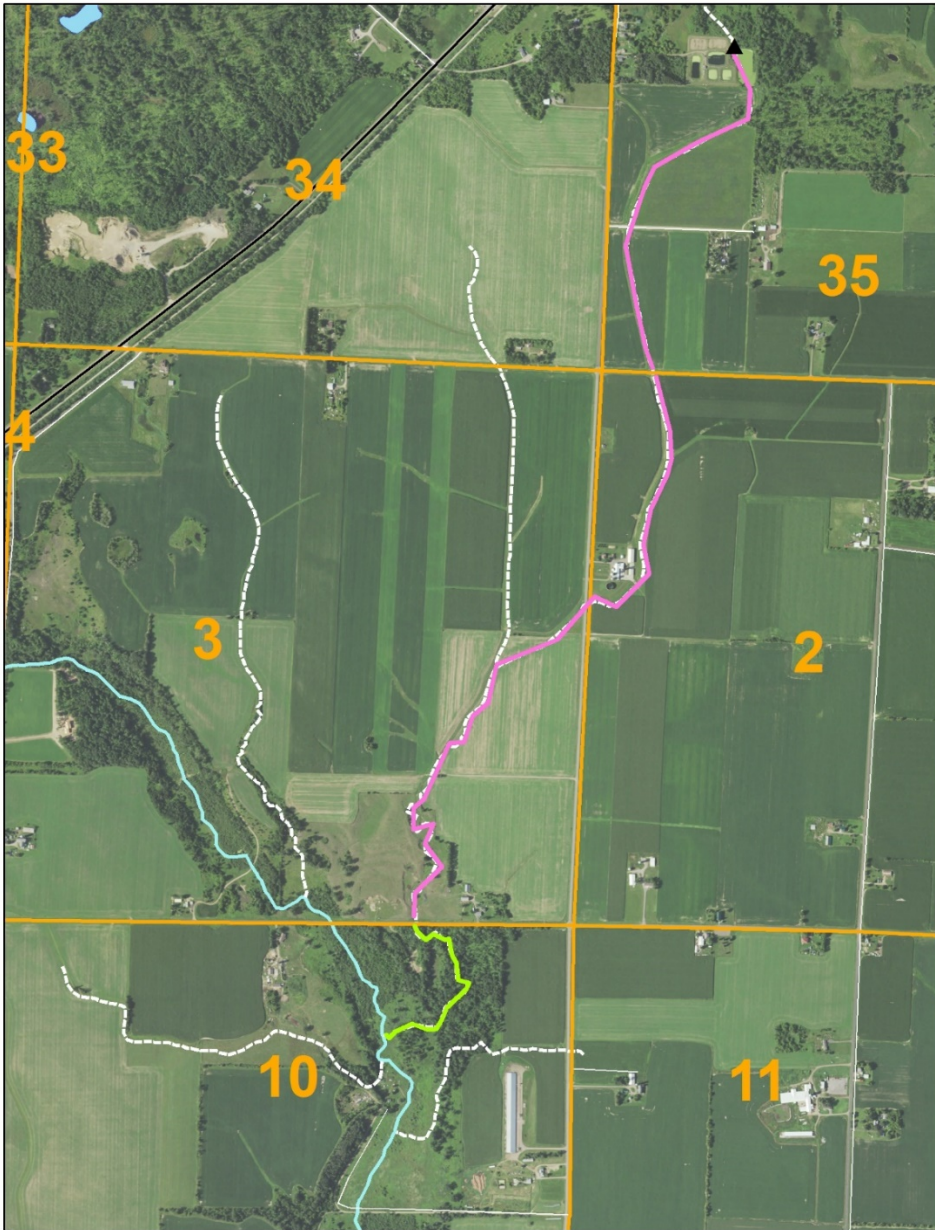
The main objective of this site visit was to determine whether LAL & LFF recommendations are appropriate for the specified extents.

