

DATE: 02-21-2025

TO: Mike Polkinghorn, Limit Calculator; Eric DeVenecia, Compliance Engineer

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

SUBJECT: Burlington Northern-Santa Fe (BNSF), Unnamed tributary (no WBIC) to Nemadji River (WBIC 2835300), Douglas County

Overview of issue

In preparation for reissuance of the Burlington Northern-Santa Fe (BNSF) Railroad permit, staff were requested to do a site visit to determine the appropriate stream classifications for the receiving waters. Stormwater coming into contact with petroleum products is treated by passing through a grit chamber and oil/water separator, and then stored in a concrete lagoon until it is directed to the settling ponds that discharge through Outfall 001. Discharges through Outfall 001 normally occur only 7 months of the year (April through October). BNSF is a noncontinuous discharger, with a maximum annual average flow of 0.576 MGD (not counting days of zero discharge; 1.07 cfs).

BNSF has an underground pipe from their last holding pond that emerges at a concrete outfall with heavy riprap. The outfall discharges to an unnamed tributary (Segment 1) to the Nemadji River (Segment 2, WBIC 2835300). The receiving water is not listed as LAL or LFF in ch. NR 104. However, the 2019 permit limits previously considered the immediate receiving water to be a wastewater effluent channel for 0.2 miles, and therefore based limits on LAL. Downstream protection limits for phosphorus were not included in the previous permit for the Nemadji River due to dilution.

The main objective of this site visit was to determine the appropriate stream classification for the receiving water. This includes the following considerations:

- Whether the immediate receiving water fits the codified definition of “wastewater effluent channel” in ch. NR 104 and LAL limits are thereby appropriate.
- If not, whether the immediate receiving water is not a stream but is a non-channelized wetland that does not support fish, and might therefore fit an LAL classification under ch. NR 104.
- Whether the receiving water has an existing fish community, and if so, which classification is appropriate; or if not, whether it should be able to support fish based on flow and habitat (i.e. what is its “attainable” designated use).

Summary of previous and proposed stream class recommendations

- **Segment 1 (most upstream): Unnamed tributary (no WBIC) from the outfall to its confluence with the Nemadji River**
 - *Currently codified designated use:* Not listed individually as LAL/LFF in ch. NR 104 and is not classified as a Trout water, so defaults to warmwater
 - *Classification used for previous permit issuance:* LAL
 - *Previous stream class recommendations:* NA
 - *Modeled Natural Community:* NA
 - ***New recommended Natural Community and Designated Use:*** Cool-warm headwater Natural Community, Warmwater Designated Use

- **Segment 2: Nemadji River (WBIC 2835300)**
 - *Currently codified designated use:* Not listed as LAL/LFF in ch. NR 104, and is not classified as a Trout water, so defaults to warmwater
 - *Classification used for previous permit issuance:* Warmwater
 - *Previous stream class recommendations:* NA
 - *Modeled Natural Community:* Cool-Warm Mainstem
 - *New recommended NC & DU:* This was not re-evaluated.

