

**North Dakota Department of Environmental Quality Public Notice
Reissue of an NDPDES Permit**

Public Notice Date: 8/14/2019

Public Notice Number: ND-2019-021

Purpose of Public Notice

The Department intends to reissue the following North Dakota Pollutant Discharge Elimination System (NDPDES) Discharge Permit under the authority of Section 61-28-04 of the North Dakota Century Code.

Permit Information

Application Date: 1/30/2019

Application Number: ND0023175

Applicant Name: Dickinson City Of

Mailing Address: 99 2nd St E, Dickinson, ND 58601-5222

Telephone Number: 701.456.7022

Proposed Permit Expiration Date: 9/30/2024

Facility Description

The reapplication is for the Dickinson Water Reclamation Facility which serves the City of Dickinson. The facility is located in NE1/4 NE1/4 Section 13 and SE1/4 SE1/4 Section 12, Township 139 North, Range 96 West. Any discharge would be through Outfall 005 to the Heart River, a Class IA stream.

Tentative Determinations

Proposed effluent limitations and other permit conditions have been made by the Department. They assure that State Water Quality Standards and applicable provisions of the FWPCAA will be protected.

Information Requests and Public Comments

Copies of the application, draft permit, and related documents are available for review. Comments or requests should be directed to the ND Dept of Env Quality, Div of Water Quality, 918 East Divide Ave, Bismarck ND 58501-1947 or by calling 701.328.5210.

All comments received by September 13, 2019 will be considered prior to finalizing the permit. If there is significant interest, a public hearing will be scheduled. Otherwise, the Department will issue the final permit within sixty (60) days of this notice. If you require special facilities or assistance relating to a disability, call TDD at 1.800.366.6868.

DRAFT

Permit No: ND0023175
Effective Date: October 1, 2019
Expiration Date: September 30, 2024

AUTHORIZATION TO DISCHARGE UNDER THE
NORTH DAKOTA POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with Chapter 33.1-16-01 of the North Dakota Department of Environmental Quality rules as promulgated under Chapter 61-28 (North Dakota Water Pollution Control Act) of the North Dakota Century Code,

the City of Dickinson

is authorized to discharge from its Water Reclamation Facility

to the Heart River

provided all the conditions of this permit are met.

This permit and the authorization to discharge shall expire at midnight,
September 30, 2024.

Signed this _____ day of _____, _____.

Karl H. Rockeman, P.E.
Director
Division of Water Quality

BP 2019.05.29

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DEFINITIONS Standard Permit BP 2019.05.29

1. **“Act”** means the Clean Water Act.
2. **“Average monthly discharge limitation”** means the highest allowable average of “daily discharges” over a calendar month, calculated as the sum of all “daily discharges” measured during a calendar month divided by the number of “daily discharges” measured during that month.
3. **“Average weekly discharge limitation”** means the highest allowable average of “daily discharges” over a calendar week, calculated as the sum of all “daily discharges” measured during a calendar week divided by the number of “daily discharges” measured during that week.
4. **“Best management practices”** (BMPs) means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the United States. BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage areas.
5. **“Bypass”** means the intentional diversion of waste streams from any portion of a treatment facility.
6. **“Composite”** sample means a combination of at least 4 discrete sample aliquots, collected over periodic intervals from the same location, during the operating hours of a facility not to exceed a 24-hour period. The sample aliquots must be collected and stored in accordance with procedures prescribed in the most recent edition of Standard Methods for the Examination of Water and Wastewater.
7. **“Daily discharge”** means the discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the “daily discharge” is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the “daily discharge” is calculated as the average measurement of the pollutant over the day.
8. **“Department”** means the North Dakota Department of Environmental Quality, Division of Water Quality.
9. **“DMR”** means discharge monitoring report.
10. **“EPA”** means the United States Environmental Protection Agency.
11. **“Geometric mean”** means the n^{th} root of a product of n factors, or the antilogarithm of the arithmetic mean of the logarithms of the individual sample values.
12. **“Grab”** for monitoring requirements, means a single "dip and take" sample collected at a representative point in the discharge stream.
13. **“Instantaneous”** for monitoring requirements, means a single reading, observation, or measurement. If more than one sample is taken during any calendar day, each result obtained shall be considered.
14. **“Maximum daily discharge limitation”** means the highest allowable “daily discharge.”
15. **“Salmonid”** means of, belonging to, or characteristic of the family Salmonidae, which includes the salmon, trout, and whitefish.

16. **“Sanitary Sewer Overflows (SSO)”** means untreated or partially treated sewage overflows from a sanitary sewer collection system.
17. **“Severe property damage”** means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.
18. **“Total drain”** means the total volume of effluent discharged.
19. **“Upset”** means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

DEFINITIONS Whole Effluent Toxicity (WET) BP 2017.04.06

20. **“Acute toxic unit”** (“TUa”) is a measure of acute toxicity. TUa is the reciprocal of the effluent concentration that causes 50 percent of the organisms to die by the end on the acute exposure period (i.e., $100/\text{“LC50”}$).
21. **“Chronic toxic unit”** (“TUc”) is a measure of chronic toxicity. TUc is the reciprocal of the effluent concentration that causes no observable effect on the test organisms by the end of the chronic exposure period (i.e., $100/\text{“IC25”}$).
22. **“Inhibition concentration”**, (“IC”), is a point estimate of the toxicant concentration that causes a given percent reduction (p) in a non-quantal biological measurement (e.g., reproduction or growth) calculated from a continuous model (e.g., Interpolation Method).
23. **“LC50”** means the concentration of toxicant (e.g., effluent) which is lethal to 50 percent of the organisms exposed in the time period prescribed by the test.
24. **“No observed effect concentration”**, (“NOEC”), is the highest concentration of toxicant (e.g., effluent) to which organisms are exposed in a chronic toxicity test [full life-cycle or partial life-cycle (short term) test], that causes no observable adverse effects on the test organisms (i.e., the highest concentration of effluent in which the values for the observed responses are not statistically significantly different from the controls).

OUTFALL DESCRIPTION

Outfall 002. Active. Final.			
Latitude: 46.867623	Longitude: -102.735242	County: Stark	
Township: 139N	Range: 96W	Section: 12	QQ: DBB
Receiving Stream: Heart River		Classification: Class IA	
Outfall Description: Effluent limitations for lagoon cell 3. Water is kept in the cell to suppress dust from the cell.			

Outfall 003. Active. Final.			
Latitude: 46.865267	Longitude: -102.730821	County: Stark	
Township: 139N	Range: 96W	Section: 12	QQ: DAC
Receiving Stream: Heart River		Classification: Class IA	
Outfall Description: Effluent limitations for lagoon cell 4. Water from the Water Reclamation Facility is sent to cell 4 for beneficial reuse storage. This point could also include effluent from lagoon cell 3.			

Outfall 005. Active. Final.			
Latitude: 46.862811	Longitude: -102.725662	County: Stark	
Township: 139N	Range: 95W	Section: 7	QQ: CCC
Receiving Stream: Heart River		Classification: Class IA	
Outfall Description: Treated effluent flows as a continuous discharge from the Water Reclamation Facility.			

Outfall 006. Active. Internal.			
Latitude: 46.860456		Longitude: -102.729097	
County: Stark			
Township: 139N		Range: 96W	
Section: 13		QQ: AA	
Receiving Stream: Heart River		Classification: Class IA	
Outfall Description: This is an interior point that is a sampling site for influent entering the Water Reclamation Facility.			

PERMIT SUBMITTALS SUMMARY

Coverage Point	Submittal	Monitoring Period	Submittal Frequency	First Submittal Date
005A	Discharge Monitoring Report	1/month	1/month	November 30, 2019
006A	Discharge Monitoring Report	1/month	1/month	November 30, 2019
005W	Discharge Monitoring Report	1/quarter	1/quarter	January 31, 2020
005Q	Discharge Monitoring Report	1/year	1/year	September 30, 2020
006Q	Discharge Monitoring Report	1/year	1/year	September 30, 2020
MMP	Mercury Pollutant Minimization Plan	None	1/permit cycle	April 30, 2020
Application Renewal	NPDES Application Renewal	None	1/permit cycle	March 31, 2024

SPECIAL CONDITIONS**Mercury Pollutant Minimization Plan**

The permittee is required to complete and submit a Mercury Pollutant Minimization Plan (MMP) to the North Dakota Department of Health (department) as detailed in this section. If it has previously submitted a MMP, the permittee must update and submit the MMP to the department. The purpose of the MMP is to evaluate collection and treatment systems to determine possible sources of mercury as well as potential mercury reduction options. Guidelines for developing a MMP are detailed in this section.

The permittee shall submit a Pollutant Minimization Plan within 180 days of permit issuance. At a minimum, the MMP must include the following:

- a) A summary of mercury influent and effluent concentrations and biosolids monitoring data using the most recent five years of monitoring data, if available.
- b) Identification of existing and potential sources of mercury concentrations and/or loading to the wastewater treatment facility (WWTF). You should consider residential, institutional, municipal, and commercial sources – such as dental clinics, hospitals, medical clinics, nursing homes, schools, and industries – that have the potential to contribute mercury to the WWTF. You also should consider other influent sources of mercury, such as stormwater inputs, ground water inflow and infiltration (I/I), and waste streams and sewer tributaries to the WWTF.
- c) An evaluation of past and present WWTF operations that maximize mercury removal.
- d) A summary of mercury reduction activities implemented during the last five years.
- e) A plan to implement mercury management and reduction measures during the next five years.

The permittee shall sample effluent for dissolved mercury throughout the life of this permit in addition to the sampling required by this permit. Effluent samples shall be collected annually from outfall 005. Effluent must be sampled prior to discharging from the WWTF and before entering waters of the state. The sampling method shall be a concurrent grab sample. Dissolved mercury shall be analyzed using an EPA approved mercury analysis method. Samples may be taken at any time during the calendar year. A trip blank shall be collected and analyzed for each sampling event. Sample results shall be reported on a custom supplemental form provided by the department. The custom supplemental form must be submitted with the DMR for the month in which the sample was collected.

Outfall 002 and 003

No discharge shall occur from outfall 002 or outfall 003.

I. LIMITATIONS AND MONITORING REQUIREMENTS**A. Discharge Authorization**

1. During the effective period of this permit, the permittee is authorized to discharge pollutants from the outfalls as specified to the following: **Heart River**.
2. No discharge shall occur from outfall 002 or outfall 003.
3. This permit authorizes the discharge of only those pollutants resulting from facility processes, waste streams, and operations that have been clearly identified in the permit application process.

B. Influent Monitoring

1. The permittee must monitor influent as specified below:

Influent Monitoring Requirements Outfall 006		
Parameter	Monitoring Requirements	
	Sample Frequency	Sample Type
Biochemical Oxygen Demand (BOD ₅)	1/week	Composite
Total Suspended Solids (TSS)	1/week	Composite
pH	1/week	Instantaneous
Ammonia as N	1/week	Composite
Trace Elements (40 CFR 122 Appendix D, Table III) ^a	1/quarter	Composite
^a Refer to Part V(F) for the list of parameters that must be analyzed as part of the trace elements sample		

C. Effluent Limitations and Monitoring

1. The permittee must limit and monitor all discharges as specified below:

OUTFALL 005:

Effluent Limitations and Monitoring Requirements Outfall 005					
Parameter	Effluent Limitations			Monitoring Requirements	
	30 Consecutive Day Average	7 Consecutive Day Average	Daily Maximum	Sample Frequency	Sample Type
Temperature (°C)	N/A	N/A	**	1/day	Grab
Stream Flow (cfs)	N/A	N/A	N/A	1/day	Instantaneous
Biochemical Oxygen Demand (BOD ₅)	25 mg/L	45 mg/L	N/A	3/week	Composite
Total Suspended Solids (TSS)	30 mg/L	45 mg/L	N/A	3/week	Composite
pH ^a	Between 6.5 and 9.0 s.u.			1/day	Instantaneous
<i>E. Coli</i> ^b	126/100 mL	N/A	409/100 mL	3/week	Grab
Nitrogen, Total ^c	Average for the month	N/A	Monitor only (mg/L)	1/month	Composite
Nitrogen, Total ^c	Average for the month	N/A	Monitor only (lb/day)	1/month	Calculated
Ammonia as N ^d	Refer to the Ammonia table below			3/week	Composite
Phosphorus, Total (as P)	Average for the month	N/A	Monitor only (mg/L)	1/month	Composite
Phosphorus, Total (as P)	Average for the month	N/A	Monitor only (lb/day)	1/month	Calculated
Oil & Grease – Visual ^e	N/A	N/A	N/A	1/day	Visual
Oil & Grease ^e	*	*	10 mg/L	Conditional	Grab
Flow Effluent (MGD)	*	*	*	1/day	Instantaneous
Drain Total (MG)	N/A	N/A	N/A	1/month	Calculated
Acute Whole Effluent Toxicity (WET) ^f	Refer to WET requirements in Part I(E)(1)			1/quarter	Grab
Chronic Whole Effluent Toxicity (WET) ^g	Refer to WET requirements in Part I(E)(2)			1/quarter	Composite
Trace Elements (App D; Table III) ^h	Refer to Part V(F)			1/quarter	Composite
Notes:					

Effluent Limitations and Monitoring Requirements Outfall 005	
a.	The pH, an instantaneous limitation, shall be between 6.5 and 9.0 s.u.
b.	This limitation, including monitoring, shall be effective from April 1 through October 31. Averages for <i>E. coli</i> shall be determined as a geometric mean.
c.	Total nitrogen is a combination of nitrate, nitrite, and Total Kjeldahl Nitrogen (TKN).
d.	The permittee will use Heart River parameters to calculate the real-time water quality standard for ammonia (refer to the Ammonia Effluent Limitations table for Outfall 005). This calculated limit will be compared to facility effluent data for ammonia. If the effluent value is greater than the calculated limit, the permittee will report a violation.
e.	There shall be no floating oil or visible sheen present in the discharge. If floating oil or a visible sheen is detected in the discharge, the department shall be contacted and a grab sample analyzed to ensure compliance with the concentration limitation. Any single analysis and/or measurement beyond this limitation shall be considered a violation of the conditions of this permit.
f.	Acute static-renewal toxicity tests on both species shall be conducted on separate grab samples quarterly from Outfall 005 during discharge.
g.	At a minimum, the permittee shall conduct one chronic short-term toxicity test on both species from Outfall 005 once per calendar quarter.
h.	A total hardness of the receiving stream needs to be determined every time metals are sampled and analyzed. The hardness is used to calculate parameter criteria according to the state water quality standards. This sample shall be collected upstream of the final discharge site.
*.	This parameter is not limited. However, the department may impose limitations based on sample history and to protect the receiving waters.
**.	The thermal mixing zone shall not present a thermal shock or stressor, affect spawning, or block the migration of aquatic organisms.
N/A	Not Applicable
Stipulations:	
The permittee must not discharge any floating solids, visible foam in other than trace amounts, or oily wastes that produce sheen on the surface of the receiving water. The discharge must be free from materials that produce a color, odor or other condition to such a degree as to create a nuisance.	
All effluent parameters shall be sampled at a point leaving outfall 005 but prior to leaving plant property or entering waters of the state.	
The dates of discharge, frequency of analysis, and number of exceedences shall be included on the Discharge Monitoring Report (DMR).	

Ammonia Effluent Limitations – Outfall 005 – Water Reclamation Facility**Average Monthly Limitation**

The 30-day average concentration of total ammonia (expressed as N in mg/L) does not exceed the numerical value given by the following formula:

$$(CV) \left(\frac{0.0577}{1 + 10^{7.688 - pH}} \right) + \left(\frac{2.487}{1 + 10^{pH - 7.688}} \right)$$

where CV = 2.85, when $T \leq 14^{\circ}\text{C}$; or

CV = $1.45 * 10^{0.028 * (25 - T)}$, when $T > 14^{\circ}\text{C}$.

Receiving stream pH and temperature are used for the calculation

Daily Maximum Limitation

The concentration of total ammonia (expressed as N in mg/L) does not exceed the numerical value given by the following formula:

$$\frac{0.411}{1 + 10^{7.204 - pH}} + \frac{58.4}{1 + 10^{pH - 7.204}}$$

Receiving stream pH is used for the calculation

Notes:

For all above calculations, the permittee receives fifty percent of the stream flow for dilution at the time of discharge based on the flow of the Heart River. The in-stream concentration will be calculated on the mass-balance basis using the following formula:

In-stream concentration = $(Q_u * C_u + Q_e * C_e) / (Q_u + Q_e)$ where

Q_u = 50% of the Heart River flow parameter

C_u = Heart River ammonia parameter

Q_e = Effluent flow parameter

C_e = Effluent ammonia as N parameter

The discharge from outfall 005 shall be regulated to avoid exceeding the ammonia effluent limitations. Where dilution flow is not available at critical low flow conditions, discharge limitations shall be based on achieving average monthly and daily maximum ammonia effluent limitations at the end-of-pipe.