### Summary of recommendations

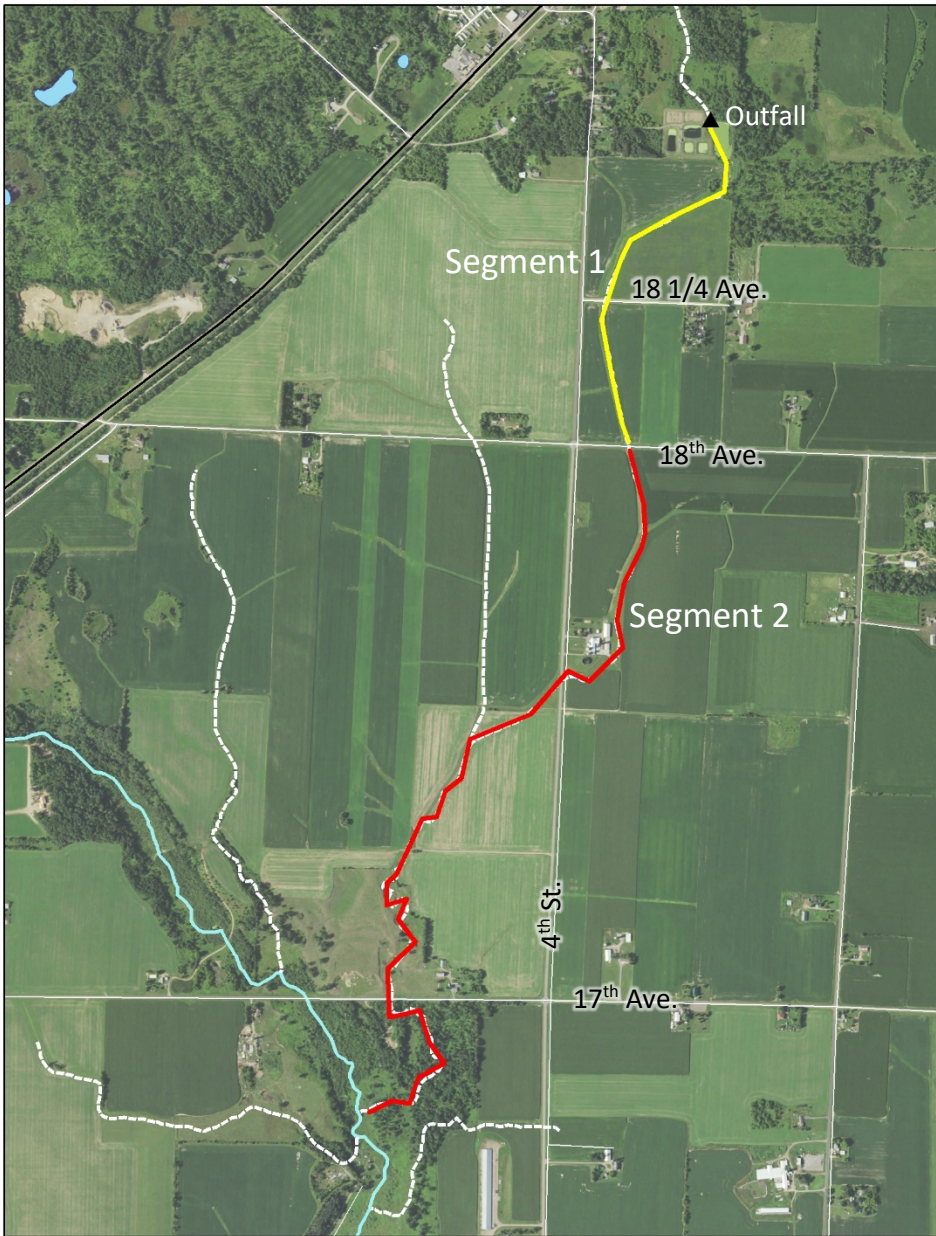
- **Segment 1 (most upstream): Unnamed tributary (WBIC 3000244) to Lightning Creek, from outfall to 18<sup>th</sup> Avenue.**
  - *Codified designated use:* Not in NR 104 as LAL/LFF, so defaults to Full Aquatic Life (in this case, Warmwater)
  - *Classification used for previous permit issuance:* LAL
  - *Previous stream class recommendations:* 2003 proposal recommends LAL "from wastewater treatment outfall to the section line in T34N R14W between S3 and S10". The 2003 proposal was based on 1983 stream class memo by Frank Koshere.
  - *Modeled Natural Community:* Coldwater
  - *New recommended Natural Community and Designated Use:* Designated Use is recommended as either LFF or Warmwater. NC Verification not done at this time.
- **Segment 2: Unnamed tributary (WBIC 3000244) to Lightning Creek, downstream of 18<sup>th</sup> Avenue to confluence with Lightning Cr.**
  - *Codified designated use:* Not in NR 104 as LAL/LFF, so defaults to Full Aquatic Life (in this case, Warmwater)
  - *Classification used for previous permit issuance:* Segment 2 was previously treated as LAL and LFF for different portions. The permit applied LAL from outfall to the section line in T34N R14W between S3 and S10; and it applied LFF from that line to the confluence with Lightning Creek.
  - *Previous stream class recommendations:* 2003 proposal recommends LFF from the above segment down to "the confluence with Lightning Creek". The 2003 proposal was based on 1983 stream class memo by Frank Koshere.
  - *Modeled Natural Community:* Coldwater
  - *New recommended NC & DU:* Full fish and aquatic life warmwater. NC Verification not done at this time.