Site overview maps

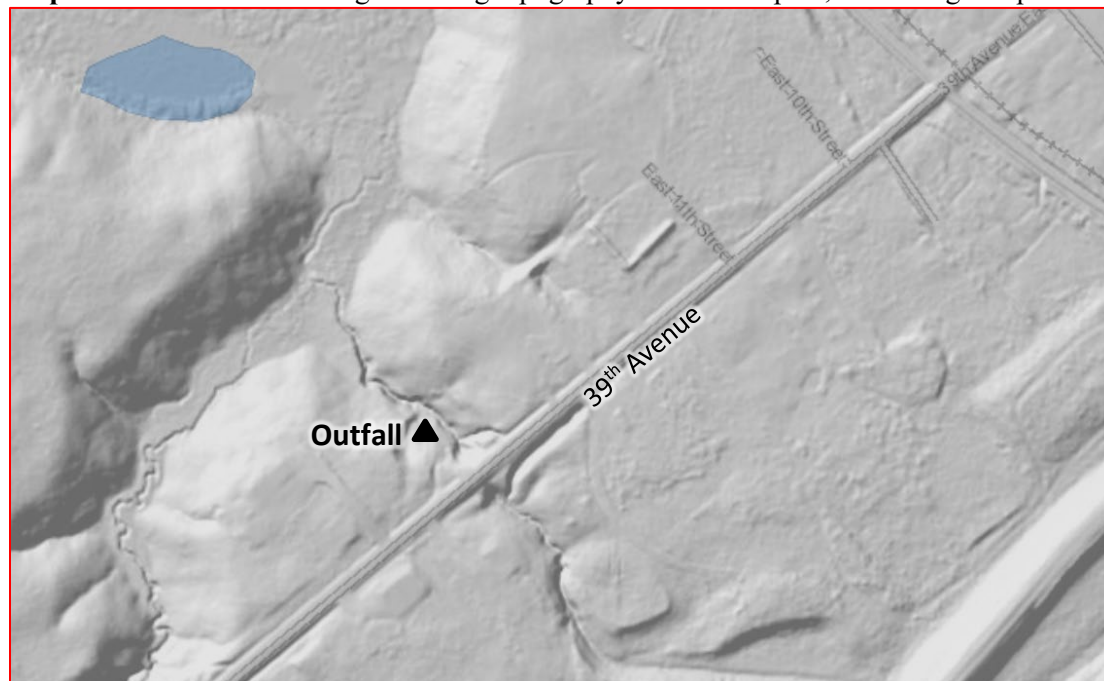
Map 1. Location of BNSF taconite facility and Nemadji River. Effluent runs through a pipe from the facility to the outfall (black triangle) north of 39th Avenue.



Map 2. Close up of receiving waterbody: unnamed tributary (noWBIC) to the Nemadji River. Segment 1 (yellow line) flows from the outfall through a wetland and floodplain complex to the Nemadji River. A fish survey was done from the wetland transition (Fish Survey Start, blue dot) to approximately 20m downstream of the outfall (Fish Survey End, blue dot).



Map 3. LiDAR hillshade image showing topography of the flow path, which begins upstream of the outfall.



Site observations

Site visits were conducted on September 20, 2023, and June 12, 2024. The summer of 2023 was exceptionally dry, with the area in an extreme drought. Because of the drought, a second site visit was requested during more normal flow conditions to evaluate the fish community. The stream was at normal flows during the 2024 site visit.

- Segment 1: *Unnamed Tributary from BNSF outfall to its confluence with the Nemadji River*
 - The unnamed tributary is a natural stream that begins upstream (south) of the outfall and flows under 39th Avenue through a perched culvert with large riprap. Near the road, the stream has significant debris. Downstream of the influence of the road crossing, the stream narrows to under 1m in width. The stream is small with a defined channel and a forested riparian corridor. Where the outfall joins the stream, the tributary increases in size significantly to 2m wide. Downstream of the outfall, the stream has a natural channel with a fairly steep gradient. The main substrates are clay-sand with areas of cobble and gravel. Closer to the wetland the stream became less steep and had predominantly fine substrates.
 - The unnamed tributary maintains its channel and receives other smaller tributaries as it moves through the wetland floodplain. Tag alder was the dominant wetland species on the banks of the tributary in the upper portion of the wetland. The tributary maintains its channel and does not switch to diffuse flow as it flows into the larger wetland floodplain close to the Nemadji River. The wetland vegetation shifted to cattails and the stream had approximately 1 foot of depth in September 2023 (i.e. there was adequate depth/habitat even in a dry year), so during a normal precipitation year adequate habitat is also expected and was evidenced by the healthy fish population upstream.