D. Ambient Monitoring

1. Ambient monitoring of the Heart River shall be conducted as described below.

In-Stream, Self-Monitoring Requirements			
Parameter	Monitoring Requirements		
	Sample Point	Measurement Frequency	Sample Type
pH (s.u.)	Upstream (prior to mixing with effluent)	1/month	Instantaneous
Temperature (°C)	Upstream (prior to mixing with effluent)	1/month	Instantaneous

E. Whole Effluent Toxicity (WET) Requirements BP 2015.08.26**1. Acute Toxicity Testing**

Acute toxicity tests shall be conducted in general accordance with the procedures set out in the latest revision of "Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms," EPA-821-R-02-012 (Fifth Ed., October 2002). The permittee shall conduct an acute 48-hour static renewal toxicity test using freshwater fleas, *Ceriodaphnia dubia* and an acute 96-hour static renewal toxicity test using fathead minnows, *Pimephales promelas*.

Outfall 005

WET tests shall be performed at least once per calendar quarter on both species. This requirement may be reduced to alternating species upon the permittee requesting a reduction to toxicity testing – refer to the "**Reduced Monitoring for Toxicity Testing**" section below.

Toxicity is defined as:

Acute test failure is defined as lethality to 50% or more of the test organisms exposed to 100% effluent or >1.0 TUa for *Ceriodaphnia dubia* 48-hour and fathead minnow 96-hour test. The 48-hour and 96-hour effluent value must be <1.0 TUa to indicate a passing test. Any 48-hour or 96-hour effluent value of >1.0 TUa will constitute a failure. Tests in which the control survival is less than 90% are invalid and must be repeated.

Acute WET requirements for Outfall 005						
Effluent Dilution	0%(Control)	12.5%	25%	50%	75%	100%
Dilution Water	Heart River or Lab Synthetic Water					
Species and Test Type	<i>Ceriodaphnia dubia</i> - 48-Hour Acute - Static Renewal - 20°C					
	Fathead minnow - 96-Hour Acute - Static Renewal - 20°C					
Endpoint	TUa					
Compliance Point	End-of-pipe					

If acute toxicity occurs in a routine test, an additional test shall be initiated within 14 days from the date of the initial toxicity findings. Should there be no discharge during a specified sampling time frame; sampling shall be performed as soon as there is a discharge. Should toxicity occur in the second test, testing shall be conducted at a frequency of once a month and the implementation of a 5.Toxicity Reduction Evaluation (TRE) shall be determined by the department. If no toxicity is found in the second test, testing shall occur as outlined in the permit.

The permittee shall report the following results of each toxicity test on the DMR for that reporting period:

***Pimephales promelas* (Fathead Minnow)**

Report the highest TUa for Fathead minnow, Parameter No. TSN6C.

***Ceriodaphnia dubia* (Water Flea)**

Report the highest TUa for *Ceriodaphnia dubia*, Parameter No. TSM3B.

2. Chronic Toxicity Testing

The chronic toxicity tests shall be conducted in general accordance with the procedures set out in the latest revision of "Short Term Methods for Estimating the Chronic Toxicity of

Effluents and Receiving Waters to Freshwater Organisms." EPA-821-R-02-013 (Fourth Ed., October 2002). The permittee shall conduct a chronic 7-day static renewal toxicity test using freshwater fleas, *Ceriodaphnia dubia* and a chronic 7-day static renewal toxicity test using fathead minnows, *Pimephales promelas*.

Outfall 005

WET tests shall be performed at least once per calendar quarter on both species. This requirement may be reduced upon the permittee requesting a reduction to toxicity testing – refer to the **“Reduced Monitoring for Toxicity Testing”** section below.

Chronic toxicity testing is for monitoring purposes.

Chronic WET requirements for Outfall 005						
Effluent Dilution	0%(Control)	6.25%	12.5%	25%	50%	100%
Dilution Water	Heart River or Lab Synthetic Water					
Species and Test Type	<i>Ceriodaphnia dubia</i> – 7-Day Chronic - Static Renewal - 25°C					
	Fathead minnow – 7-Day Chronic - Static Renewal - 25°C					
Endpoint	Survival and Reproduction – IC 25 reported as TUc					
Compliance Point	Not applicable – monitoring only					

If chronic toxicity occurs in a routine test, an additional test shall be conducted within four weeks from the date of the initial toxicity findings. Should there be no discharge during a specified sampling time frame; sampling shall be performed as soon as there is a discharge. Should chronic toxicity occur in the second test, testing shall be conducted at a frequency of once a month and the implementation of a 5.Toxicity Reduction Evaluation (TRE) shall be determined by the department. If no toxicity is found in the second test, testing shall occur as outlined in the permit.

The permittee shall report the following results of each toxicity test on the DMR for that reporting period:

***Pimephales promelas* (Fathead Minnow)**

Report the highest TUc for Fathead minnow, Parameter No. TTP6C.

***Ceriodaphnia dubia* (Water Flea)**

Report the highest TUc for *Ceriodaphnia dubia*, Parameter No. TTP3B.

3. Reduced Monitoring For Toxicity Testing

a. Alternating Species

If the results of a minimum of four consecutive samples taken over at least a 12 month period indicate no toxicity, the permittee may request a test reduction from the department. This reduction would only be testing one species per sampling frequency. If fathead minnows are used first then the next test would be *C. dubia* or vice versa and continue alternating. The department may approve or deny the request, based on the biomonitoring results and other available information. If the request is approved, the test procedures are to be the same as outlined in 1. Acute Toxicity Testing and/or 2. Chronic Toxicity Testing.

If toxicity occurs in any single species test, the provision for alternating species shall be immediately revoked and 1. Acute Toxicity Testing and/or 2. Chronic Toxicity Testing shall be followed in whole.

b. **Monthly Testing**

If the results of 5. Toxicity Reduction Evaluation (TRE) have been accepted by the department or a period of time has indicated no toxicity, the permittee may request the department to allow a reduction from monthly to quarterly toxicity testing for both species. The department may approve or deny the request, based on the bio-monitoring results and other available information. If the request is approved, the test procedures are to be the same as outlined in 1. Acute Toxicity Testing and/or 2. Chronic Toxicity Testing.

4. Reporting Requirements

Test results shall be submitted with the DMR form for each reporting period. The format for the report shall be consistent with the above reference manual(s) as outlined in the section "Report Preparation and Test Review." Each lab generated report shall document the findings for each species reference toxicity testing chart.

5. Toxicity Reduction Evaluation (TRE)

If toxicity is detected, and it is determined by the department that a TRE is necessary, the permittee shall be so notified and shall initiate a TRE immediately thereafter. A TRE shall reference the latest revision of "Technical Support Document For Water Quality-based Toxics Control," EPA/505/2-90-001 – PB91-127415 (March 1991). The purpose of the TRE will be to establish the cause of the toxicity, locate the source(s) of the toxicity, and control or provide treatment for the toxicity.

If the TRE establishes that the toxicity cannot be eliminated by the current treatment system, the permittee shall submit a proposed compliance plan to the department. The plan shall include the proposed approach to control toxicity and a proposed compliance schedule for achieving control. If the approach and schedule are acceptable to the department, this permit may be reopened and modified.

If the TRE shows that the toxicity is caused by a toxicant(s) that may be controlled with specific numerical limitations or proper discharge management as approved by the department, the permittee may:

- a. Submit an alternative control program for compliance with the numerical requirements; or
- b. If necessary, provide a modified biomonitoring protocol which compensates for the pollutant(s) being controlled numerically.

If acceptable to the department, this permit may be reopened and modified to incorporate any additional numerical limitations, a modified compliance schedule if judged necessary by the department, and/or a modified biomonitoring protocol.

Failure to conduct an adequate TRE, or failure to submit a plan or program as described above, or the submittal of a plan or program judged inadequate by the department, shall in no way relieve the permittee from maintaining compliance with the whole effluent toxicity requirements of this permit.

II. MONITORING, RECORDING, AND REPORTING REQUIREMENTS BP 2019.05.29**A. Representative Sampling (Routine and Non-Routine Discharges)**

All samples and measurements taken shall be representative of the monitored discharge.

In order to ensure that the effluent limits set forth in this permit are not violated at times other than when routine samples are taken, the permittee must collect additional samples at the appropriate outfall whenever any discharge occurs that may reasonably be expected to cause or contribute to a violation that is unlikely to be detected by a routine sample. The permittee must analyze the additional samples for those parameters limited under **Part I Effluent Limitations and Monitoring** requirements of this permit that are likely to be affected by the discharge.

The permittee must collect such additional samples as soon as the spill, discharge, or bypassed effluent reaches the outfall. The samples must be analyzed in accordance with **B. Test Procedures**. The permittee must report all additional monitoring in accordance with **D. Additional Monitoring**.

B. Test Procedures

The collection and transportation of all samples shall conform with EPA preservation techniques and holding times found in 40 CFR 136. All laboratory tests shall be performed by a North Dakota certified laboratory in conformance with test procedures pursuant to 40 CFR 136, unless other test procedures have been specified in this permit or approved by EPA as an alternate test procedure under 40 CFR 136.5. The method of determining the total amount of water discharged shall provide results within 10 percent of the actual amount.

C. Recording of Results

Records of monitoring information shall include:

1. the date, exact place and time of sampling or measurements;
2. the name(s) of the individual(s) who performed the sampling or measurements;
3. the name of the laboratory;
4. the date(s) and time(s) analyses were performed;
5. the name(s) of the individual(s) who performed the analyses;
6. the analytical techniques or methods used; and
7. the results of such analyses.

D. Additional Monitoring

If the discharge is monitored more frequently than this permit requires, all additional results, if in compliance with **B. Test Procedures**, shall be included in the summary on the Discharge Monitoring Report.

E. Reporting of Monitoring Results

1. Monitoring results shall be summarized and reported to the department using Discharge Monitoring Reports (DMRs). If no discharge occurs during a reporting period, "No Discharge" shall be reported. The permittee must submit DMRs electronically using the electronic information reporting system unless requirements in subsection 3 are met.
2. Prior to December 21, 2020, the permittee may elect to electronically submit the following compliance monitoring data and reports instead of mailing paper forms. Beginning December 21, 2020, the permittee must report the following using the electronic reporting system:
 - a. General permit reports [e.g., notices of intent (NOI); notices of termination (NOT); no exposure certifications (NOE)];
 - b. Municipal separate storm sewer system program reports;
 - c. Pretreatment program reports;
 - d. Sewer overflow/bypass event reports; and
 - e. Clean Water Act 316(b) annual reports
3. The permittee may seek a waiver from electronic reporting. To obtain a waiver, the permittee must complete and submit an Application for Temporary Electronic Reporting Waiver form (SFN 60992) to the department. The department will have 120 days to approve or deny the waiver request. Once the waiver is approved, the permittee may submit paper versions of monitoring data and reports to the department.
 - a. One of the following criteria must be met in order to obtain a waiver. The department reserves the right to deny any waiver request, even if they meet one of the criteria below.
 1. No internet access,
 2. No computer access,
 3. Annual DMRs (upon approval of the department),
 4. Employee turnover (3-month periods only), or
 5. Short duration permits (upon approval of the department)

All reports must be postmarked by the last day of the month following the end of each reporting period. All original documents and reports required herein shall be signed and submitted to the department at the following address:

ND Department of Environmental Quality
Division of Water Quality
918 East Divide Ave
Bismarck ND 58501-1947

F. Records Retention

All records and information (including calibration and maintenance) required by this permit shall be kept for at least three years or longer if requested by the department or EPA.

III. COMPLIANCE RESPONSIBILITIES**A. Duty to Comply**

The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application.

B. Proper Operation and Maintenance

The permittee shall at all times maintain in good working order and operate as efficiently as possible all treatment or control facilities or systems installed or used by the permittee to achieve compliance with the terms and conditions of this permit. If necessary to achieve compliance with the conditions of this permit, this shall include the operation and maintenance of backup or auxiliary systems.

C. Planned Changes

The department shall be given advance notice of any planned changes at the permitted facility or of an activity which may result in permit noncompliance. Any anticipated facility expansions, production increase, or process modifications which might result in new, different, or increased discharges of pollutants shall be reported to the department as soon as possible. Changes which may result in a facility being designated a "new source" as determined in 40 CFR 122.29(b) shall also be reported.

D. Duty to Provide Information

The permittee shall furnish to the department, within a reasonable time, any information which the department may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the department, upon request, copies of records required to be kept by this permit. When a permittee becomes aware that it failed to submit any relevant facts or submitted incorrect information in a permit application or any report, it shall promptly submit such facts or information.

E. Signatory Requirements

All applications, reports, or information submitted to the department shall be signed and certified.

All permit applications shall be signed by a responsible corporate officer, a general partner, or a principal executive officer or ranking elected official.

All reports required by the permit and other information requested by the department shall be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:

The authorization is made in writing by a person described above and submitted to the department; and

The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility, such as the position of plant manager, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters.

If an authorization under E. Signatory Requirements is no longer accurate for any reason, a new authorization satisfying the above requirements must be submitted to the department prior to or together with any reports, information, or applications to be signed by an authorized representative.

Any person signing a document under this section shall make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

F. Twenty-four Hour Notice of Noncompliance Reporting

1. The permittee shall report any noncompliance which may endanger health or the environment. Any information shall be provided orally as soon as possible, but no later than twenty-four (24) hours from the time the permittee first became aware of the circumstances. The following occurrences of noncompliance shall be included in the oral report to the department at 701.328.5210:
 - a. Any lagoon cell overflow or any unanticipated bypass which exceeds any effluent limitation in the permit under G. Bypass of Treatment Facilities;
 - b. Any upset which exceeds any effluent limitation in the permit under H. Upset Conditions; or
 - c. Violation of any daily maximum effluent or instantaneous discharge limitation for any of the pollutants listed in the permit.
2. A written submission shall also be provided within five days of the time that the permittee became aware of the circumstances. The written submission shall contain:
 - a. A description of the noncompliance and its cause;
 - b. The period of noncompliance, including exact dates and times;
 - c. The estimated time noncompliance is expected to continue if it has not been corrected; and
 - d. Steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.

Reports shall be submitted to the address in Part II.E. Reporting of Monitoring Results. The department may waive the written report on a case by case basis if the oral report has been received within 24 hours by the department at 701.328.5210 as identified above.

All other instances of noncompliance shall be reported no later than at the time of the next Discharge Monitoring Report submittal. The report shall include the four items listed in this subsection.

G. Bypass of Treatment Facilities

1. Bypass not exceeding limitations. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to any of the

following provisions in this section.

2. Bypass exceeding limitations-notification requirements.
 - a. Anticipated Bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible at least ten (10) days before the date of bypass.
 - b. Unanticipated Bypass. The permittee shall submit notice of an unanticipated bypass as required under F. Twenty-four Hour Notice of Noncompliance Reporting.
3. Prohibition of Bypass. Bypass is prohibited, and the department may take enforcement action against a permittee for bypass, unless:
 - a. Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;
 - b. There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and
 - c. The permittee submitted notices as required under the 1. Anticipated Bypass subsection of this section.

The department may approve an anticipated bypass, after considering its adverse effects, if the department determines that it will meet the three (3) conditions listed above.

H. Upset Conditions

An upset constitutes an affirmative defense to an action brought for noncompliance with technology-based permit effluent limitations if the requirements of the following paragraph are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

1. An upset occurred and the permittee can identify its cause(s);
2. The permitted facility was, at the time being, properly operated;
3. The permittee submitted notice of the upset as required under F. Twenty-four Hour Notice of Noncompliance Reporting and
4. The permittee complied with any remedial measures required under I. Duty to Mitigate.

In any enforcement proceeding, the permittee seeking to establish the occurrence of an upset has the burden of proof.

I. Duty to Mitigate

The permittee shall take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment. The permittee, at the department's request, shall provide accelerated or additional monitoring as necessary to determine the nature and impact of any discharge.

J. Removed Materials

Collected screenings, grit, solids, sludges, or other pollutants removed in the course of treatment shall be buried or disposed of in such a manner to prevent any pollutant from entering any waters of the state or creating a health hazard. Sludge/digester supernatant and filter backwash shall not be directly blended with or enter either the final plant discharge and/or waters of the state. The permit issuing authority shall be contacted prior to the disposal of any sewage sludges. At that time, concentration limitations and/or self-monitoring requirements may be established.

K. Duty to Reapply

Any request to have this permit renewed should be made six months prior to its expiration date.

IV. GENERAL PROVISIONS**A. Inspection and Entry**

The permittee shall allow department and EPA representatives, at reasonable times and upon the presentation of credentials if requested, to enter the permittee's premises to inspect the wastewater treatment facilities and monitoring equipment, to sample any discharges, and to have access to and copy any records required to be kept by this permit.

B. Availability of Reports

Except for data determined to be confidential under 40 CFR Part 2, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the department and EPA. As required by the Act, permit applications, permits, and effluent data shall not be considered confidential.

C. Transfers

This permit is not transferable except upon the filing of a Statement of Acceptance by the new party and subsequent department approval. The current permit holder should inform the new controller, operator, or owner of the existence of this permit and also notify the department of the possible change.

D. New Limitations or Prohibitions

The permittee shall comply with any effluent standards or prohibitions established under Section 306(a), Section 307(a), or Section 405 of the Act for any pollutant (toxic or conventional) present in the discharge or removed substances within the time identified in the regulations even if the permit has not yet been modified to incorporate the requirements.

E. Permit Actions

This permit may be modified, revoked and reissued, or terminated for cause. This includes the establishment of limitations or prohibitions based on changes to Water Quality Standards, the development and approval of waste load allocation plans, the development or revision to water quality management plans, changes in sewage sludge practices, or the establishment of prohibitions or more stringent limitations for toxic or conventional pollutants and/or sewage sludges. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

F. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

G. State Laws

Nothing in this permit shall be construed to preclude the institution of legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable state law or regulation preserved under Section 510 of the Act.

H. Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under Section 311 of the Act.

I. Property Rights

The issuance of this permit does not convey any property rights of any sort, nor any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations.

J. Severability

The provisions of this permit are severable, and if any provision of this permit or the application of any provision of this permit to any circumstance is held invalid, the application of such provision to other circumstances and the remainder of this permit shall not be affected thereby.

V. INDUSTRIAL WASTE MANAGEMENT BP 2013.01.10
Major POTWs-Non Approved Pretreatment Program Requirements

A. General Responsibilities

The permittee has the responsibility to protect the Publicly-Owned Treatment Works (POTW) from pollutants which would inhibit, interfere, or otherwise be incompatible with operation of the treatment works including interference with the use or disposal of municipal sludge.

B. Pollutant Restrictions

Pretreatment Standards (40 CFR Section 403.5) developed pursuant to Section 307 of the Federal Clean Water Act (the Act) require that the permittee shall not allow, under any circumstances, the introduction of the following pollutants to the POTW from any source of nondomestic discharge:

1. Any other pollutant which may cause Pass Through or Interference;
2. Pollutants which create a fire or explosion hazard in the POTW, including, but not limited to, waste streams with a closed cup flashpoint of less than sixty (60) degrees Centigrade (140 degrees Fahrenheit) using the test methods specified in 40 CFR Section 261.21;
3. Pollutants which will cause corrosive structural damage to the POTW, but in no case discharges with a pH of lower than 5.0 s.u., unless the treatment facilities are specifically designed to accommodate such discharges;
4. Solid or viscous pollutants in amounts which will cause obstruction to the flow in the POTW, or other interference with the operation of the POTW;
5. Any pollutant, including oxygen demanding pollutants (e.g., BOD), released in a discharge at a flow rate and/or pollutant concentration which will cause Interference with any treatment process at the POTW;
6. Heat in amounts which will inhibit biological activity in the POTW resulting in Interference, but in no case heat in such quantities that the temperature at the POTW treatment plant exceeds forty (40) degrees Centigrade (104 degrees Fahrenheit) unless the Approval Authority, upon request of the POTW, approves alternate temperature limits;
7. Petroleum oil, non-biodegradable cutting oil, or products of mineral oil origin in amounts that will cause Interference or Pass Through at the POTW;
8. Pollutants which result in the presence of toxic gases, vapors, or fumes within the POTW in a quantity that may cause acute worker health and safety problems;
9. Any trucked or hauled pollutants, except at discharge points designated by the POTW; and
10. Any specific pollutant which exceeds a local limitation established by the permittee in accordance with the requirements of 40 CFR Section 403.5 (c) and (d).

C. Approval Authority

North Dakota was delegated the Industrial Pretreatment Program in September of 2005. The North Dakota Department of Environmental Quality, Division of Water Quality shall be the Approval Authority and the mailing address for all reporting and notifications to the Approval Authority shall be:

ND Department of Environmental Quality
Division of Water Quality
918 East Divide Ave
Bismarck ND 58501-1947

D. Industrial Categories

In addition to the general limitations expressed above, more specific Pretreatment Standards have been and will be promulgated for specific industrial categories under Section 307 of the Act (40 CFR Part 405 et. Seq.).

E. Notification Requirements

The permittee must notify the Approval Authority, of any new introductions by new or existing industrial users or any substantial change in pollutants from any industrial user within sixty (60) days following the introduction or change. Such notice must identify:

1. Any new introduction of pollutants into the POTW from an industrial user which would be subject to Sections, 301, 306, and 307 of the Act if it were directly discharging those pollutants; or
2. Any substantial change in the volume or character of pollutants being introduced into the POTW by any industrial user;
3. For the purposes of this section, adequate notice shall include information on:
 - a. The identity of the industrial user;
 - b. The nature and concentration of pollutants in the discharge and the average and maximum flow of the discharge to be introduced into the POTW; and
 - c. Any anticipated impact of the change on the quantity or quality of effluent to be discharged from or biosolids produced at such POTW.
4. For the purposes of this section, a significant industrial user shall include:
 - a. Any discharger subject to Categorical Pretreatment Standards under Section 307 of the Act and 40 CFR chapter I, subchapter N;
 - b. Any discharger which has a process wastewater flow of 25,000 gallons or more per day;
 - c. Any discharger contributing five percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant;
 - d. Any discharger who is designated by the Approval Authority as having a reasonable potential for adversely affecting the POTW's operation or for violating any Pretreatment Standards or requirements.

F. Sampling and Reporting Requirements

The permittee shall sample and analyze the effluent for the following pollutants:

40 CFR 122 Appendix D Table III				
Antimony, Total	Arsenic, Total	Beryllium, Total	Cadmium, Total	Chromium, Total
Copper, Total	Lead, Total	Mercury, Total	Nickel, Total	Selenium, Total
Silver, Total	Thallium, Total	Zinc, Total	Cyanide, Total	Phenols, Total
Hardness, Total a/				
Notes:				
a. A total hardness of the receiving stream needs to be determined every time the above parameters are tested. The hardness is used to calculate parameter criterion(s) according to the North Dakota State Water Quality Standards.				

The sampling shall commence within thirty (30) days of the effective date of this permit and continue at a frequency of once per quarter.

Sampling and analytical procedures shall be in accordance with guidelines established in 40 CFR Part 136. Where sampling methods are not specified the effluent samples collected shall be composite samples consisting of at least twelve (12) aliquots collected at approximately equal intervals over a representative 24 hour period and composited according to flow. Where a flow proportioned composite sample is not practical, the permittee shall collect at least three (3) grab samples, taken at equal intervals over a representative 24 hour period. The permittee shall analyze the effluent with a method detection limit less than the water quality criterion where reasonable.

The results of all analyses shall be attached to, and reported along with the Discharge Monitoring Report (DMR) submitted for the end of that reporting period.

G. Approval Authority Options

At such time as a specific pretreatment limitation becomes applicable to an industrial user of the permittee, the Approval Authority may, as appropriate:

1. Amend the permittee's North Dakota Pollutant Discharge Elimination System (NDPDES) discharge permit to specify the additional pollutant(s) and corresponding effluent limitation(s) consistent with the applicable Pretreatment Standards;
2. Require the permittee to specify, by ordinance, order, or other enforceable means, the type of pollutant(s) and the maximum amount which may be discharged to the permittee's POTW for treatment. Such requirement shall be imposed in a manner consistent with the POTW program development requirements of the General Pretreatment Regulations at 40 CFR Part 403; and/or,
3. Require the permittee to monitor its discharge for any pollutant which may likely be discharged from the permittee's POTW, should the industrial user fail to properly pre-treat its waste.

H. Enforcement Authority

The Approval Authority retains, at all times, the right to take legal action against any source of nondomestic discharge, whether directly or indirectly controlled by the permittee, for violations of a permit, order or similar enforceable mechanism issued by the permittee, violations of any Pretreatment Standard or requirement, or for failure to discharge at an acceptable level under national standards issued by EPA under 40 CFR, chapter I, subchapter N. In those cases where a NDPDES permit violation has occurred because of requirements as necessary to protect the POTW, the North Dakota Department of Environmental Quality and/or Approval Authority shall hold the permittee and/or industrial user responsible and may take legal action against the permittee as well as the industrial user(s) contributing to the permit violation.

VI. BENEFICIAL REUSE BP 2015.09.03**A. Irrigation**

Only wastewater that has received secondary or tertiary treatment may be used for irrigation provided soil and water compatibility testing confirms the water is suitable for irrigation. Wastewater used for irrigation shall be applied at a rate which would allow complete infiltration and not result in ponding or runoff from the irrigated area.

Agricultural land may be irrigated provided the crop is not used for human consumption. Forage crops used for livestock consumption or pastures irrigated with wastewater shall not be harvested or grazed within 30 days of a wastewater application.

Public properties such as golf courses or parks may be irrigated provided the treated wastewater meets the following quality criteria.

Parameter	Discharge Limitations	Monitoring Frequency	
		Measurement Frequency	Sample Type
BOD ₅ (mg/L)	30.0	1 per 14 days	Grab
TSS (mg/L)	45.0	1 per 14 days	Grab
<i>E. Coli</i> (number/100 mL)	126	Weekly	Grab

Whenever possible, irrigation shall take place during hours when the public does not have access to the area being irrigated. If the public has constant access to an area, signs must be posted in visible areas during irrigation and for two hours after irrigation is completed. The signs must advise people that the water could pose a health concern and to avoid the irrigated area.

Worker and public contact with treated wastewater should be minimized. Where frequent contact is likely, a higher level of disinfection should be provided such as achieving *E. Coli* counts less than 14 colonies per 100 mL.

Avoid application within 100 feet of areas which have unlimited access (i.e., yards) or within 300 feet of potable water supply wells.

Runoff that occurs from irrigated areas shall be monitored at the frequencies and with the types of measurements described in Part I(C).

The permittee shall maintain monitoring records indicating, the location and usage (e.g., park or agricultural) of the land being irrigated, the dates irrigation occurred, the amount of wastewater used, and the total flow. In addition, monitoring records must include results from collected samples.

B. Construction

Treated domestic wastewater may be used for construction purposes such as soil compaction, dust suppression and washing aggregate, provided the following conditions are met.

The wastewater intended for use in construction, must at a minimum, receive secondary treatment.

Prior to using treated wastewater a sample from the prospective source must be tested and meet the criteria set below. In addition the test results for *E. coli* must be provided to the department prior to use. Results from samples up to two (2) weeks old will be considered valid. The water quality limitations and minimum sampling frequencies recommended for wastewater used in construction are provided in the following table.

Parameter	Limitations (Maximum)	Measurement Frequency	Sample Type
BOD ₅ (mg/L)	30	Monthly	Grab
TSS (mg/L)	100	Monthly	Grab
<i>E. Coli</i> (number/100 mL)	126	Weekly	Grab

In some systems chlorination is available. Chlorination is particularly desirable when frequent worker contact with the treated wastewater is likely or when the public may have constant access to areas where the wastewater is being used. Maintaining a chlorine residual of at least 0.1 mg/l is recommended.

While the conventional methods for treating domestic wastewater are generally effective in reducing infectious agents (bacteria, viruses, parasites) to acceptable levels, direct reuse of treated wastewater can pose a health concern. Additional precautions to consider are:

1. Worker and public contact with treated wastewater should be minimized.
2. Where frequent worker contact is likely a higher level of disinfection should be provided, such as achieving *E. coli* counts less than 14/100 mL.
3. Work closely with the treatment system operator to ensure treated wastewater quality is suitable when it is drawn for construction purposes.
4. Apply the treated wastewater in a manner that does not result in runoff or ponding.

Runoff that occurs from application areas shall be monitored at the frequencies and with the types of measurements described in Part I(C).

The permittee shall maintain monitoring records indicating the location and usage of the land where application occurs, the dates application occurred, the amount of wastewater used, and the total flow. In addition, monitoring records must include results from collected samples.

C. Oil and Gas Production (including Hydraulic Fracturing)

The specific user of the wastewater may determine the specific treatment requirements for receiving wastewater.

The permittee shall maintain monitoring records indicating the specific user, the amount of wastewater used, and the total flow. In addition, monitoring records must include results from collected samples.

D. Other Uses as Approved

The permittee must consult with the department before beneficially reusing wastewater for purposes not identified in this permit.

**FACT SHEET FOR NDPDES PERMIT
ND-0023175**

PERMIT REISSUANCE

**CITY OF DICKINSON
DICKINSON, ND**

DATE OF THE FACT SHEET – AUGUST 2019

INTRODUCTION

The Federal Clean Water Act (CWA, 1972, and later amendments in 1977, 1981, and 1987, etc.) established water quality goals for the navigable (surface) waters of the United States. One mechanism for achieving the goals of the CWA is the National Pollutant Discharge Elimination System (NPDES), which the US Environmental Protection Agency (EPA) has oversight authority. In 1975, the State of North Dakota was delegated primacy of the NPDES program by EPA. The North Dakota Department of Environmental Quality (NDDEQ), hereafter referred to as “department”, has been designated the state water pollution control agency for all purposes of the Federal Water Pollution Control Act, as amended [33 U.S.C. 1251, et seq.], and is hereby authorized to take all action necessary or appropriate to secure to this state the benefits of the act and similar federal acts. The department’s authority and obligations for the wastewater discharge permit program is in the NDAC 33.1-16 (North Dakota Administrative Code) which was promulgated pursuant to NDCC chapter 61-28 (North Dakota Century Code). The department uses North Dakota Pollutant Discharge Elimination System (NDPDES) as its permitting title.

The following rules or regulations apply to NDPDES permits:

- Procedures the department follows for issuing NDPDES permits (NDAC chapter 33.1-16-01),
- Standards of Quality for Waters of the State (NDAC chapter 33.1-16-02.1).

These rules require any treatment facility operator to obtain an NDPDES permit before discharging wastewater to state waters. They also define the basis for limits on each discharge and for other requirements imposed by the permit.

According to the North Dakota Administrative Code (NDAC) section 33.1-16-01-08, the department must prepare a draft permit and accompanying fact sheet, and make it available for public review. The department must also publish an announcement (public notice) during a period of thirty days, informing the public where a draft permit may be obtained and where comments regarding the draft permit may be sent (NDAC chapter 33.1-16-01-07). For more information regarding preparing and submitting comments about the fact sheet and permit, please see **Appendix A – Public Involvement**. Following the public comment period, the department may make changes to the draft NDPDES permit. The department will summarize the responses to comments and changes to the permit in **Appendix D - Response to Comments**.