- **Segment 3: Lightning Creek (WBIC 2080500)**
  - *Codified designated use:* Not in NR 104 as LAL/LFF, so defaults to Full Aquatic Life
  - *Classification used for previous permit issuance:* Warmwater Sport Fish
  - *Previous stream class recommendations:* Lightning Creek is a Class 2 Trout Stream so it should be Coldwater; it was listed in 2008 (was not in the 1980 Trout Book)
  - *Modeled Natural Community:* Coldwater
  - *New recommended NC & DU:* Full fish and aquatic life. NC and DU are coldwater based on trout stream listing. Previous fish data confirm its coldwater status.

**Site overview maps**



Map 1. Location of Crystal Lake SD outfall and previous class recommendations from 2003. Lightning Creek is Class 2 Trout (solid bright blue line). Above the section line between S3 & S10 (17<sup>th</sup> Avenue) was recommended LAL in 2003 (pink line). Below that section line the stream was recommended in 2003 as LFF for a short stretch (light green line) until it meets Lightning Creek.



Map 2. Location of Crystal Lake SD, Unnamed tributary (WBIC 3000244), and Lightning Creek (WIBC 2080500). Segment 1 (yellow line) of the unnamed tributary is recommended as either LFF or Warmwater from the outfall to 18<sup>th</sup> Avenue. Segment 2 (red line) of the unnamed tributary is recommended as Warmwater from downstream of 18<sup>th</sup> Avenue to the confluence with Lightning Creek. Fish surveys were conducted downstream of 17<sup>th</sup> Avenue and upstream of 18 ¼ Avenue.

### Site observations

The purpose of this site visit was to determine whether the direct receiving water is appropriately considered LAL and LFF. Crossings were visually assessed, and two sites had fish and habitat surveys to achieve this goal. Site visit occurred on May 10, 2023. The facility was discharging on the day of the visit (reported flows for May 10 were 0.0629 MGD).

- **Segment 1: Unnamed tributary from WWTP outfall to 18<sup>th</sup> Avenue**

A pond is present directly below the outfall on aerial photos and could be hydrologically connected to the stream. The unnamed tributary flows in a grassed waterway through farm fields. Gravel/rock substrate was observed in the culverts and downstream of the culverts of 18 ¼ Avenue. Downstream of 18 ¼ Avenue to 18<sup>th</sup> Avenue the stream has two channels running parallel to each other and was likely channelized for agricultural purposes.

- **Segment 2: Unnamed tributary downstream of 18<sup>th</sup> Avenue to confluence with Lightning Creek**

Downstream of 18<sup>th</sup> Avenue the stream begins to meander and form a riffle pool structure. Gravel/rock substrate was observed in the culverts and downstream of the culverts of 18<sup>th</sup> Avenue and 4<sup>th</sup> Street. At 4<sup>th</sup> Street the stream is around 2 m wide with sand. Good depth appeared to be present at time of site visit. Upstream of 17<sup>th</sup> Avenue the stream flows through a pasture and is impacted by cattle. Dead calves were present in the culverts upstream and downstream. Downstream of 17<sup>th</sup> Avenue the stream flows through woodland. Fish were observed in the pool below the culverts. Algae and floating manure were present in stream above the fish survey start.