Fish and habitat survey results

A fish survey and qualitative habitat survey were conducted on June 12, 2024 using a single backpack shocker (Table 1). The goal of the survey was primarily to determine whether a fish community was present to inform whether an LAL classification was appropriate, and if a fish community is present, to determine the appropriate stream classification.

- Segment 1: *Unnamed Tributary from BNSF outfall to its confluence with the Nemadji River*
 - The 100m survey was conducted from ~120m downstream of the outfall to 20 m below the outfall. The survey found 168 fish and 12 species (Table 1). Five intermediate tolerant species were present (the others were tolerant species). The fish community was verified to be a cool-warm headwater natural community. This natural community fits the small stream Fish Index of Biotic Integrity, and the survey has an IBI score of 50 (fair). Bank erosion was present but was mitigated by the intact riparian buffer. Bank erosion is likely caused by flashy hydrology common to the area and the gradient. Sediments were predominantly fines, with areas of cobble and gravel. Wood and some boulders provided fish cover, and a good number of riffles/bends were present. Width to depth ratio was good. Overall, the qualitative habitat score for the tributary was 53, which is good (Table 2).

Table 1. Fish survey data for unnamed Tributary to Nemadji River (no WBIC). Fish survey was conducted on June 12, 2024.

Fish Survey Data for Unnamed Tributary to Nemadji River					
Site	Station length (m)	Fish species	Count	Length	Intermediate Tolerance
~120m downstream of BNSF outfall	100	Creek chub	6		
		Central mudminnow	31		
		Brook stickleback	9		
		Fathead minnow	64		
		Northern redbelly dace	31		X
		White sucker	16		
		Black bullhead	1	5 in.	
		Common shiner	6		X
		Emerald shiner	1		X
		Golden shiner	1		
		Tadpole madtom	1		X
		Finescale dace	1		X
		Total		168	
Index of Biotic Integrity (IBI) Score			50 (fair)		

Table 2. Qualitative Habitat Survey for unnamed Tributary to Nemadji River (no WBIC) conducted on June 12, 2024. Survey was done on the same segment as the fish survey.

Habitat Survey Results for Unnamed Tributary to Nemadji River									
Site	Mean Stream Width (m)	Riparian buffer width	Bank erosion	Pool area	Width:depth ratio	Riffle:riffle or bend:bend ratio	Fine sediments	Cover for fish	Overall score
~120m downstream of BNSF outfall	2	Excellent (15)	Fair (5)	Fair (3)	Excellent (15)	Good (10)	Poor (0)	Fair (5)	53

Determination of whether it is a wastewater effluent channel

In addition to the site visit, we reviewed aerial photos and LiDAR to determine whether the immediate receiving water fits the definition of a wastewater effluent channel:

Ch. NR 104.02(1)(d): “*Wastewater effluent channels*. This classification includes discharge conveyances constructed primarily for the purpose of transporting wastes from a facility to a point of discharge. Drainage ditches (including those established under ch. 88, Stats.) constructed primarily for the purposes of relieving excess waters on agricultural lands shall not be construed as effluent channels. Modifications made to natural watercourses receiving wastewater effluents for the purpose of increasing or enhancing the natural flow characteristics of the stream shall not be classified as effluent channels.”

From our review, the immediate receiving water does not fit this definition, for two reasons:

- The site visits found that there does not appear to be a constructed channel, as the waterway is meandering and has diverse habitats, indicating a natural channel. The unnamed tributary continued to

maintain a defined channel into the cattail wetland, with evidence in the aerial images that the tributary does maintain a naturally meandering channel into open water within the wetland that is connected via a larger channel to the Nemadji River.

- The site visits also found a natural channel above the effluent outfall and a culvert under 39th Avenue.
- The topographic map and LiDAR image show that based on the land contours, there was naturally a low-lying flow path in the location of the discharge that would have been a natural watercourse during periods of precipitation leading to the seasonally-flooded wetland floodplain of the river.