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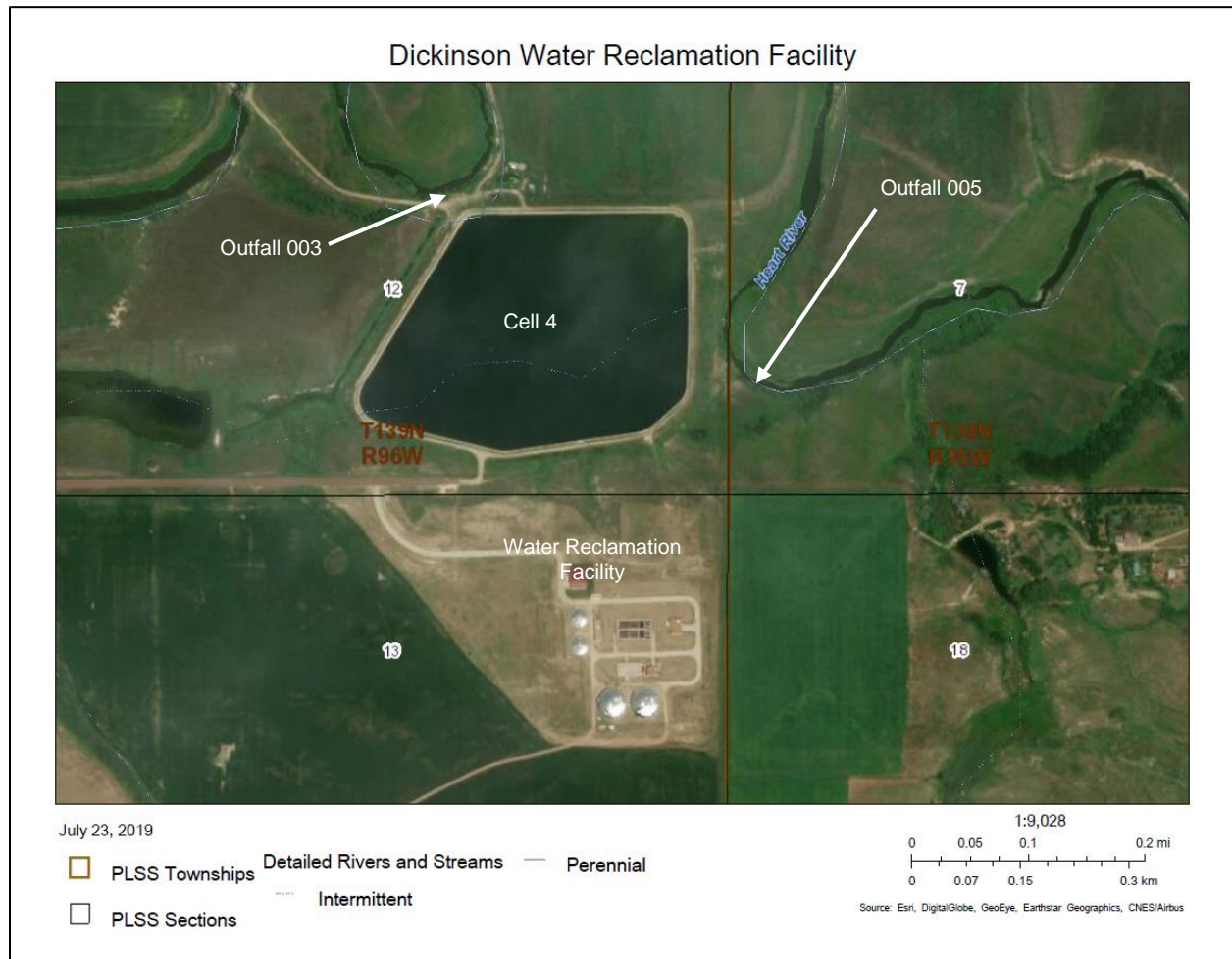
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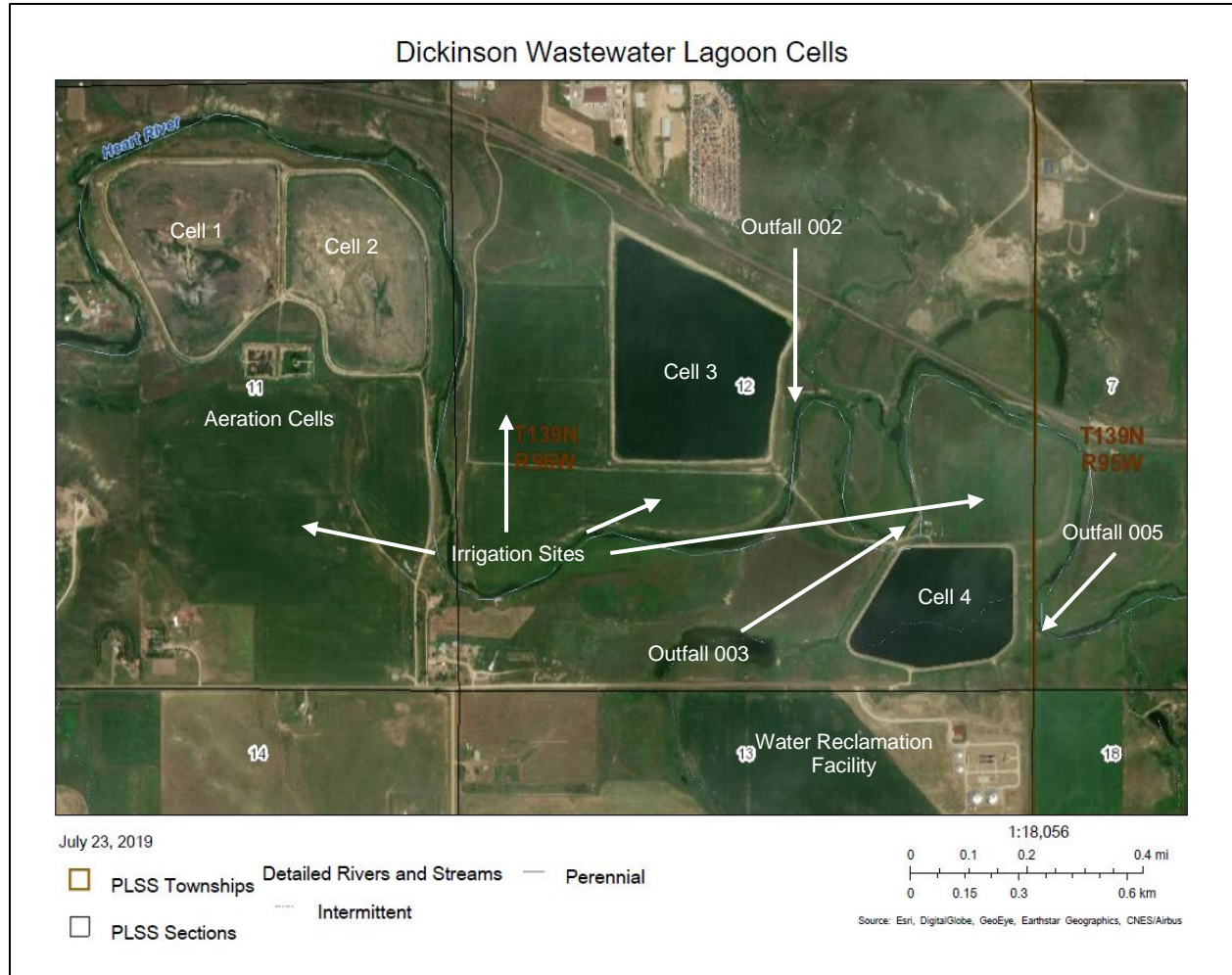
BACKGROUND INFORMATION

Table 1 – General Facility Information

Permittee:	City of Dickinson
Facility Name and Address:	Water Reclamation Facility 99 2 nd Street East, Dickinson, ND 58601
Permit Number:	ND-0023175
Permit Type:	Major Municipality - Renewal
Type of Treatment:	Advanced Mechanical Wastewater Treatment Plant
SIC Code:	4952
Discharge Location:	005: Heart River, Class IA Stream Latitude: 46.862811 Longitude: -102.725662
Hydrologic Code:	10130202 – Upper Heart
Population:	17,787 – US Census of 2010

Figure 1 – Aerial Photograph of the City of Dickinson Water Reclamation Facility, Dickinson, ND
(North Dakota Geographic Information System, Map Generated July 2019)





FACILITY DESCRIPTION

The city of Dickinson Water Reclamation Facility (WRF) consists of an advanced mechanical treatment system to treat municipal waste. The WRF is located in the NE1/4 NE1/4, Section 13 and SE1/4 SE1/4 Section 12, Township 139N, Range 96W. Construction of the WRF was completed in 2014. Prior to construction of the WRF, the city treated sanitary waste with a four-cell waste stabilization pond treatment system that included two additional aeration cells. The treatment components of the former treatment system (aeration cells; Cells 1, 2, and 3) are located in Sections 11 and 12.

Wastewater that enters the WRF is treated using screening and grit removal, integrated fixed film activated sludge, biological treatment, clarification, and ultraviolet disinfection. Treated effluent can be discharged continuously to the Heart River (outfall 005), sent to Cell 4 for industrial and irrigation uses, or sent to a load-out station where it is hauled away by truck for industrial purposes.

Outfall 005 consists of a diffuser located in the Heart River east of Cell 4. Outfall 005 has a design flow rate of 3.65 million gallons per day (MGD). Cell 4 is a 29.7-acre polishing cell that was part of the former treatment system. Discharges from Cell 4 were from outfall 003. No discharges are expected from outfall 003. The load-out station is located in the southwest part of the City of Dickinson.

The former aeration cells, and Cells 1, 2, and 3 have been decommissioned. Cells 1 and 2 were planted with a hay/clover mix in 2018 and are no longer used for wastewater treatment. Treated effluent is pumped to Cell 3 to control dust from the unused cell. Water in this cell evaporates and is not discharged. The aeration cells are no longer used and are expected to be reclaimed within the next few years.

The former treatment system had three outfalls that discharged treated effluent to the Heart River (outfalls 002, 003 and 004). Discharges from outfall 002 originated from Cell 3. Discharges from outfall 003 originated from Cell 4. Outfall 004 was a French drain tile system that collected seepage from Cell 4. Improvements were made to the French drain tile system in 2015 that allowed collected water to be discharged back into Cell 4. No discharge occurred from outfall 002 or 003 during the past permit cycle.

According to the NDPDES permit application, the city of Dickinson services a population of 29,000 people. This includes treating wastewater from the city of South Heart which services a population of 1000, as well as treating septage from regional facilities. Because of the uncertainty of rapid population growth in the area, the WRF has the ability to expand in phases. Each expansion depends on population growth. Phase I services a population of 35,000 to 38,000 people. Subsequent phases would have a design capacity to treat a population of 57,000 people and ultimately 76,000 people.

Treated effluent is sent to the Marathon Dickinson Refinery located west of Dickinson. Wastewater from the refinery is discharged to the city's wastewater treatment plant. The average daily flow of the refinery is 1.50 MGD. The refinery is a categorical industrial user and is subject to pretreatment requirements. The city does not have a pretreatment program therefore the refinery is permitted through the department's pretreatment program. Effluent information from the refinery is reported to the department through the pretreatment program.

The city of Dickinson continues to beneficially reuse treated effluent for irrigation. The amount of treated effluent used for irrigation depends on irrigation contracts developed between the city and landowners. The current average amount of treated effluent applied per day is 0.02 MGD. Historically, irrigation took place on privately- and city-owned agricultural land next to the wastewater treatment system.

Biosolids generated at the WRF are land applied to a field owned by the city located west of the WRF in the NE1/4 of Section 13, Township 139 North, Range 96 West. The generation process begins by sending sludge from the clarifiers through the waste activated sludge screen, then to the aerobic digesters. The thickened sludge is then sent to the biosolids holding tanks before land application.

Discharge Outfalls

There are three active discharge outfalls associated with the facility. The description of the active and inactive outfalls is provided below:

Outfall 002. Active. Final.			
Latitude: 46.867622	Longitude: -102.735241	County: Stark	
Township: 139N	Range: 96W	Section: 12	QQ: DBB
Receiving Stream: Heart River		Classification: Class IA	
Outfall Description: Effluent limitations for lagoon cell 3. Water is kept in the cell to suppress dust from the cell.			

Outfall 003. Active. Final.			
Latitude: 46.865267	Longitude: -102.730821	County: Stark	
Township: 139N	Range: 96W	Section: 12	QQ: DAC
Receiving Stream: Heart River		Classification: Class IA	
Outfall Description: Effluent limitations for lagoon cell 4. Water from the Water Reclamation Facility is sent to cell 4 for beneficial reuse storage. This point could also include effluent from lagoon cell 3.			

Outfall 005. Active. Final.			
Latitude: 46.862811	Longitude: -102.725662	County: Stark	
Township: 139N	Range: 95W	Section: 7	QQ: CCC
Receiving Stream: Heart River		Classification: Class IA	
Outfall Description: Treated effluent flows as a continuous discharge from the Water Reclamation Facility.			

Outfall 006. Active. Internal.			
Latitude: 46.860456		Longitude: -102.729097	
County: Stark			
Township: 139N		Range: 96W	
Section: 13		QQ: AA	
Receiving Stream: Heart River		Classification: Class IA	
Outfall Description: This is an interior point that is a sampling site for influent entering the Water Reclamation Facility.			

Outfall 001. Not Active. Final.			
Latitude: 46.868832	Longitude: -102.747726	County: Stark	
Township: 139N	Range: 96W	Section: 11	QQ: ADD
Receiving Stream: Heart River		Classification: Class IA	
Outfall Description: Outfall 001 was removed from lagoon cell 2.			

Outfall 004. Not Active. Final.			
Latitude: 46.863267	Longitude: -102.726501	County: Stark	
Township: 139N	Range: 96W	Section: 12	QQ: DDD
Receiving Stream: Heart River		Classification: Class IA	
Outfall Description: Outfall 004 was a French Drain tile for lagoon cell 4. A new pump station was installed in 2014 to intercept and return flows from the French drain to cell 4.			

PREVIOUS PERMIT STATUS

The department issued the current permit for this facility on November 26, 2014. The current permit has effluent monitoring requirements for:

- Temperature,
- Stream flow,
- Five-day biochemical oxygen demand (BOD₅),
- Total suspended solids (TSS),
- pH,
- *E. coli*,
- Total nitrite plus nitrate as nitrogen,
- Total Kjeldahl Nitrogen,
- Ammonia as nitrogen,
- Total phosphorus,
- Oil and grease,
- Whole effluent toxicity (WET), and
- Trace elements

The permit also has influent monitoring for BOD₅, TSS, pH, ammonia as nitrogen, and trace elements. The permit will expire on September 30, 2019.

SUMMARY OF COMPLIANCE WITH PREVIOUS PERMIT ISSUED

The department's Division of Water Quality and Division of Municipal Facilities conduct yearly inspections of the facility. The department's assessment of compliance is based on review of the facility's Discharge Monitoring Reports (DMRs) and inspections conducted by department staff.

Bypasses

The city reported eleven bypasses since November 2014. Bypasses were caused by infrastructure failures, blockages, pump and equipment failures, and valve failures. Blockages, pump failures, and relief valve failures occurred the most.

Past Discharge Data

The concentration of pollutants in the discharge was reported on discharge monitoring report forms. Effluent information for outfall 005 is characterized as shown in Table 2. The information spans the period from November 2014 to April 2019. Discharges from outfalls 002 and 003 were discontinued once effluent began discharging from outfall 005.

Table 2 – Effluent Information for the City of Dickinson (2014-2019)

Parameter	Units	Range	Average	Permit Limit	Number of Excursions
<i>Effluent – Outfall 005</i>					
BOD ₅	mg/L	0.89 – 24.4	3.43	25 30-day avg 45 7-day avg	0 0
TSS	mg/L	0.91 – 10.3	3.26	30 30-day avg 45 7-day avg	0 0
pH	S.U.	6.69 – 9.06	NA	7.0 to 9.0	28
<i>E. coli</i>	#/100 mL	0 – 2420	23 (geometric mean)	126 30-day avg 409 Daily max	2 15
Ammonia as N	mg/L	0.1 – 9.29	0.88	Water Quality Standard	0
Oil & Grease - Visual		0	0	0 = No Visible Sheen 1 = Visible Sheen	0
Oil & Grease	mg/L	No Visible Sheen	No Visible Sheen	10 Daily max	0
Flow	MGD	2.86 (max)	1.50	N/A	N/A
Drain	MG	3 – 68	45	N/A	N/A
Antimony ^a	ug/L	<1 – <2	1.3	N/A	N/A
Arsenic	ug/L	<2 – 39.2	4.3	N/A	N/A
Beryllium ^{a,b}	ug/L	<0.5	<0.5	N/A	N/A
Cadmium ^a	ug/L	<0.1 – <0.5	<0.1	N/A	N/A
Chromium ^a	ug/L	<2 – 5	2.3	N/A	N/A
Copper ^a	ug/L	<2 – 19.4	5.2	N/A	N/A
Cyanide ^{b,c}	mg/L	<0.005 – <0.007	<0.005	N/A	N/A
Lead ^a	ug/L	<0.5 – 1.1	0.7	N/A	N/A
Mercury ^{b,c}	ug/L	<0.2	<0.2	N/A	N/A
Nickel ^a	ug/L	2.3 – 11.6	5.6	N/A	N/A
Phenols ^a	mg/L	<0.01 – 0.0572	0.01	N/A	N/A
Selenium ^a	ug/L	<2 – <5	2.4	N/A	N/A
Silver ^{a,b}	ug/L	<0.5	<0.5	N/A	N/A
Thallium ^d	ug/L	<0.1 – <0.5	<0.2	N/A	N/A
Zinc ^a	ug/L	29 – <50	<49	N/A	N/A

Table 2 – Effluent Information for the City of Dickinson (2014-2019)

Notes:
The WRF removes 99 percent of the BOD ₅ and 99 percent of the TSS that enters the plant.
a. All sample results were below the applicable water quality standard. A hardness concentration of 664 mg/L as CaCO ₃ was used for hardness dependent trace elements. The hardness concentration was derived from the average concentration reported on DMRs.
b. All sample results were below detection levels.
c. Results received from the laboratory were below the detection level but greater than the applicable water quality standard. An appropriate reasonable potential analysis cannot be conducted due to inadequate data
d. Most thallium results were below the applicable water quality standards; this includes a detectable concentration of 0.2 mg/L. The thallium results that were above the applicable water quality standard were below the method detection level.

PROPOSED PERMIT LIMITS

EFFLUENT LIMITATIONS

The discharge of wastewater generated by the WRF is regulated by secondary treatment limitations as well as state rules. Secondary treatment limitations may be found in Title 40 of the Code of Federal Regulations, Part 133 (or 40 CFR 133) and in NDAC chapter 33.1-16-01-30. These regulations describe the minimum level of effluent quality attainable by secondary treatment of municipal wastewater in terms of BOD₅, TSS and pH. The regulations also include requirements to remove at least 85 percent of the BOD₅ and TSS found in the influent to the WRF or provide treatment equivalent to secondary treatment under certain circumstances. NDAC chapter 33.1-16-01-14 also establishes additional treatment standards for municipal wastes.

Limitations also may be generated using Best Professional Judgment (BPJ) in the absence of a federal standard to ensure reasonable control technologies are used to prevent potential harmful effects of the discharge. In addition, the department must consider and include limitations necessary to protect water quality standards applicable to the receiving waters.

Limitations based on numeric nutrient criteria are not being included in the proposed permit. Numeric nutrient criteria have yet to be developed for the state of North Dakota. Currently, the WQS contain a narrative standard stating that surface waters must be free from nutrients in concentrations or loadings that cause objectionable growth of vegetation, algae, or other impairments.

The proposed permit removes the eighty-five degree temperature water-quality based effluent limitation and proposes to add a thermal mixing zone. Refer to the "Evaluation of Surface Water Quality-Based Effluent Limits for Numeric Criteria" section for the basis of the determination.

The lower pH effluent limitation in the current permit is 7.0 standard units (s.u.). As part of the permit application, the city resubmitted a 2016 request to lower the pH effluent limitation. EPA's DESCON model confirmed that the WQS of 7.0 s.u. at the edge of the mixing zone will be maintained if the pH effluent limitation was lowered to 6.5 s.u. This information is found in (Appendix C).

Discharges from outfalls 002 and 003 have been discontinued. Effluent limitations and monitoring requirements for outfalls 002 and 003 will not be continued in the proposed permit. The city will not be authorized to discharge from outfalls 002 and 003 under the proposed permit. In the event that water needs to be discharged from the holding ponds or outfalls 002 and 003, such as for decommissioning the holding ponds, coverage will need to be obtained under one of the general permits for discharges from waste stabilization ponds (NDG12-, 22-, or 320000). The department will specify the appropriate general permit at that time.

The limitations included in the proposed permit are for the WRF.

