Addendum 2 – Thermal (Temperature) Recommendations for Norway Sanitary District #1 Wastewater Treatment Facility
WPDES Permit No WI-0031470-07
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Chapter NR 102, Subchapter II of the Wisconsin Administrative Code establishes water quality standards for temperature, in order to protect fish and other aquatic life from lethal and sub-lethal effects. Chapter NR 106, Subchapter V, specifies procedures for calculating water quality based effluent limitations for temperature. These rule changes became effective on October 1st, 2010.

In accordance with 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 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.

For the Norway Sanitary District, , Qs (receiving water flow) is 25% of the 7-day average, 10 year low flow (7Q10) of 0 cfs.

In the table below, the two columns to the far right provide weekly average and daily maximum temperature limitations for the corresponding months listed in the column to the far left. Regardless of the calculated value, no daily maximum temperature limit may exceed 120 degrees F in order to protect public welfare, unless the permittee can demonstrate that the discharge does not pose a potential for human scalding.

Temperature limits for receiving waters with unidirectional flow

(calculation using default ambient temperature data)

Facility:	Norway SD 1	**Data Range**	**7Q10 or 4Q3:**	0	cfs
Outfall(s):	001	**Start:** 01/01/10	**Dilution:**	25%	
Date Prepared:	3-Dec-14	**End:** 10/31/14	**f:**	0	
Design Flow (Qe):	1.6 mgd		**Stream type:**	Small warm water sport or forage fish community	
Region:	**SER**		**Qs:Qe ratio:**	0.0 :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	0.00	1.344	1.910	**51**	53	**51**	NA	**49**	76
FEB	34	50	76	0.00	1.559	2.007	49	60	49	NA	50	76
MAR	38	52	77	0.00	2.015	2.433	**55**	56	51	NA	**52**	77
APR	48	55	79	0.00	2.813	4.474	**55**	57	53	NA	**55**	79
MAY	58	65	82	0.00	1.711	2.626	63	66	60	NA	65	82
JUN	66	76	84	0.00	2.169	2.991	68	69	65	NA	76	84
JUL	69	81	85	0.00	2.240	3.175	71	73	70	NA	81	85
AUG	67	81	84	0.00	1.230	1.621	71	73	70	NA	81	84
SEP	60	73	82	0.00	1.134	1.688	71	73	70	NA	73	82
OCT	50	61	80	0.00	0.808	0.859	**65**	67	**65**	NA	**61**	80
NOV	40	49	77	0.00	1.080	1.669	**59**	61	**59**	62	**49**	77
DEC	35	49	76	0.00	0.937	1.454	**57**	59	**55**	59	**49**	76

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

Key –

Ta (default) = Default ambient monthly temperature of the receiving water. These ambient temperatures are specific to each calendar month (from NR 102, Table 2, small warm water stream ('Warm – Small' on the table))

Sub-lethal WQC = sub-lethal (weekly) water quality criteria for the receiving water. These criteria are specific to each calendar month (from NR 102, Table 2, small warm water stream ('Warm – Small' on the table))

Acute WQC = acute (daily maximum) water quality criterion for the receiving water. These criteria are specific to each calendar month (from NR 102, Table 2, small warm water stream ('Warm – Small' on the table))

Qesl = highest seven day rolling average flow rate for the Norway SD #1 discharge; based on effluent flow data from January 2010 through October 2014. These averages are specific to the calendar month.

Qea = highest daily flow rate for the Norway SD #1 discharge; based on effluent flow data from January 2010 through October 2014. These averages are specific to the calendar month.

Representative Highest Monthly Temperatures – these were determined from effluent temperature data collected by Norway SD #1 from January 2011 through October 2014. The daily maximum temperatures are determined from the highest daily temperature taken for the corresponding month. The weekly average is from the highest weekly average of daily maximum temperatures taken for the calendar month. A week is defined in NR 106.52(12) as a calendar week (Sunday through Saturday).

Weekly Average Effluent Limitation = provides the limitation for the 7-day average of daily maximum temperature. The weekly maximum temperatures for the highlighted months (October through January) exceed the calculated sublethal limits.

Daily Maximum Temperature Limitation: Limitation applicable to daily maximum temperature. This limit applies to the maximum temperature determined by continuous monitoring, or the maximum of several discrete temperatures taken by discrete monitoring, over a 24 hour period.

Limit Recommendations: **The table above shows that weekly average effluent limitations were exceeded in the months of January, March, April, October, November, and December.** This indicates the need for a weekly (sub-lethal) limit for those months unless there is information from the permittee to support dissipative cooling of the waste stream. Norway SD #1 submitted a dissipative cooling study to the department in November 2014 which included temperature and conductivity measurements made 11/20/2014 at a number of strategic locations in the immediate receiving water and further downstream. The study shows that:

- Roughly 40% of the heat differential was dissipated within 20 feet downstream of Norway SD #1's discharge
- The sub lethal criteria of 49 degrees was met within 20 feet downstream of Norway SD #1's discharge
- Temperature and conductance data submitted shows that the middle and far-shore (from the outfall) of the creek provides a generally undisturbed zone of free passage for organisms from the outfall's confluence with the drainage canal

The above conditions are supportive of rapid heat dissipation, therefore no temperature limits are recommended for Norway SD #1's discharge to the Waubesee Lake Drainage Canal. Daily maximum effluent temperature monitoring for 12 consecutive months during the fourth year of the next permit term is recommended. Monitoring during this time will provide the department with representative data needed for a statistical evaluation of effluent temperature at that time.