Discussion and Designated Use Recommendations

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

- Segment 1 (most upstream): *Unnamed Tributary from BNSF outfall to its confluence with the Nemadji River*
 - The immediate receiving water is a natural stream. The fish survey in 2024 found 168 fish and 12 species, indicating an existing full forage fish community is supported in the stream. The fish captured are characteristic of a cool-warm headwater natural community, which falls within the warmwater designated use.
 - An LAL classification is not appropriate for the immediate receiving water or the downstream wetland floodplain section of the stream. The LAL classification is described under chs. NR 102.04(3)(e) and 104.02(3)(b)1., and is applied to wastewater effluent channels, diffused surface waters, wetlands (non-channelized), and other waters that do not support fish.
 - The stream does not fit the “wastewater effluent channel” definition, as discussed above.
 - The stream does not fit the “diffused surface water” definition under ch. NR 104.02(1)(b) because it maintains flow outside of periods of precipitation or snowmelt.
 - The stream maintains its channel through the wetland rather than becoming a diffused flow path through the wetland. Therefore, a designated use appropriate to the stream characteristics is applied rather than the wetland classification. The wetland floodplain portion of the stream had sufficient depth in 2023, which was a drought year. At normal flows the wetland portion of the stream would have increased depth and more habitat available than was observed in 2023.
 - The stream supports a full fish and aquatic life community, so does not otherwise fit LAL, which is applied to streams that cannot support a fish community.
 - The tributary also does not fit the LFF classification because there is an existing full fish and aquatic life community. Under the Clean Water Act, a designated use cannot be assigned that is lower than the “existing” aquatic life community (an “existing use” is any use attained in a waterbody at any point after 1975).
 - Although the downstream portion that flows through the wetland was not surveyed, the stream maintains a defined channel through the floodplain wetland and connects to the Nemadji River which has a warmwater sport fishery. Therefore the whole length of segment 1 is expected to support a full fish community. The recommended designated use is for a full fish and aquatic life community, warmwater designated use.

Are code changes needed?

No. As discussed above, the tributary does not fit the LAL classification, as the tributary does not fit the definition of wastewater effluent channel or diffuse surface water, and the stream channel continues through the wetland providing access and habitat for fish. There is adequate flow and habitat to support fish, as evidenced by an existing full fish and aquatic life cool-warm headwater community. Therefore it also does not fit the LFF classification. Since it is not currently listed in the Administrative Code as LAL or LFF (though limits had previously been based on LAL), there is no LAL/LFF code listing to remove from code.

Attachments

Photo 1. Unnamed Tributary culvert downstream of 39th Avenue (2024).



Photo 2. Unnamed Tributary upstream of outfall looking upstream (2024).



Photo 3. BNSF Outfall (2023).



Photo 4. Unnamed Tributary downstream of outfall looking upstream (2024).



Photo 5. Unnamed Tributary at fish survey end looking upstream (2024).



Photo 6. Habitat in fish survey (2024).



Photo 7. Unnamed Tributary looking upstream in fish survey (2024).



Photo 8. Wetland Complex looking upstream at another tributary (2023).



Photo 9. Unnamed Tributary in wetland looking downstream (2023).



Photo 10. Unnamed Tributary channel in wetland floodplain (2023).



Photo 11. Transition to cattail wetland floodplain looking downstream (2023).



Photo 12. Unnamed Tributary channel in cattail floodplain (2023).