Table 3: Comparison of Effluent Limits of Outfall 005

Effluent Parameter	30-Day Average	7-Day Average	Daily Maximum	Basis ^a
BOD ₅ ^b	25 mg/l	45 mg/l	N/A	NDAC 33-16-01-14(3)(c)(1); 40 CFR 133.102(a)(2)
TSS ^c	30 mg/l	45 mg/l	N/A	40 CFR 133.102(b)
pH ^d	Between 6.5 and 9.0 s.u.			WQS
Oil & Grease – Visual ^e	N/A	N/A	N/A	WQS
Oil & Grease ^e	*	*	10 mg/l	BPJ
Temperature	N/A	N/A	**	WQS
<i>Escherichia coli</i> (<i>E. coli</i>) ^f	126/100 ml	N/A	409/100 ml	WQS
Ammonia as N ^{g,h}	Refer to the Ammonia Table (Table 4)			WQS
Whole Effluent Toxicity	No Acute Toxicity			40 CFR 122.44(d)(1)(iv),(v)
The permittee must not discharge any floating solids, visible foam in other than trace amounts, or oily wastes that produce sheen on the surface of the receiving water. The discharge must be free from materials that produce a color, odor or other condition to such a degree as to create a nuisance.				Previous Permit
All effluent parameters shall be sampled at a point leaving outfall 005 but prior to leaving plant property or entering waters of the state.				BPJ, Previous Permit
Notes:				
a. The basis of the effluent limitations is given below: “BPJ” refers to best professional judgment. “Previous Permit” refers to limitations in the previous permit. The NPDES regulations 40 CFR Part 122.44(1)(1) Reissued permits require that when a permit is renewed or reissued, interim				

Table 3: Comparison of Effluent Limits of Outfall 005

<p>limitations, standards or conditions must be at least as stringent as the final effluent limitations, standards, or conditions in the previous permit unless the circumstances on which the previous permit was issued have materially and substantially changed since the previous permit was issued and would constitute cause for permit modification or revocation and reissuance under 40 CFR Part 122.62.</p> <p>“WQS” refers to effluent limitations based on North Dakota's “Standards of Quality for Waters of the State,” NDAC Chapter 33-16-02.1.</p>	
b.	The limits for BOD ₅ are based on 40 CFR 133.102(a)(2) “Secondary Treatment Standards,” and NDAC Chapter 33-16-01-14(3)(c)(1).
c.	The limits for TSS are based on 40 CFR 133.102(b), “Secondary Treatment Standards.”
d.	The limits for pH are based on the WQS for a class IA stream with allowable mixing zone.
e.	There shall be no floating oil or visible sheen present in the discharge. If floating oil or a visible sheen is detected in the discharge, the department shall be contacted and a grab sample analyzed to ensure compliance with the concentration limitation. Any single analysis and/or measurement beyond this limitation shall be considered a violation of the conditions of the permit.
f.	The limit for <i>E. coli</i> shall apply only during the recreational season, April 1 to October 31. Monitoring for <i>E. coli</i> shall be in effect only during the recreational season. Averages for <i>E. coli</i> shall be determined as a geometric mean.
g.	A discharge ammonia criterion will be dependent on river flow, discharge rate, river pH and temperature, and the effluent concentration. This determination shall be in accordance to the formula specified in the latest revision of the state water quality standards.
h.	Permittee will use Heart River parameters to calculate the real-time water quality standard for ammonia. This calculated limit will be compared to facility effluent data on ammonia, and if the effluent value is greater than the calculated limit, the permittee will report a violation.
*	This parameter is not limited. However, the department may impose limitations based on sample history and to protect the receiving waters.
**.	The thermal mixing zone shall not present a thermal shock or stressor, affect spawning, or block the migration of aquatic organisms.
N/A	Not Applicable

Table 4: Ammonia Effluent Limitations – Outfall 005**Average Monthly Limitation**

The 30-day average concentration of total ammonia (expressed as N in mg/L) does not exceed the numerical value given by the following formula:

$$(CV) \left(\frac{0.0577}{1 + 10^{7.688 - pH}} \right) + \left(\frac{2.487}{1 + 10^{pH - 7.688}} \right)$$

where CV = 2.85, when $T \leq 14^{\circ}\text{C}$; or
 $CV = 1.45 * 10^{0.028 * (25 - T)}$, when $T > 14^{\circ}\text{C}$.

Receiving stream pH and temperature are used for the calculation

Daily Maximum Limitation

The concentration of total ammonia (expressed as N in mg/L) does not exceed the numerical value given by the following formula:

$$\frac{0.411}{1 + 10^{7.204 - pH}} + \frac{58.4}{1 + 10^{pH - 7.204}}$$

Receiving stream pH is used for the calculation

Notes:

- Calculations must be performed for each discharge sample. If an exceedance is detected on any single sample, the exceedance must be reported on the DMR.
- In-stream sample must be collected/recorded the same day as the ammonia sample.

For all above calculations, the permittee receives fifty percent of the stream flow for dilution at the time of discharge based on the flow of the Heart River. The in-stream concentration will be calculated on the mass-balance basis using the following formula:

In-stream concentration = $(Q_u * C_u + Q_e * C_e) / (Q_u + Q_e)$ where

Q_u = 50% of the Heart River flow parameter

C_u = Heart River ammonia parameter

Q_e = Effluent flow parameter

C_e = Effluent ammonia as N parameter

SELF-MONITORING REQUIREMENTS**Influent/Effluent Monitoring**

All effluent parameters will be sampled prior to entering waters of the state.

Table 5: Self-Monitoring Requirements, Outfall 006

Influent Parameter	Frequency	Sample Type ^a
BOD ₅	1/week	Composite
TSS	1/week	Composite
pH	1/week	Instantaneous
Ammonia as N	1/week	Composite
Trace Elements (40 CFR 122 Appendix D, Table III)	1/quarter	Composite
Notes:		
a. Refer to Appendix B for definitions.		

Table 6: Self-Monitoring Requirements, Outfall 005

Effluent Parameter	Frequency	Sample Type ^a
Temperature	1/day ^b	Grab
Stream flow	1/day ^b	Usable data source
BOD ₅	3/week	Composite
TSS	3/week	Composite
pH	1/day ^b	Instantaneous
<i>E. coli</i>	3/week	Grab
Nitrogen, Total ^c	1/month	Composite
Ammonia as N	3/week	Composite
Phosphorus, Total	1/month	Composite
Oil & Grease – Visual	1/day ^b	Visual
Oil & Grease	Conditional	Grab
Flow	1/day	Instantaneous
Total Drain	1/month	Calculated
Whole Effluent Toxicity ^d	1/quarter	Grab
Trace Elements (40 CFR 122 Appendix D, Table III)	1/quarter	Composite
Notes:		
a. Refer to Appendix B for definitions.		
b. Sampling once per day applies during normal daily operations when the facility is staffed. Typically, a work week runs Monday through Friday.		
c. Total nitrogen is a combination of nitrate, nitrite, and Total Kjeldahl Nitrogen (TKN).		
d. Acute Whole Effluent Toxicity Testing has been reduced from sampling once per month to once per quarter.		

Ambient Monitoring

The proposed permit includes ambient monitoring in the Heart River for pH and temperature.

SECONDARY TREATMENT EFFLUENT LIMITS

Federal and state regulations define secondary treatment limitations for municipal wastewater treatment facilities. These effluent limitations are given in 40 CFR 133 and in NDAC Chapter 33.1-16-01-30. These regulations describe the minimum level of effluent quality attainable by secondary treatment of municipal wastewater in terms of BOD₅, TSS and pH.

NDAC Chapter 33.1-16-01-30 incorporates by reference 40 CFR 133 which list the following technology-based limits for BOD₅, TSS, and pH:

Table 7: Secondary Treatment Limits

Parameter	30 Day Average	7 Day Average
BOD ₅	25 mg/l	45 mg/l
TSS	30 mg/l	45 mg/l
pH	Remain between 6.0 to 9.0	--
Percent Removal	85% BOD ₅ and TSS	--

SURFACE WATER QUALITY-BASED EFFLUENT LIMITS

The North Dakota State Water Quality Standards (NDAC Chapter 33.1-16-02.1) are designed to protect existing water quality and preserve the beneficial uses of North Dakota's surface waters. Wastewater discharge permits must include conditions that ensure the discharge will meet the surface water quality standards. Water quality-based effluent limits may be based on an individual waste load allocation or on a waste load allocation developed during a basin wide total maximum daily load (TMDL) study. TMDLs result from a scientific study of the water body and are developed in order to reduce pollution from all sources.

The Heart River is listed as a class IA stream in the Standards of Quality for Waters of the State (NDAC 33.1-16-02.1). Class IA streams must be suitable for resident fish and other aquatic life, as well as recreation use. The quality of water in class IA streams also must be suitable for irrigation, stock watering and wildlife. The quality must be able to meet the bacteriological, physical, and chemical requirements for municipal or domestic use.

The segment of the Heart River that receives discharges from the facility is listed as impaired in the 2016 North Dakota Section 303(d) List of Waters Needing Total Maximum Daily Loads (303(d) List). Biological stressors are indicated as the impairment; however no specific stressor has been identified. Lake Tschida, downstream, also is included on the 303(d) list. It is listed as impaired for nutrients. TMDLs for the Heart River and Lake Tschida are not scheduled for completion prior to the expiration date of the proposed permit. Nutrient monitoring requirements will be maintained in the proposed permit to aid in any TMDL development for Lake Tschida.

Numerical Criteria for the Protection of Aquatic Life and Recreation

Numerical water quality criteria are listed in the water quality standards for surface waters (NDAC Chapter 33.1-16-02.1). They specify the maximum levels of pollutants allowed in receiving water to protect aquatic life and recreation in and on the water. The department uses numerical criteria along with chemical and physical data for the wastewater and receiving water to derive the effluent limits in the discharge permit. When surface water quality-based limits are more stringent or potentially more stringent than technology-based limits, the discharge must meet the water quality-based limits.

Numerical Criteria for the Protection of Human Health

The U.S. EPA has published numeric water quality criteria for the protection of human health that are applicable to dischargers. These criteria are designed to protect humans from exposure to pollutants linked to cancer and other diseases, based on consuming fish and shellfish and drinking contaminated surface waters. The Water Quality Standards also include radionuclide criteria to protect humans from the effects of radioactive substances.

Narrative Criteria

Narrative water quality criteria (NDAC Chapter 33.1-16-02.1-08) limit concentrations of pollutants from exceeding applicable standards of the receiving waters. The department adopted a narrative biological goal solely to provide an additional assessment method that can be used to identify impaired surface waters.

Antidegradation

The purpose of North Dakota's Antidegradation Policy (NDAC Chapter 33.1-16-02 (Appendix IV)) is to:

- Provide all waters of the state one of three levels of antidegradation protection.
- Determine whether authorizing the proposed regulated activity is consistent with antidegradation requirements.

The department's fact sheet demonstrates that the existing and designated uses of the receiving water will be protected under the conditions of the proposed permit.

Mixing Zones

The department's WQS contain a Mixing Zone and Dilution Policy and Implementation Procedure, NDAC Chapter 33.1-16-02.1 (Appendix III). This policy addresses how mixing and dilution of point source discharges with receiving waters will be addressed in developing chemical-specific and whole effluent toxicity discharge limitations for point source discharges. Depending upon site-specific mixing patterns and environmental concerns, some pollutants/criteria may be allowed a mixing zone or dilution while others may not. In all cases, mixing zone and dilution allowances shall be limited, as necessary, to protect the integrity of the receiving water's ecosystem and designated uses.

EVALUATION OF SURFACE WATER QUALITY-BASED EFFLUENT LIMITS FOR NUMERIC CRITERIA

pH

Discharges to class IA streams shall have an instantaneous limitation between 7.0 (s.u.) and 9.0 (s.u.). The city submitted a request to lower the pH effluent limitation from 7.0 s.u. to 6.5 s.u. EPA's DESCON model was used for the analysis which showed that at an effluent pH level of 6.5 s.u., the pH level at the end of the mixing zone boundary would be 7.08 s.u. (Appendix C). Based on the DESCON analysis, the lower pH effluent limitation in the proposed permit will be 6.5 s.u.

Oil & Grease

The WQS state that waters of the state must be free from oil or grease attributable to wastewater which causes a visible sheen or film upon the water. Using BPJ the department has determined that a daily maximum limitation of 10 mg/l is appropriate for this type of facility if a visible sheen is detected. Other treatment systems in the state have similar limitations.

Temperature

The current permit contains language that states the temperature cannot be above 29.44 degrees Celsius ($^{\circ}\text{C}$). The effluent limitation was based on the state WQS for temperature. The department reviewed the temperature of the effluent from the WRF as well as the available upstream Heart River temperature measured by the permittee as required by the current permit. During the warmer months of the year (June through September) the temperature of the Heart River increases to around 28°C ; typically peaking in late July/early August. The temperature of the river also varies considerably from week to week, ranging from 15°C to 30°C . The corresponding temperature of the WRF effluent during these months increases at the same time but does not rise much above 24°C . The highest temperature of the effluent, at 24.5°C , is nearly the same as the 90th-percentile of the measured temperature of the Heart River during the summer months.

The monthly temperature of the effluent from the WRF does not vary appreciably from year-to-year and is not expected to change. The temperature of the effluent does not approach and will not cause the Heart River to exceed the maximum temperature of WQS of 29.44°C . Based on this, the department proposes to remove the maximum effluent temperature limitation from the proposed permit. The department has determined that although the Heart River itself can exceed the maximum temperature WQS, effluent from the WRF does not have the potential to cause the exceedance since the effluent would be at a cooler temperature. The department has also determined that any heat generated in the process of wastewater treatment is de minimis and thus proposes to discontinue the limit for temperature of 29.44°C .

The current permit also contains language that states the temperature of the discharge cannot be more than 2.78°C above the receiving stream. The effluent limitation in the current permit was based on the state WQS for temperature and the point of compliance has been at the end-of-pipe. As part of the permit renewal, the department proposes to allow a thermal mixing zone in the Heart River and remove the 2.78°C temperature change limitation from the proposed permit.

As part of the determination, the department developed different effluent and receiving stream dynamics to determine what the resulting mixing temperature would be based on different discharge and receiving water flows and the temperature difference between the effluent and receiving water during colder months. At current effluent flows, the change in temperature of the effluent/river mix was generally below 2.78°C . Changes in temperature greater than 2.78°C generally occurred when there were low flows in the receiving water (approximately 10 cubic feet per second [cfs]) and the difference in temperature between the effluent and river was more than 10°C .

The department also evaluated changes to the thermal mixing zone temperature based on thermal energy of the effluent and receiving stream. A constant effluent flow of 1.5 mgd was used in the evaluation. The department used the measured temperatures of the effluent and corresponding measured temperature of the river in the evaluation. The evaluation showed that

temperature changes above 2.78 °C decreased as the receiving stream flow increased. In the early fall and late spring months it took less of an increase in river flow (approximately 9 cfs) to see a temperature change beyond 2.78 °C. During the months from late fall to early spring, more flow in the river was needed to not have a temperature change beyond 2.78 °C. When the flow of the river was set to 14 cfs, the temperature change did not increase above 2.78 °C.

The department continued its evaluation of the thermal mixing zone by calculating the thermal effects of the presence of ice on the effluent and receiving stream. The department reviewed information available for freezing and thawing degree days to estimate the amount of ice generated during the colder months. A freezing degree day is determined by calculating the difference in temperature below the freezing temperature for the average temperature during the day. A thawing degree day is determined the same way but for temperatures above the freezing temperature. The department obtained freezing and thawing degree day information measured at Theodore Roosevelt Regional Airport in Dickinson. The information collected extends back to 2016. As part of the evaluation, the department also had to estimate the size of the thermal mixing zone. The width of the receiving stream is approximately 7 meters which allows for a mixing zone length of approximately 70 meters. The department estimated the mixing zone area would be about 490 square meters.

The department predicted ice thickness within the thermal mixing zone using the methods found in the study "Ice Thickness Prediction: A Comparison of Various Practical Approaches" (Comfort and Abdelnour, 2013). The department calculated the mass of the ice generated per year and the amount of thermal energy needed to melt the ice. Based on the calculations, the thermal energy of the effluent stream was less than the thermal energy of the ice predicted in the thermal mixing zone. The results predict that the thermal energy within the effluent stream would melt ice near the outfall but would not be able to melt all of the ice in the mixing zone during the colder months of the year. As such, the ice in the mixing zone would work to lower the temperature of the receiving stream towards 0 °C as the water leaves the mixing zone. This would indicate that the temperature of the effluent stream would not affect the temperature of the receiving stream beyond the thermal mixing zone. The results also predict that the temperature of the effluent stream would have to be approximately 20 °C to have enough thermal energy to not allow for the formation of ice in the mixing zone.

Based on this evaluation, the department has determined that it is not necessary to continue the 2.78 °C temperature variation limit in the proposed permit and instead will require a narrative thermal mixing zone effluent standard. The department has determined that removing the 2.78 °C temperature variation limit will not result in backsliding since the thermal mixing zone is still protective of aquatic species and beneficial uses.

Temperatures within a thermal mixing zone may exceed the numeric criteria of the WQS; however temperatures may not exceed the acute standards. In addition, the thermal mixing zone must meet the WQS found in NDAC 33-16-02.1-08. The thermal mixing zone cannot present a thermal shock or stressor, affect spawning, or block the migration of aquatic organisms. The department has determined the thermal mixing zone meets these requirements and will include the thermal mixing zone in the proposed permit. Temperature monitoring will still be required in the proposed permit to monitor the thermal component of the discharge and receiving stream.