### Fish survey results

Fish surveys were conducted on May 10, 2023 using a single backpack shocker (Table 1). This is outside of the standard sampling period, but the goal of the survey was primarily to determine whether a fish community was present to inform whether an LAL classification was appropriate (the LAL classification is intended for waterways that cannot support fish). Because the goal of the survey was to determine if fish were present and it was outside the standard sampling dates and the minimum number of fish (25) were not captured, a Natural Community Verification or IBI were not completed.

- **Segment 1: Unnamed tributary from WWTP outfall to 18<sup>th</sup> Avenue**

The stream was navigable during the site visit. A fish survey was conducted from 18 ¼ Avenue to 100m upstream. The amount of plants impacted fish recovery, so more fish were likely present that were captured. Twenty two fish and five species were captured. These species were also found downstream, indicating that the fish were able to migrate upstream to this site. NC Verification and IBI unable to be calculated due to too few fish.

- **Segment 2: Unnamed tributary downstream of 18<sup>th</sup> Avenue to confluence with Lightning Creek**

Survey was conducted downstream of 17<sup>th</sup> Avenue for 100m. Six species and 116 fish were captured. Large creek chubs were present and likely spawning. A natural community verification could not be done due to the high number of tolerant species. The observed fish community is typical of a cool-warm natural community. If land use practices improved, the observed fish community could change.

### **Habitat results:**

Qualitative habitat surveys were conducted on the same date and stream sections as the fish surveys.

- **Segment 1: Unnamed tributary from WWTP outfall to 18<sup>th</sup> Avenue**  
Upstream of 18 ¼ Ave. stream had good depth (0.4m) in a grassed waterway. The substrate was fine sediments and habitat was the same throughout the survey area. Qualitative habitat score was 30.
- **Segment 2: Unnamed tributary downstream of 18<sup>th</sup> Avenue to confluence with Lightning Creek**  
Large debris piles were observed at the start of the station, indicating the stream experiences pulses of high water volume (i.e. flashy hydrography). The banks were also eroded, which is associated with a flashy system. This segment had good diversity of habitat, width:depth ratio. Limited fine sediments were present in the survey segment. Land use practices upstream are impacting this stream segment. Overall habitat score was 52.

### **Discussion and Designated Use Recommendations**

*Note: Recommendations from this site visit are shown at the top of this memo.*

- **Segment 1: Unnamed tributary from WWTP outfall to 18<sup>th</sup> Avenue.**  
Upstream of 18 ¼ Avenue the unnamed tributary experiences dry periods without flow. Previous site visits conducted in late summer/fall have found no flow in the stream. Nevertheless, when there is flow there is enough water and habitat to support fish, as supported by the most recent fish survey. Five species and twenty two fish were captured despite the difficult sampling conditions, indicating a forage fish community is present seasonally in this segment. Fish were also able to move upstream to the area as indicated by the similar species found at both fish surveys. Fish likely use this section of stream until the water depth becomes too shallow and they move downstream. Habitat has been impacted by agricultural practices as seen by a qualitative habitat score of 30. Downstream of 18 ¼ Avenue the stream has been channelized likely for agricultural purposes. The channelization likely limits how long water is held within the stream and reduces available habitat, making it similar to the upstream portion. For these reasons the designated use for segment 1 could appropriately be limited forage fish; however, an LFF designation may require a Use Attainability Analysis (UAA) and Administrative Code revision. If a UAA found that a warmwater use is attainable if controllable conditions were controlled, then a warmwater use would apply.
- **Segment 2: Unnamed tributary downstream of 18<sup>th</sup> Avenue to confluence with Lightning Creek**  
Since the stream was hydrologically connected at the time and fish were able to move upstream of 18 ¼ Avenue, it is expected that a full fish community would be present given the existing depth and habitat up to 18<sup>th</sup> Avenue where the stream maintains a more of a natural channel, better depth, and habitat. All sections of this stream have been impacted by the agricultural land use, with the upstream sections being most impacted. Despite this impact a fish community has been maintained in the tributary, with a full fish community present at the survey downstream of 17<sup>th</sup> Avenue. Thus the recommended designated use for segment 2 is full fish and aquatic life. While a natural community verification could not be done, the observed fish community is typical of a cool-warm natural community. If land use practices improved, the observed fish community could change and improve. The recommended thermal class at this time is warmwater.