CORRESPONDENCE/MEMORANDUM

State of Wisconsin

STREAM FISH SURVEY FORM

Stream Name: <u>Unnamed Tributary to Nemadji</u>	☒ Backpack ☐ Stream shocker	Date: <u>6/12/29</u>
WBIC: <u>NA</u>	Current ☐ DC ☒ PDC	Start time: <u>1231</u>
SWIMS#: <u>NA</u>	Volts: <u>89</u> Pulse Rate: <u>80</u>	End time: <u>1311</u>
Station Name/Description: <u>DS of BNSF outfall</u>	Amps: <u>1.1</u> Duty Cycle: <u>10</u>	Total time: <u>40</u>
County: <u>Douglas</u>	No. of dippers/anodes: <u>1</u>	Distance shocked (m): <u>100</u>
Start Lat: <u>46.6837090</u>	Water temp (C or F): <u>14.6</u>	Mean width (m): <u>2</u>
Start Long: <u>-92.0369859</u>	D.O. (mg/l): <u>8.9</u> <u>90.8%</u>	Water Level: <u>-</u>
End Lat: <u>46.68313</u>	Conductivity (umhos/cm): <u>542</u>	high ☐ norm ☒ low ☐
End Long: <u>-92.03614</u>	pH: <u>7.7</u>	
Collectors: <u>Madeline Roberts</u>	Transparency (cm): <u>>120</u>	
<u>Jon Christ</u>	Flow (cfs): <u>-</u>	
	Field Sample i.d. <u>-</u>	
	Clarity: clear ☒ turbid ☐ stained ☐	
Comments: <u>Stream visible & Flow US 1 on Fall #1. School of fish visible in stream just DS of E. Channel stream entering waterway > 50 individuals in</u>		
AIS observed: <u>School</u>		
Crayfish observed: <u>-</u>		
Species/Count (list lengths for sportfish)		
1	Mud minnow. <u> </u>	
2		
3	Fathead minnow. <u> </u>	
4		
5	Brook stickleback. <u> </u>	
6		
7	Creek Chub <u> </u>	
8		
9	N. Darter <u> </u>	
10		
11	White sucker <u> </u>	
12		
13	Black Bullhead 5"	
14		
15	Common shiner <u> </u>	
16		
17	Emerald shiner. <u> </u>	
18		
19	Golden shiner <u> </u>	
20		
21	Tadpole, mid form <u> </u>	
22		
23	Finless Dace <u> </u>	
24		
25	12 Species of fish	
26	Stream channel very defined good r. fl. run, bend structure	
27	pools were present, probably 4-5 pools, good amount of wood in stream	
28	Banks very eroded, incised channel r. fl. w/ gravel / visible boulder	
29	Stream margins clay, pools clay / silty	
30	Fin erosion. mud minnow. <u> </u>	max. Def. by 11
31	fathead <u> </u>	mud minnow skin in action 1
32		

fish already included in tallies above

Field Parameters US of Effluent / outfall #1

Temp. 12.0

DO 9.4

% sat. 89.4 %

Cond 740

pH 7.9

Wadable Stream Qualitative Fish Habitat Rating for Streams < 10 m wide

Form 3600-532A (R 6/07)

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Instructions: Bold fields must be completed. Record all measurements in metric units.

Station Summary					
Stream Name <i>Unnamed Trib to Nemadji BNSF</i>		Waterbody ID Code <i>NA</i>	SWIMS Station ID <i>NA</i>	FH Database ID	
Date (MMDDYYYY) <i>06/12/2029</i>	Station Name <i>Unnamed</i>				
Latitude - Longitude Determination Method Used <i>GPS W6584</i>					Datum Used
Start Latitude	Start Longitude	End Latitude <i>46.68313</i>	End Longitude <i>-92.03614</i>	County <i>Douglas</i>	
Water Characteristics					
Time (24-hr clock) <i>1300</i>	Air Temperature (C)	Water Temperature (C) <i>14.6</i>	Conductivity (µs/cm) <i>542</i>	Transparency (cm) <i>>120</i>	
Dissolved Oxygen (mg/l) <i>8.9</i>		Dissolved Oxygen % Saturation <i>90.8</i>		pH <i>7.7</i>	
Flow (m³/sec)	Water Level (check one - measure distance if Above or Below Normal): ☒ Normal ☐ Below: _____ (m) ☐ Above: _____ (m)			Water Clarity: ☒ Clear ☐ Turbid ☐ Stained	
Channel and Basin Characteristics					
Mean Stream Width (m) <i>2</i>		Station Length (m) <i>100</i>			
Channel Condition: (check one)	☒ Natural ☐ > 20-year-old Channelization ☐ 10- to 20-year-old Channelization ☐ < 10-year-old Channelization ☐ Concrete Channel				
Percent Channelization	Sinuosity	Gradient (m/km)	Stream Order	Basin Area (km²)	