E. coli

Based on the WQS, the department has determined that an *E. coli* limitation of 126 organisms per 100 mL as a monthly geometric mean and 409 organisms per 100 mL as a daily maximum is appropriate for this type of facility. The standard only applies during the recreation season from May 1 through September 30. The limitation in the permit is meant to cover the period one month before and one month after the recreation season (April 1 through October 30).

Ammonia as Nitrogen

Ammonia, a nonconventional pollutant, is present in the waste stream of discharge point 005 and could potentially be present in toxic amounts. Ammonia toxicity, both acute and chronic, is variable and is dependent on pH levels and temperature. As temperatures rise or pH levels increase, ammonia toxicity increases. North Dakota's aquatic life standards for ammonia also are dependent upon pH and temperature of the receiving water body. Federal regulations (40 CFR 122.44) require the department to place limits in NDPDES permits on pollutants in an effluent (whether conventional, nonconventional, or toxic) whenever there is a reasonable potential for those pollutants to exceed the surface water quality criteria.

The department conducted a Reasonable Potential (RP) analysis to determine whether effluent limits for ammonia would be required in this permit, using procedures given in "Technical Support Document (TSD) For Water Quality based Toxics Control"; EPA/505/2-90-001; March 1991. The department found reasonable potential (Appendix C) for the WRF to cause a violation of the state WQS for ammonia.

Total Arsenic

The department reviewed data to determine whether a WQBEL was necessary for total arsenic for outfall 005. Sixteen sample results were available for outfall 005. Fifteen of the results were below the method detection limit of 2 micrograms/liter (ug/L), with one result of 39.2 ug/L.

An RP analysis was conducted based on the aquatic life criteria for total arsenic. The acute and chronic aquatic life criteria are 340 and 150 ug/L, respectively. The RP analysis did not show the potential to exceed the total arsenic standard for aquatic life.

An RP analysis also was conducted based on the human health criteria for total arsenic. The human health criteria for class IA streams is 10 ug/L (based on the Safe Drinking Water Act). The RP analysis showed the potential to exceed the total arsenic standard for human health.

Although the RP analysis showed the potential to exceed the human health criteria, the department determined there was insufficient data at this time to require an effluent limitation. The permittee will continue to monitor for total arsenic in the proposed permit.

WHOLE EFFLUENT TOXICITY (WET)

The permittee must conduct *Ceriodaphnia dubia* (Water Flea) and *Pimephales promelas* (Fathead Minnow) WET tests. Acute toxicity testing shall occur once each calendar quarter. Acute test failure (LC₅₀) is defined as lethality of 50% or more of each test organism at any effluent concentration. Chronic toxicity testing shall be performed once each calendar quarter for monitoring purposes.

If an acute toxicity test failure occurs, an additional test must be initiated within fourteen days of the initial toxicity findings. If the additional test fails, the department will determine whether a Toxicity Reduction Evaluation (TRE) is necessary.

The department reviewed acute toxicity testing results submitted on DMRs as part of the permit renewal. None of the results indicated acute toxicity in discharges from outfall 005. Since discharges from outfall 005 do not indicate acute toxicity, the department has reduced acute toxicity testing from once per month to once per quarter in the proposed permit. Conducting acute toxicity testing once per quarter is consistent with similar types of facilities that conduct acute toxicity testing.

HUMAN HEALTH

North Dakota's water quality standards include numeric human health-based criteria that the department must consider when writing NDPDES permits. These criteria were established in 1992 by the U.S. EPA in its National Toxics Rule (40 CFR 131.36). The National Toxics Rule allows states to use mixing zones to evaluate whether discharges comply with human health criteria. The department determined the applicant's discharge is unlikely to contain chemicals regulated to protect human health. The department will re-evaluate this discharge for impacts to human health at the next permit reissuance.

MONITORING REQUIREMENTS

The department requires monitoring, recording, and reporting (NDAC Chapter 33.1-16-01-(21 through 23) and 40 CFR 122.41) to verify that the treatment process is functioning correctly and that the discharge complies with the permit's limits.

BIOSOLIDS

Currently the department does not have the authority to regulate biosolids. Therefore, the permittee is required under the Direct Enforceability provision of 40 CFR §503.3(b) to meet the applicable requirements of the regulation.

TEST PROCEDURES

The collection and transportation of all samples shall conform with EPA preservation techniques and holding times found in 40 CFR 136. All laboratory tests shall be performed by a North Dakota certified laboratory in conformance with test procedures pursuant to 40 CFR 136, unless other test procedures have been specified or approved by EPA as an alternate test procedure under 40 CFR 136.5. The method of determining the total amount of water discharged shall provide results within 10 percent of the actual amount.

OTHER PERMIT CONDITIONS

MERCURY POLLUTANT MINIMIZATION PLAN

The proposed permit contains requirements for the permittee to complete and submit a Mercury Pollutant Minimization Plan. The purpose of the plan is to determine possible sources of mercury that can contribute to the collection and treatment system, and evaluate options to

reduce mercury in the system. The plan is intended to minimize the amount of mercury that enters the system, consequently minimizing the amount of mercury that discharges from the facility.

OUTFALLS 002 AND 003

The proposed permit states that there shall be no discharge from outfall 002 or 003.

INDUSTRIAL WASTE MANAGEMENT

The proposed permit contains general pretreatment language and requirements. The general requirements include protection from any source of non-domestic wastewater which causes Pass Through or Interference; creates a fire or explosion hazard; causes corrosive structural damage; causes obstruction; interferes with the treatment process; includes excessive heat; contains petroleum oil and other products which causes Interference or Pass Through; results in the presence of toxic gases, vapors or fumes in the facility; and is any trucked or hauled pollutant except at designated discharge points.

In addition to the general limitations and requirements, the facility must sample and analyze the effluent from discharge point 005 for those parameters listed in 40 CFR 122, Appendix D, Table III (Table 8). Samples must be collected quarterly from outfall 005.

Table 8: Parameters from 40 CFR 122, Appendix D, Table III

Antimony, Total	Lead, Total	Zinc, Total
Arsenic, Total	Mercury, Total	Cyanide, Total
Beryllium, Total	Nickel, Total	Phenols, Total
Cadmium, Total	Selenium, Total	Hardness as CaCO ₃
Chromium, Total	Silver, Total	
Copper, Total	Thallium, Total	

BENEFICIAL REUSE

The proposed permit will continue to contain conditions for the beneficial reuse of wastewater for irrigation, construction, and oil and gas production.

PERMIT ISSUANCE PROCEDURES

PERMIT ACTIONS

This permit may be modified, revoked and reissued, or terminated for cause. This includes the establishment of limitations or prohibitions based on changes to Water Quality Standards, the development and approval of waste load allocation plans, the development or revision to water quality management plans, changes in sewage sludge practices, or the establishment of prohibitions or more stringent limitations for toxic or conventional pollutants and/or sewage sludges. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

PROPOSED PERMIT ISSUANCE

This proposed permit meets all statutory requirements for the department to authorize a wastewater discharge. The permit includes limits and conditions to protect human health and aquatic life, and the beneficial uses of waters of the State of North Dakota. The department proposes to issue this permit for a term of five years.

APPENDIX A – PUBLIC INVOLVEMENT INFORMATION

The department proposes to reissue a permit for the **City of Dickinson**. The permit includes wastewater discharge limits and other conditions. This fact sheet describes the facility and the department's reasons for requiring permit conditions.

The department will place a Public Notice of Draft on **August 14, 2019** in the **Dickinson Press** to inform the public and to invite comment on the proposed draft North Dakota Pollutant Discharge Elimination System permit and fact sheet.

The Notice –

- Indicates where copies of the draft Permit and Fact Sheet are available for public evaluation.
- Offers to provide assistance to accommodate special needs.
- Urges individuals to submit their comments before the end of the comment period.
- Informs the public that if there is significant interest, a public hearing will be scheduled.

You may obtain further information from the department by telephone, 701.328.5210, or by writing to the address listed below.

North Dakota Department of Environmental Quality
Division of Water Quality
918 East Divide Avenue, 4th Floor
Bismarck, ND 58501

The primary author of this permit and fact sheet is Dallas Grossman.

**North Dakota Department of Environmental Quality Public Notice
Reissue of an NDPDES Permit**

Public Notice Date: 8/14/2019

Public Notice Number: ND-2019-021

Purpose of Public Notice

The Department intends to reissue the following North Dakota Pollutant Discharge Elimination System (NDPDES) Discharge Permit under the authority of Section 61-28-04 of the North Dakota Century Code.

Permit Information

Application Date: 1/30/2019

Application Number: ND0023175

Applicant Name: Dickinson City Of

Mailing Address: 99 2nd St E, Dickinson, ND 58601-5222

Telephone Number: 701.456.7022

Proposed Permit Expiration Date: 9/30/2024

Facility Description

The reapplication is for the Dickinson Water Reclamation Facility which serves the City of Dickinson. The facility is located in NE1/4 NE1/4 Section 13 and SE1/4 SE1/4 Section 12, Township 139 North, Range 96 West. Any discharge would be through Outfall 005 to the Heart River, a Class IA stream.

Tentative Determinations

Proposed effluent limitations and other permit conditions have been made by the Department. They assure that State Water Quality Standards and applicable provisions of the FWPCAA will be protected.

Information Requests and Public Comments

Copies of the application, draft permit, and related documents are available for review. Comments or requests should be directed to the ND Dept of Env Quality, Div of Water Quality, 918 East Divide Ave, Bismarck ND 58501-1947 or by calling 701.328.5210.

All comments received by September 13, 2019 will be considered prior to finalizing the permit. If there is significant interest, a public hearing will be scheduled. Otherwise, the Department will issue the final permit within sixty (60) days of this notice. If you require special facilities or assistance relating to a disability, call TDD at 1.800.366.6868.

APPENDIX B – GLOSSARY

DEFINITIONS Standard Permit BP 2019.05.29

1. “**Act**” means the Clean Water Act.
2. “**Average monthly discharge limitation**” means the highest allowable average of “daily discharges” over a calendar month, calculated as the sum of all “daily discharges” measured during a calendar month divided by the number of “daily discharges” measured during that month.
3. “**Average weekly discharge limitation**” means the highest allowable average of “daily discharges” over a calendar week, calculated as the sum of all “daily discharges” measured during a calendar week divided by the number of “daily discharges” measured during that week.
4. “**Best management practices**” (BMPs) means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the United States. BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage areas.
5. “**Bypass**” means the intentional diversion of waste streams from any portion of a treatment facility.
6. “**Composite**” sample means a combination of at least 4 discrete sample aliquots, collected over periodic intervals from the same location, during the operating hours of a facility not to exceed a 24-hour period. The sample aliquots must be collected and stored in accordance with procedures prescribed in the most recent edition of Standard Methods for the Examination of Water and Wastewater.
7. “**Daily discharge**” means the discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the “daily discharge” is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the “daily discharge” is calculated as the average measurement of the pollutant over the day.
8. “**Department**” means the North Dakota Department of Environmental Quality, Division of Water Quality.
9. “**DMR**” means discharge monitoring report.
10. “**EPA**” means the United States Environmental Protection Agency.
11. “**Geometric mean**” means the n^{th} root of a product of n factors, or the antilogarithm of the arithmetic mean of the logarithms of the individual sample values.

12. **"Grab"** for monitoring requirements, means a single "dip and take" sample collected at a representative point in the discharge stream.
13. **"Instantaneous"** for monitoring requirements, means a single reading, observation, or measurement. If more than one sample is taken during any calendar day, each result obtained shall be considered.
14. **"Maximum daily discharge limitation"** means the highest allowable "daily discharge."
15. **"Salmonid"** means of, belonging to, or characteristic of the family Salmonidae, which includes the salmon, trout, and whitefish.
16. **"Sanitary Sewer Overflows (SSO)"** means untreated or partially treated sewage overflows from a sanitary sewer collection system.
17. **"Severe property damage"** means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.
18. **"Total drain"** means the total volume of effluent discharged.
19. **"Upset"** means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

DEFINITIONS Whole Effluent Toxicity (WET) BP 2017.04.06

20. **"Acute toxic unit"** ("TUa") is a measure of acute toxicity. TUa is the reciprocal of the effluent concentration that causes 50 percent of the organisms to die by the end on the acute exposure period (i.e., $100/\text{"LC50"}$).
21. **"Chronic toxic unit"** ("TUc") is a measure of chronic toxicity. TUc is the reciprocal of the effluent concentration that causes no observable effect on the test organisms by the end of the chronic exposure period (i.e., $100/\text{"IC25"}$).
22. **"Inhibition concentration"**, ("IC"), is a point estimate of the toxicant concentration that causes a given percent reduction (p) in a non-quantal biological measurement (e.g., reproduction or growth) calculated from a continuous model (e.g., Interpolation Method).
23. **"LC50"** means the concentration of toxicant (e.g., effluent) which is lethal to 50 percent of the organisms exposed in the time period prescribed by the test.

“No observed effect concentration”, (“NOEC”), is the highest concentration of toxicant (e.g., effluent) to which organisms are exposed in a chronic toxicity test [full life-cycle or partial life-cycle (short term) test], that causes no observable adverse effects on the test organisms (i.e., the highest concentration of effluent in which the values for the observed responses are not statistically significantly different from the controls).

APPENDIX C – DATA AND TECHNICAL CALCULATIONS

The department reviewed DMR information and applicable water quality standards for class IA streams to determine the appropriate requirements to be placed in the permit. In addition, the department reviewed Total Maximum Daily Load information for the Heart River and the department's 2016 North Dakota Section 303(d) List of Waters Needing Total Maximum Daily Loads (303(d) List).

pH Modeling

The analysis below provides the results of EPA's DESCION model. The analysis was conducted based on the procedures in EPA's DESCION program (EPA, 1988. Technical Guidance on Supplementary Stream Design Conditions for Steady State Modeling. USEPA Office of Water, Washington D.C.). The output of the model demonstrates that the pH at the end of the mixing zone boundary will be 7.08. The model and support information are provided below. The support information is an excerpt of a 2016 Technical Memorandum submitted by The City of Dickinson requesting a modification of the NDPDES permit. The city requested that the Technical Memorandum be considered as part of the NDPDES permit application. The full version of the Technical Memorandum is available upon request.

<p>Calculation of pH of a mixture of two flows. Based on the procedure in EPA's DESCION program (EPA, 1988. Technical Guidance on Supplementary Stream Design Conditions for Steady State Modeling. USEPA Office of Water, Washington D.C.)</p> <p>Based on Lotus File PHMIX2.WK1 Revised 19-Oct-93</p>			
INPUT			
1. DILUTION FACTOR AT MIXING ZONE BOUNDARY	9.000	Mixing zone (10%)	
2. UPSTREAM/BACKGROUND CHARACTERISTICS			
Temperature (deg C):	31.50	Highest Temp	
pH:	7.16	Lowest pH	
Alkalinity (mg CaCO ₃ /L):	360.00	Highest Alkalinity	
3. EFFLUENT CHARACTERISTICS			
Temperature (deg C):	23.00	Highest Temp	
pH:	8.50	Proposed pH limit	
Alkalinity (mg CaCO ₃ /L):	160.00	Highest Alkalinity	
OUTPUT			
1. IONIZATION CONSTANTS			
Upstream/Background pKa:	6.32		
Effluent pKa:	6.36		
2. IONIZATION FRACTIONS			
Upstream/Background Ionization Fraction:	0.87		
Effluent Ionization Fraction:	0.58		
3. TOTAL INORGANIC CARBON			
Upstream/Background Total Inorganic Carbon (mg CaCO ₃ /L):	411.72		
Effluent Total Inorganic Carbon (mg CaCO ₃ /L):	276.47		
4. CONDITIONS AT MIXING ZONE BOUNDARY			
Temperature (deg C):	30.56		
Alkalinity (mg CaCO ₃ /L):	337.79		
Total Inorganic Carbon (mg CaCO ₃ /L):	396.69		
pKa:	6.32		
pH at Mixing Zone Boundary:	7.08		
pHDESCION-Draft.xlsx(phmix2, Printed 7/30/2019)			



CITY OF **DICKINSON** **RECEIVED**

Public Works Department

DEC 28 2016

Street & Fleet Solid Waste Water Utilities

DIV. OF WATER QUALITY

December 13, 2016

Mr. Marty Haroldson
NDPDES Program Manager
Division of Water Quality
North Dakota Department of Health
918 E Divide Avenue, 4th Floor
Bismarck ND 58501-1947

RE: Dickinson Water Reclamation Facility
NPDES Permit Minor Modifications

Dear Mr. Haroldson:

The City of Dickinson Water Reclamation Facility has been operating for nearly 2 years. Over the past 2 years, we had identified some permit issues and requested a meeting with the North Dakota Department of Health in the spring of 2016. At the meeting, the NDDH requested additional data and sampling through the summer of 2016 before a formal permit modification would be considered. The City, along with APEX Engineering Group, has completed the sampling and data analysis and proposes the following modifications to our NPDES permit:

1. Monitoring Frequency
2. Temperature
3. Effluent Diffuser Mixing
4. Effluent pH

If requested, the City of Dickinson and APEX Engineering Group will meet with you to discuss any of the information contained in this Technical Memorandum. If you have any questions, please call me at (701) 690-6433. Thank you for your time and perseverance with our request.