### **Are code changes and/or a Use Attainability Analysis needed?**

Under current conditions, the fish community in Segment 1 is a forage fish community present at least seasonally and reflects what would be expected of an LFF community. If there is desire to further consider whether an LFF classification could be appropriate, it may require a Use attainability analysis (UAA) and a code revision. This may be a low priority because the difference in limits (temperature, etc) between warmwater and LFF is relatively small and is not expected to provide significant relief to the facility. Otherwise code revisions are not needed.

**Attachments**

**Fish Survey Data for Unnamed Tributary 3000244**

Site	Station length (m)	Fish species	Count
1 m upstream of 18 ¼ Avenue	100	Brook stickleback	3
		Central mudminnow	12
		Northern redbelly dace	2
		Finescale dace	1
		Fathead minnow	4
<b>Total</b>			<b>22</b>
120m downstream of 17 <sup>th</sup> Avenue	100	Brook Stickleback	25
		Central Mudminnow	24
		Northern redbelly dace	5
		Finescale dace	1
		Fathead minnow	11
		Creek Chub	50
<b>Total</b>			<b>116</b>

Table 1. Fish survey data for unnamed Tributary to Lightning Creek (WBIC 3000244). Fish surveys were conducted on May 10, 2023.

**Habitat Survey Results for Unnamed Tributary 3000244**

Site	Mean Stream Width (m)	Riparian buffer width	Bank erosion	Pool area	Width:depth ratio	Riffle:rifle or bend:bend ratio	Fine sediments	Cover for fish	Overall score
1 m upstream of 18 ¼ Avenue	3.5	Poor (0)	Good (10)	Poor (0)	Good (10)	Poor (0)	Poor (0)	Good (10)	30
120m downstream of 17 <sup>th</sup> Avenue	3	Fair (5)	Fair (5)	Good (7)	Good (10)	Good (10)	Good (10)	Fair (5)	52

Table 2. Qualitative Habitat Surveys for unnamed Tributary to Lightning Creek (WBIC 3000244) conducted on May 10, 2023. Surveys were done on the same segments as the fish surveys.

**Photos (taken May 10, 2023)**

Photo 1. Unnamed Tributary at 18 ¼ Avenue looking upstream at survey area.



Photo 2. Unnamed Tributary at 18 ¼ Avenue looking downstream.



Photo 3. Unnamed Tributary at 18<sup>th</sup> Avenue looking upstream.



Photo 4. Unnamed Tributary at 18<sup>th</sup> Avenue looking downstream.





Photo 5. Unnamed Tributary at 4<sup>th</sup> Street looking upstream.



Photo 6. Unnamed Tributary at 4<sup>th</sup> Street looking downstream.



Photo 7. Unnamed Tributary at 17<sup>th</sup> Avenue looking upstream.



Photo 8. Unnamed Tributary at 17<sup>th</sup> Avenue looking downstream.



Photo 9. Unnamed Tributary downstream of 17<sup>th</sup> Avenue looking upstream.



Photo 10. Unnamed Tributary downstream of 17<sup>th</sup> Avenue looking downstream.



Photo 11. Unnamed Tributary downstream of 17<sup>th</sup> Avenue at fish survey end looking upstream.



Photo 12. Unnamed Tributary downstream of 17<sup>th</sup> Avenue habitat in fish survey.



Photo 13. Unnamed Tributary downstream of 17<sup>th</sup> Avenue at fish survey start looking upstream.



Photo 14. Unnamed Tributary downstream of 17<sup>th</sup> Avenue at fish survey start looking downstream.