Comments / Notes

Water clear & flows higher than 2023. These are normal flows - water in channel bank to bank. Fresh erosion present on banks. Stream incised, & had better floodplain connection in wetland area. Better depth overall this year vs. 2023 w/ normal flows. Some wood shifted, especially at survey end point.

Upstream of outfall, a large perched culvert present under 39th Ave. Culvert was flowing. Lots of riprap at culvert & debris downstream of culvert. BNSF outfall flow higher this year. Effluent easily visible between riprap closer to stream.

Wadable Stream Qualitative Fish Habitat Rating for Streams < 10 m wide

Form 3600-532A (R 6/07)

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Rating Item	Excellent	Good	Fair	Poor	Score
Riparian Buffer Width (m) Width of contiguous undisturbed land uses; meadow, shrubs, woodland, wetland, exposed rock	Riparian zone well protected; buffer wide (> 10.0 m) 15	Riparian zone protected, but buffer width moderate (5.0 - 10.0 m) 10	Riparian zone moderately disturbed, buffer narrow (1.0 - 4.9 m) 5	Most of the riparian zone disturbed, buffer very narrow or absent (< 1.0 m) 0	15
Bank Erosion Width of bare soil on bank, along transects	No significant bank erosion; < 0.20 m of bank is bare soil 15	Limited erosion; 0.20 - 0.50 m of bank is bare soil 10	Moderate erosion; 0.51 - 1.0 m of bank is bare soil 5	Extensive erosion; > 1.0 m of bank is bare soil 0	5
Pool Area % of stream length in pools	Pools common; wide, deep, slow velocity habitat, balanced by other habitats; 40 to 60% of station 10	Pools present; not frequent or over-abundant; 30 to 39% or 61 to 70% of station 7	Pools present, but either rare or overly dominant, few other habitats present; 10 to 29% or 71 to 90% of station 3	Pools either absent or dominant, not balanced by other habitats; < 10% or > 90% of station 0	3
Width:Depth Ratio Average stream width divided by average thalweg depth in runs and pools	Streams very deep and narrow; width/depth ≤ 7 15	Stream relatively deep and narrow; width/depth 8-15 10	Stream moderately deep and narrow; width/depth 16-25 5	Stream relatively wide and shallow; width/depth > 25 0	15
Riffle:Riffle or Bend:Bend Ratio Average distance between riffles or bends divided by average stream width	Diverse habitats; meandering stream with deep bends and riffles common; ratio < 10 15	Diverse habitats; bends and riffles present, but not abundant; ratio 10 to 14 10	Habitat diversity low; occasional riffles or bends, ratio 15 to 25 5	Habitat monotonous; riffles or bends rare; generally continuous run habitat; ratio > 25 0	10
Fine Sediments % of the substrate that is < 2 mm (sand, silt, or clay)	Fines rare or absent, < 10% of the stream bed 15	Fines present but limited, generally in stream margins or pools; 10 to 20% of stream bed 10	Fines common in mid-channel areas, present in riffles and extensive in pools; 21 to 60% 5	Fines extensive in all habitats; > 60% of stream bed covered 0	0
Cover for Fish % of the stream area with cover	Cover/shelter for fish abundant; > 15% of stream 15	Cover common, but not extensive; 10 - 15% of stream 10	Occasional cover, limited to one or two areas; 5 - 9% of stream 5	Cover rare or absent; limited to < 5% of stream 0	5
Total Score					53