Sincerely,

Greg Stack
Water Reclamation Facility Manager

Enclosure: Technical Memorandum – Water Reclamation Facility NPDES Permit

CC: Gary Zuroff, Public Works Director
Shawn Kessel, City Administrator
Karla Olson PE, APEX Engineering Group



Water | Transportation | Municipal | Facilities

701.373.7980
4733 Amber Valley Parkway
Fargo, ND 58104

Technical Memorandum

Water Reclamation Facility NPDES Permit

City of Dickinson, ND | 15.107.0014-11

To: Greg Stack, City of Dickinson

Cc: Gary Zuroff, City of Dickinson

From: Apex Engineering Group, Inc.
Karla Olson, PE

Re: Water Reclamation Facility NPDES Permit Modifications
Dickinson, ND

Date: December 13, 2016

This technical memorandum constitutes our understanding of items discussed and decision reached. In the event there are questions, additions, or corrections, please contact the author.

The City of Dickinson Water Reclamation Facility has been operating for nearly 2 years. Over the past 2 years, the city's operations staff identified some permit issues and requested a meeting with the North Dakota Department of Health in the spring of 2016. At the meeting, the NDDH requested additional data and sampling through the summer of 2016 before a formal permit modification would be considered.

The City completed the sampling and Apex Engineering Group was retained to analyze the sample results and make recommendations to the City of Dickinson regarding proposed permit modifications. Based on the data collected, Apex concurs with the City's request for permit modifications. The requirements set forth by the North Dakota Department of Health

Special Conditions – Diffuser Information requirement of the city's NPDES permit to demonstrate near instantaneous and complete mixing of the discharge with the receiving water for outfall 005.

4. Effluent pH

The city's NPDES permit includes a pH effluent limitation between 7 and 9 standard units. We understand this is a river water quality standard for a Class IA stream in North Dakota, such as the Heart River. To identify the allowable WRF discharge pH, the NDDH distributed a model for calculating the pH of a mixture of two flows (river and WRF effluent). Historical data was used to simulate downstream river conditions after instantaneous and complete mixing of the WRF effluent.

The following historical data was used in the pH model for analysis:

Parameter	Value	Source
Upstream Alkalinity	360 mg/l as CaCO ₃	Summer 2016 sampling data
Upstream pH	7.16-8.87 SU	2015-2016 daily monitoring data
Upstream Temperature	0.2-31.5°C	2015-2016 daily monitoring data
Stream Flow	0.7-75.5 cfs	2015-2016 daily monitoring data
WRF Alkalinity	160 mg/l as CaCO ₃	Summer 2016 sampling data
WRF Temperature	6-23°C	2015-2016 daily monitoring data
WRF Flow	3.65 mgd	WRF Design Flow

The model was used to simulate the maximum allowable pH in the WRF effluent while maintaining a minimum river pH of 7.0 under varying river stream flows and the conditions in the table above. The minimum WRF effluent pH values under low flow river conditions are shown in the table below.

Heart River Flow	Minimum WRF pH
5 cfs	6.5 SU
4 cfs	6.6 SU
2.5 cfs	6.7 SU
0.7 cfs	6.8 SU

The WRF effluent pH under the lowest flow conditions (0.7 cfs) can be 6.8 SU to maintain a downstream pH of 7.0 SU. Since the low flow condition of 0.7 is rare (3 times in 2016), correlating the effluent pH WRF permit limit to river flow conditions would meet the intent of the ND Water Quality Standards. We propose the following pH limits for the corresponding Heart River Flows.

Heart River Flow	WRF Effluent pH Limit
Greater than 4 cfs	6.6-9.0 SU
2 - 4 cfs	6.7-9.0 SU
Less than 2 cfs	6.8-9.0 SU

DFLOW

The department used daily flow data Edward Arthur Patterson Lake to determine critical low flows using the DFLOW (3.1b) program. The data was obtained from the U.S. Bureau of Reclamation and covered the period from 1989 to 2018.

DFLOW 1B3 (ACUTE)	0.00	CFS	DFLOW 1Q10 (ACUTE)	0.00	CFS
DFLOW 4B3 (CHRONIC)	0.00	CFS	DFLOW 7Q10 (CHRONIC)	0.00	CFS
DFLOW 30B10 (AMMONIA)	0.00	CFS			

Ammonia as Nitrogen

The reasonable potential (RP) determinations for ammonia as nitrogen are provided, below. The determinations were conducted utilizing the Technical Support Document For Water Quality-based Toxics Control, EPA/505/2-90-001, March 1991 (TSD; March 1991). The coefficient of variation (CV) for outfall 005 was 1.8.

Receiving Water Concentration (RWC) Reasonable Potential (RP) Determination					
Technical Support Document (TSD) For Water Quality-based Toxics Control EPA/505/2-90-001; March 1991					
Facility Name:	Dickinson	Receiving Stream:	Heart River		
NDPDES Permit:	ND0023175	1Q10 Acute	0 cfs		
Daily Maximum Flow (mgd):	2.86	1B3 Acute	0 cfs		
Daily Average Flow (mgd):	1.50	7Q10 Chronic	0 cfs		
Stream Design Mixing:	50.0%	4B3 Chronic	0 cfs		
Statistical Multiplier:	6.1				
Upstream Concentration:	0.4700 mg/l			Parameter:	
Effluent Concentration (max):	9.2900 mg/l			Ammonia	
				Outfall:	
				005	
$RWC = \frac{(StatQeCe) + (Cs(pmf)Qs)}{Qe + (pmf)Qs}$					
RWC = Receiving water concentration, the resultant magnitude of concentration in the receiving water after effluent discharge concentration (also known as the in-stream waste concentration)					
Stat = Statistical multiplier for effluent parameter (Table 3-1 and 3-2; page 57 of the TSD)					
Qe = Effluent Design Flow					
Ce = Highest effluent concentration reported.					
pmf = Partial mix factor, percent of Qs allowed for mixing by State authority.					
Qs = Receiving Water Flow (1Q10 or 1B3 for acute and 7Q10 or 4B3 for chronic)					
Cs = Background concentration of the receiving water.					
Qe - Acute	2.86	mgd	Qs - 1Q10	0.00	mgd
Qe - Chronic	1.50	mgd	Qs - 1B3	0.00	mgd
Ce	9.2900	mg/l	Qs - 7Q10	0.00	mgd
Cs	0.4700	mg/l	Qs - 4B3	0.00	mgd
Stat	6.10				
pmf	50.0%				
Acute RP		Chronic RP			
RWC - 1Q10	56.6690	mg/l	RWC - 7Q10	56.6690	mg/l
RWC - 1B3	56.6690	mg/l	RWC - 4B3	56.6690	mg/l
Criterion Maximum Concentration (CMC)		Criterion Continuous Concentration (CCC)			
Acute Criterion	1.64	mg/l	Chronic Criterion	0.2390	mg/l
If the calculated RWC is greater than its respective criterion then there is RP and if RWC is less than the criterion then there is no RP.					
CMC RP Present:		CCC RP Present:			
1Q10 Acute OR	YES	7Q10 Chronic OR	YES		
1B3 Acute	YES	4B3 Chronic	YES		
The North Dakota State Water Quality Standards (WQS) Chapter 33-16-02.1 use biologically based design and harmonic mean flows to determine Water Quality Based Effluent Limits (WQBELs) and Whole Effluent Toxicity (WET) limits.					

Total Arsenic

The reasonable potential (RP) determinations for total arsenic are provided, below. The determinations were conducted utilizing the Technical Support Document For Water Quality-based Toxics Control, EPA/505/2-90-001, March 1991 (TSD; March 1991). The coefficient of variation (CV) for outfall 005 was 2.1. RP determinations were conducted for both the human health and aquatic life criteria.

Human Health Criteria

**Receiving Water Concentration (RWC)
Reasonable Potential (RP)
Determination**

Technical Support Document (TSD) For Water Quality-based Toxics Control
EPA/505/2-90-001; March 1991

Facility Name:	Dickinson	Receiving Stream:	Heart River
NDPDES Permit:	ND0023175	1Q10 Acute	0 cfs
Daily Maximum Flow (mgd):	2.86	1B3 Acute	0 cfs
Daily Average Flow (mgd):	1.50	7Q10 Chronic	0 cfs
Stream Design Mixing:	10.0%	4B3 Chronic	0 cfs
Statistical Multiplier:	2.4		
Upstream Concentration:	0.0094 mg/l	Parameter:	
Effluent Concentration (max):	0.0392 mg/l	Arsenic - Human Health	
		Outfall:	
		005	

RWC = Receiving water concentration, the resultant magnitude of concentration in the receiving water after effluent discharge concentration (also known as the in-stream waste concentration)

Stat = Statistical multiplier for effluent parameter (Table 3-1 and 3-2; page 57 of the TSD)

Qe = Effluent Design Flow

Ce = Highest effluent concentration reported.

pmf = Partial mix factor, percent of Qs allowed for mixing by State authority.

Qs = Receiving Water Flow (1Q10 or 1B3 for acute and 7Q10 or 4B3 for chronic)

Cs = Background concentration of the receiving water.

Qe - Acute	2.86	mgd	Qs - 1Q10	0.00	mgd
Qe - Chronic	1.50	mgd	Qs - 1B3	0.00	mgd
Ce	0.0392	mg/l	Qs - 7Q10	0.00	mgd
Cs	0.0094	mg/l	Qs - 4B3	0.00	mgd
Stat	2.40				
pmf	10.0%				

Acute RP

RWC - 1Q10	0.0941	mg/l
RWC - 1B3	0.0941	mg/l

Chronic RP

RWC - 7Q10	0.0941	mg/l
RWC - 4B3	0.0941	mg/l

Criterion Maximum Concentration (CMC)

Acute Criterion 0.01 mg/l

Criterion Continuous Concentration (CCC)

Chronic Criterion 0.0100 mg/l

If the calculated RWC is greater than its respective criterion then there is RP and if RWC is less than the criterion then there is no RP.

CMC RP Present:

1Q10 Acute OR YES
1B3 Acute YES

CCC RP Present:

7Q10 Chronic OR YES
4B3 Chronic YES

The North Dakota State Water Quality Standards (WQS) Chapter 33-16-02.1 use biologically based design and harmonic mean flows to determine Water Quality Based Effluent Limits (WQBELs) and Whole Effluent Toxicity (WET) limits.

The following spreadsheets show the relationship between effluent temperature and receiving water temperature. The spreadsheet below shows the different dynamics between the effluent and receiving stream. The results show the change in river temperature above the temperature change standard of 2.78 °C based on the following criteria: effluent temperature, river temperature, WRF flow (actual and design), and river flow. The results show all of the criteria influence the resultant change in temperature in the river.

FACT SHEET FOR NDPDES PERMIT ND-0023175

City of Dickinson

EXPIRATION DATE: SEPTEMBER 30, 2024

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The following three spreadsheets show changes to the thermal mixing zone temperature based on the thermal energy of the effluent and receiving stream. The spreadsheets compare the potential for an exceedance based on effluent and river temperature during a particular time of year with a constant effluent flow and increasing river flow. The spreadsheets show that exceedances of the 2.78 °C temperature standard generally occur in the early fall, winter, and early spring months when lower flows are present, but lessen as river flow increases.

Temp (deg C)	Emblyry (deg C)	River Temp (deg C)	Emblyry (deg C)	Flow (m³/s)	Estimate Mass (mg)	River Mass (mg)	Mix Mass (mg)	Emblyry (mg)	Mix Temp (deg C)	Exceedance (°N)	Effluent Temp (deg C)	River Temp (deg C)	River Flow (m³/s)	River Mass (mg)	Temp (deg C)	Emblyry (deg C)	Temp (deg C)	Emblyry (deg C)	
September 22	19	79.244	20	83.915	1.3	5.664E+06	2	7.932E+06	13.22E+07	87.500	20.84 N	2.00	4	1.510E+07	2.07E+07	0.01	0.001	22	7.932E+06
September 23	19	79.244	20	83.915	1.3	5.664E+06	2	7.932E+06	13.22E+07	87.500	20.84 N	2.00	4	1.510E+07	2.07E+07	0.01	0.001	23	7.932E+06
September 24	19	79.244	20	83.915	1.3	5.664E+06	2	7.932E+06	13.22E+07	87.500	20.84 N	2.00	4	1.510E+07	2.07E+07	0.01	0.001	24	7.932E+06
September 25	19	79.244	20	83.915	1.3	5.664E+06	2	7.932E+06	13.22E+07	87.500	20.84 N	2.00	4	1.510E+07	2.07E+07	0.01	0.001	25	7.932E+06
September 26	19	79.244	20	83.915	1.3	5.664E+06	2	7.932E+06	13.22E+07	87.500	20.84 N	2.00	4	1.510E+07	2.07E+07	0.01	0.001	26	7.932E+06
September 27	19	79.244	20	83.915	1.3	5.664E+06	2	7.932E+06	13.22E+07	87.500	20.84 N	2.00	4	1.510E+07	2.07E+07	0.01	0.001	27	7.932E+06
September 28	19	79.244	20	83.915	1.3	5.664E+06	2	7.932E+06	13.22E+07	87.500	20.84 N	2.00	4	1.510E+07	2.07E+07	0.01	0.001	28	7.932E+06
September 29	19	79.244	20	83.915	1.3	5.664E+06	2	7.932E+06	13.22E+07	87.500	20.84 N	2.00	4	1.510E+07	2.07E+07	0.01	0.001	29	7.932E+06
September 30	19	79.244	20	83.915	1.3	5.664E+06	2	7.932E+06	13.22E+07	87.500	20.84 N	2.00	4	1.510E+07	2.07E+07	0.01	0.001	30	7.932E+06
October 1	20	83.915	3	12.9555	1.3	5.664E+06	2	7.932E+06	13.22E+07	86.014	6.53 N	17.00	16	6.025E+07	6.605E+07	62.882	17	71.355	6.025E+07
October 2	12	50.406	6	25.2064	1.3	5.664E+06	2	7.932E+06	13.22E+07	86.014	6.53 N	6.00	20	63.915	6.025E+07	62.882	16	67.160E+07	6.025E+07
October 3	15	63.982	3	12.9555	1.3	5.664E+06	2	7.932E+06	13.22E+07	86.014	6.53 N	12.00	48	63.915	6.025E+07	104.033	14	58.2	6.025E+07
October 4	20	83.915	1	14.1102	1.3	5.664E+06	2	7.932E+06	13.22E+07	86.343	9.13 V	19.00	96	3.615E+06	3.668E+06	25	13	54.595	3.615E+06
October 5	7	29.4068	2	8.55357	1.3	5.664E+06	2	7.932E+06	13.22E+07	87.199	4.41 N	5.00	192	7.250E+06	7.307E+06	12	50.406	7.250E+06	
October 6	18	75.241	0	0.001	1.3	5.664E+06	2	7.932E+06	13.22E+07	87.199	4.41 N	18.00	364	1.456E+06	1.456E+06	8	33.621	1.456E+06	
October 7	18	75.241	0	0.001	1.3	5.664E+06	2	7.932E+06	13.22E+07	87.199	4.41 N	18.00	364	1.456E+06	1.456E+06	8	33.621	1.456E+06	
October 8	6	33.621	2	8.38317	1.3	5.664E+06	2	7.932E+06	13.22E+07	87.199	4.41 N	6.00	8	29.420	29.420	15.00	1	1.417102	29.420
October 9	11	46.214	1	14.1102	1.3	5.664E+06	2	7.932E+06	13.22E+07	87.199	4.41 N	10.00	8	29.420	29.420	15.00	1	1.417102	29.420
October 10	17	63.982	0	0.001	1.3	5.664E+06	2	7.932E+06	13.22E+07	86.993	6.42 V	15.00	8	29.420	29.420	15.00	8	33.621	29.420
October 11	17	63.982	0	0.001	1.3	5.664E+06	2	7.932E+06	13.22E+07	86.993	6.42 V	15.00	8	29.420	29.420	15.00	8	33.621	29.420
October 12	17	63.982	0	0.001	1.3	5.664E+06	2	7.932E+06	13.22E+07	86.993	6.42 V	15.00	8	29.420	29.420	15.00	8	33.621	29.420
October 13	17	63.982	0	0.001	1.3	5.664E+06	2	7.932E+06	13.22E+07	86.993	6.42 V	15.00	8	29.420	29.420	15.00	8	33.621	29.420
October 14	14	58.79	2	8.38317	1.3	5.664E+06	2	7.932E+06	13.22E+07	86.993	6.42 V	10.00	8	29.420	29.420	15.00	8	33.621	29.420
October 15	16	67.1608	8	16.8778	1.3	5.664E+06	2	7.932E+06	13.22E+07	86.993	6.42 V	12.00	8	29.420	29.420	15.00	8	33.621	29.420
October 16	7	29.4068	0	0.001	1.3	5.664E+06	2	7.932E+06	13.22E+07	86.993	6.42 V	7.00	8	29.420	29.420	15.00	8	33.621	29.420
October 17	9	37.3216	4	12.9555	1.3	5.664E+06	2	7.932E+06	13.22E+07	86.993	6.42 V	6.00	8	29.420	29.420	15.00	8	33.621	29.420
October 18	11	46.214	4	16.8778	1.3	5.664E+06	2	7.932E+06	13.22E+07	86.993	6.42 V	7.00	8	29.420	29.420	15.00	8	33.621	29.420
October 19	13	54.598	6	25.2064	1.3	5.664E+06	2	7.932E+06	13.22E+07	86.993	6.42 V	9.00	8	29.420	29.420	15.00	8	33.621	29.420
October 20	15	63.982	6	25.2064	1.3	5.664E+06	2	7.932E+06	13.22E+07	86.993	6.42 V	9.00	8	29.420	29.420	15.00	8	33.621	29.420
October 21	17	71.3552	8	33.6212	1.3	5.664E+06	2	7.932E+06	13.22E+07	86.993	6.42 V	9.00	8	29.420	29.420	15.00	8	33.621	29.420
October 22	9	37.3216	4	16.8778	1.3	5.664E+06	2	7.932E+06	13.22E+07	86.993	6.42 V	9.00	8	29.420	29.420	15.00	8	33.621	29.420
October 23	10	42.022	4	33.6212	1.3	5.664E+06	2	7.932E+06	13.22E+07	86.993	6.42 V	9.00	8	29.420	29.420	15.00	8	33.621	29.420
October 24	12	50.406	12	50.406	1.3	5.664E+06	2	7.932E+06	13.22E+07	86.993	6.42 V	2.00	8	29.420	29.420	15.00	8	33.621	29.420
October 25	14	58.79	13	50.406	1.3	5.664E+06	2	7.932E+06	13.22E+07	86.993	6.42 V	2.00	8	29.420	29.420	15.00	8	33.621	29.420
October 26	16	67.1608	15	62.962	1.3	5.664E+06	2	7.932E+06	13.22E+07	86.993	6.42 V	2.00	8	29.420	29.420	15.00	8	33.621	29.420

Month	Embryo [Sett./L]	Embryo [Sett./L]	River Temp [deg C]	Flow [m3/s]	Power [W]	Embryo Mass [mg]	River Flow [m3/s]	River Mass [kg]	Min Mass [kg]	Min [kg]	Min Temp [deg C]	Exceedance [1/N]	Difference Between		
													Embryo Temp [deg C]	Embryo Temp [deg C]	
September	18	93,321	10	42,913	1.5	5.664E+06	6	2.664E+07	2.632E+07	48,585	20.40	11.80 N	4	1.515E+07	2.071E+07
October	17	71,993	15	54,598	1.5	5.664E+06	6	2.664E+07	2.632E+07	37,549	13.80 N	4.00	5	3.012E+07	3.587E+07
November	20	83,915	3	12,3935	1.5	5.664E+06	6	2.664E+07	2.632E+07	26,529	6.30 Y	17.00	16	6.041E+07	6.608E+07
December	12	50,406	6	23,204	1.5	5.664E+06	6	2.664E+07	2.632E+07	30,125	7.20 N	6.00	24	9.081E+07	9.629E+07
January	15	62,962	3	12,3935	1.5	5.664E+06	6	2.664E+07	2.632E+07	22,679	5.39 N	12.00	48	1.811E+08	1.868E+08
	17	71,993	0	0.001	1.5	5.664E+06	6	2.664E+07	2.632E+07	23,420	3.20 N	13.00	48	7.621E+08	7.662E+08
February	12	42,913	0	0.001	1.5	5.664E+06	6	2.664E+07	2.632E+07	12,500	3.00 N	10.00	184	1.408E+09	1.408E+09
	14	46,214	2	8,39337	1.5	5.664E+06	6	2.664E+07	2.632E+07	13,431	3.60 Y	18.00			
March	15	54,598	0	0.001	1.5	5.664E+06	6	2.664E+07	2.632E+07	12,500	3.00 N	10.00			
	17	71,993	0	0.001	1.5	5.664E+06	6	2.664E+07	2.632E+07	14,721	3.40 Y	17.00			
April	8	38,621	0	0.001	1.5	5.664E+06	6	2.664E+07	2.632E+07	6,712	1.61 N	8.00			
	10	42,022	0	0.001	1.5	5.664E+06	6	2.664E+07	2.632E+07	8,405	2.01 N	10.00			
May	14	58,321	2	8,39337	1.5	5.664E+06	6	2.664E+07	2.632E+07	18,463	4.39 N	12.00			
	16	67,486	4	16,0778	1.5	5.664E+06	6	2.664E+07	2.632E+07	28,450	6.39 N	12.00			
June	17	71,993	1	4,17102	1.5	5.664E+06	6	2.664E+07	2.632E+07	10,561	2.38 N	7.00			
	9	37,8216	3	12,3935	1.5	5.664E+06	6	2.664E+07	2.632E+07	17,661	4.20 N	6.00			
July	11	46,214	4	16,0778	1.5	5.664E+06	6	2.664E+07	2.632E+07	22,689	5.40 N	7.00			
	13	54,598	6	23,204	1.5	5.664E+06	6	2.664E+07	2.632E+07	31,096	7.39 N	7.00			
August	15	62,962	6	23,204	1.5	5.664E+06	6	2.664E+07	2.632E+07	32,779	7.79 N	8.00			
	17	71,993	0	0.001	1.5	5.664E+06	6	2.664E+07	2.632E+07	6,712	1.61 N	8.00			
September	8	38,621	0	0.001	1.5	5.664E+06	6	2.664E+07	2.632E+07	6,712	1.61 N	8.00			
	10	42,022	0	0.001	1.5	5.664E+06	6	2.664E+07	2.632E+07	8,405	2.01 N	10.00			
October	14	58,321	2	8,39337	1.5	5.664E+06	6	2.664E+07	2.632E+07	18,463	4.39 N	12.00			
	16	67,486	4	16,0778	1.5	5.664E+06	6	2.664E+07	2.632E+07	28,450	6.39 N	12.00			
November	17	71,993	1	4,17102	1.5	5.664E+06	6	2.664E+07	2.632E+07	10,561	2.38 N	7.00			
	9	37,8216	3	12,3935	1.5	5.664E+06	6	2.664E+07	2.632E+07	17,661	4.20 N	6.00			
December	11	46,214	4	16,0778	1.5	5.664E+06	6	2.664E+07	2.632E+07	22,689	5.40 N	7.00			
	13	54,598	6	23,204	1.5	5.664E+06	6	2.664E+07	2.632E+07	31,096	7.39 N	7.00			
January	15	62,962	6	23,204	1.5	5.664E+06	6	2.664E+07	2.632E+07	32,779	7.79 N	8.00			
	17	71,993	0	0.001	1.5	5.664E+06	6	2.664E+07	2.632E+07	6,712	1.61 N	8.00			
February	8	38,621	0	0.001	1.5	5.664E+06	6	2.664E+07	2.632E+07	6,712	1.61 N	8.00			
	10	42,022	0	0.001	1.5	5.664E+06	6	2.664E+07	2.632E+07	8,405	2.01 N	10.00			
March	14	58,321	2	8,39337	1.5	5.664E+06	6	2.664E+07	2.632E+07	18,463	4.39 N	12.00			
	16	67,486	4	16,0778	1.5	5.664E+06	6	2.664E+07	2.632E+07	28,450	6.39 N	12.00			
April	17	71,993	1	4,17102	1.5	5.664E+06	6	2.664E+07	2.632E+07	10,561	2.38 N	7.00			
	9	37,8216	3	12,3935	1.5	5.664E+06	6	2.664E+07	2.632E+07	17,661	4.20 N	6.00			
May	11	46,214	4	16,0778	1.5	5.664E+06	6	2.664E+07	2.632E+07	22,689	5.40 N	7.00			
	13	54,598	6	23,204	1.5	5.664E+06	6	2.664E+07	2.632E+07	31,096	7.39 N	7.00			
June	15	62,962	6	23,204	1.5	5.664E+06	6	2.664E+07	2.632E+07	32,779	7.79 N	8.00			
	17	71,993	0	0.001	1.5	5.664E+06	6	2.664E+07	2.632E+07	6,712	1.61 N	8.00			
July	12	50,406	1	4,17102	1.5	5.664E+06	6	2.664E+07	2.632E+07	13,418	3.20 N	11.00			
	18	75,545	2	8,39337	1.5	5.664E+06	6	2.664E+07	2.632E+07	13,431	3.60 Y	18.00			
August	14	46,214	1	4,17102	1.5	5.664E+06	6	2.664E+07	2.632E+07	12,500	3.00 N	10.00			
	17	71,993	0	0.001	1.5	5.664E+06	6	2.664E+07	2.632E+07	14,721	3.40 Y	17.00			
September	8	38,621	0	0.001	1.5	5.664E+06	6	2.664E+07	2.632E+07	6,712	1.61 N	8.00			
	10	42,022	0	0.001	1.5	5.664E+06	6	2.664E+07	2.632E+07	8,405	2.01 N	10.00			
October	14	58,321	2	8,39337	1.5	5.664E+06	6	2.664E+07	2.632E+07	18,463	4.39 N	12.00			
	16	67,486	4	16,0778	1.5	5.664E+06	6	2.664E+07	2.632E+07	28,450	6.39 N	12.00			
November	17	71,993	1	4,17102	1.5	5.664E+06	6	2.664E+07	2.632E+07	10,561	2.38 N	7.00			
	9	37,8216	3	12,3935	1.5	5.664E+06	6	2.664E+07	2.632E+07	17,661	4.20 N	6.00			
December	11	46,214	4	16,0778	1.5	5.664E+06	6	2.664E+07	2.632E+07	22,689	5.40 N	7.00			
	13	54,598	6	23,204	1.5	5.664E+06	6	2.664E+07	2.632E+07	31,096	7.39 N	7.00			
January	15	62,962	6	23,204	1.5	5.664E+06	6	2.664E+07	2.632E+07	32,779	7.79 N	8.00			
	17	71,993	0	0.001	1.5	5.664E+06	6	2.664E+07	2.632E+07	6,712	1.61 N	8.00			
February	8	38,621	0	0.001	1.5	5.664E+06	6	2.664E+07	2.632E+07	6,712	1.61 N	8.00			
	10	42,022	0	0.001	1.5	5.664E+06	6	2.664E+07	2.632E+07	8,405	2.01 N	10.00			
March	14	58,321	2	8,39337	1.5	5.664E+06	6	2.664E+07	2.632E+07	18,463	4.39 N	12.00			
	16	67,486	4	16,0778	1.5	5.664E+06	6	2.664E+07	2.632E+07	28,450	6.39 N	12.00			
April	17	71,993	1	4,17102	1.5	5.664E+06	6	2.664E+07	2.632E+07	10,561	2.38 N	7.00			
	9	37,8216	3	12,3935	1.5	5.664E+06	6	2.664E+07	2.632E+07	17,661	4.20 N	6.00			
May	11	46,214	4	16,0778	1.5	5.664E+06	6	2.664E+07	2.632E+07	22,689	5.40 N	7.00			
	13	54,598	6	23,204	1.5	5.664E+06	6	2.664E+07	2.632E+07	31,096	7.39 N	7.00			
June	15	62,962	6	23,204	1.5	5.664E+06	6	2.664E+07	2.632E+07	32,779	7.79 N	8.00			
	17	71,993	0	0.001	1.5	5.664E+06	6	2.664E+07	2.632E+07	6,712	1.61 N	8.00			
July	12	50,406	1	4,17102	1.5	5.664E+06	6	2.664E+07	2.632E+07	13,418	3.20 N	11.00			
	18	75,545	2	8,39337	1.5	5.664E+06	6	2.664E+07	2.632E+07	13,431	3.60 Y	18.00			
August	14	46,214	1	4,17102	1.5	5.664E+06	6	2.664E+07	2.632E+07	12,500	3.00 N	10.00			
	17	71,993	0	0.001	1.5	5.664E+06	6	2.664E+07	2.632E+07	14,721	3.40 Y	17.00			
September	8	38,621	0	0.001	1.5	5.664E+06	6	2.664E+07	2.632E+07	6,712	1.61 N	8.00			
	10	42,022	0	0.001	1.5	5.664E+06	6	2.664E+07	2.632E+07	8,405	2.01 N	10.00			
October	14	58,321	2	8,39337	1.5	5.664E+06	6	2.664E+07	2.632E+07	18,463	4.39 N	12.00			
	16	67,486	4	16,0778	1.5	5.664E+06	6	2.664E+07	2.632E+07	28,450	6.39 N	12.00			
November	17	71,993	1	4,17102	1.5	5.664E+06	6	2.664E+07	2.632E+07	10,561	2.38 N	7.00			
	9	37,8216	3	12,3935	1.5	5.664E+06	6	2.664E+07	2.632E+07	17,661	4.20 N	6.00			
December	11	46,214	4	16,0778	1.5	5.664E+06	6	2.664E+07	2.632E+07	22,689	5.40 N	7.00			
	13	54,598	6	23,204	1.5	5.664E+06	6	2.664E+07	2.632E+07	31,096	7.39 N	7.00			
January	15	62,962	6	23,204	1.5	5.664E+06	6	2.664E+07	2.632E+07	32,779	7.79 N	8.00			
	17	71,993	0	0.001	1.5	5.664E+06	6	2.664E+07	2.632E+07	6,712	1.61 N	8.00			
February	8	38,621	0	0.001	1.5	5.664E+06	6	2.664E+07	2.632E+07	6,712	1.61 N	8.00			
	10	42,022	0	0.001	1.5	5.664E+06	6	2.664E+07	2.632E+07	8,405	2.01 N	10.00			
March	14	58,321	2	8,39337	1.5	5.664E+06	6								

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Month	Temp [C]	Effluent [mg/L]	River Temp [C]	Effluent [mg/L]	Flow [m³/d]	River Flow [m³/d]	Min Mass [kg/d]	Min [mg/L]	Max Temp [C]	Exceedance [%]	Difference between Effluent Temp and River Temp [C]	River Flow [m³/d]	River Mass [kg/d]	Min Mass [kg/d]	Temp [C]	Effluent [mg/L]	Temp [C]	Effluent [mg/L]	
September	19	79.7234	16	67.1666	2	7.351E+06	4.13E+07	59.425	16.35 N	14.99 N	5.00	4	1.10E+07	2.28E+07	0.01	10	42.021	17	79.7234
October	17	61.982	10	42.021	2	7.351E+06	4.13E+07	40.482	10.91 N	9.69 N	9.00	16	6.04E+07	6.79E+07	15	72.8257	16	67.1666	
November	15	61.982	2	8.383E+03	2	7.351E+06	4.13E+07	18.310	4.96 N	4.96 N	13.00	24	9.05E+07	9.81E+07	20	83.915	14	58.79	
December	14	61.982	7	29.4208	2	7.351E+06	4.13E+07	37.313	8.45 N	8.45 N	8.00	48	1.81E+08	1.88E+08	13	54.598	13	54.598	
January	14	54.598	3	11.7925	2	7.351E+06	4.13E+07	20.995	4.99 N	4.99 N	11.00	96	3.62E+08	3.70E+08	12	50.406	12	50.406	
February	11	48.214	0	0.001	2	7.351E+06	4.13E+07	8.409	2.00 N	2.00 N	11.00	192	7.25E+08	7.42E+08	9	37.8216	9	37.8216	
March	13	61.982	0	0.001	2	7.351E+06	4.13E+07	11.432	2.73 N	2.73 N	13.00	384	1.40E+09	1.43E+09	8	33.6212	8	33.6212	
April	10	42.021	0	0.001	2	7.351E+06	4.13E+07	6.877	1.64 N	1.64 N	9.00	768	2.79E+09	2.82E+09	7	29.4208	7	29.4208	
May	10	42.021	0	0.001	2	7.351E+06	4.13E+07	7.642	1.82 N	1.82 N	10.00	1536	5.45E+09	5.49E+09	6	18.8079	6	18.8079	
June	13	54.598	0	0.001	2	7.351E+06	4.13E+07	9.326	2.37 N	2.37 N	10.00	3072	1.10E+10	1.11E+10	5	14.7102	5	14.7102	
July	13	54.598	0	0.001	2	7.351E+06	4.13E+07	12.345	6.72 N	6.72 N	7.00	6144	2.22E+10	2.24E+10	4	11.7925	4	11.7925	
August	12	50.406	4	16.8077	2	7.351E+06	4.13E+07	22.917	5.42 N	5.42 N	8.00	12288	4.44E+10	4.48E+10	3	8.383E+03	3	8.383E+03	
September	10	42.021	0	0.001	2	7.351E+06	4.13E+07	7.642	1.82 N	1.82 N	10.00	24576	8.88E+10	9.00E+10	2	4.00E+06	2	4.00E+06	
October	9	37.8216	0	0.001	2	7.351E+06	4.13E+07	6.877	1.64 N	1.64 N	9.00	49152	1.78E+11	1.80E+11	1	3.00E+06	1	3.00E+06	
November	12	50.406	8	33.6212	2	7.351E+06	4.13E+07	36.673	10.25 N	10.25 N	4.00	98304	3.56E+11	3.60E+11	0	0.00E+00	0	0.00E+00	
December	13	54.598	10	42.021	2	7.351E+06	4.13E+07	48.356	12.73 N	12.73 N	3.00	196608	7.12E+11	7.20E+11	0	0.00E+00	0	0.00E+00	
January	14	54.598	10	42.021	2	7.351E+06	4.13E+07	48.071	10.73 N	10.73 N	4.00	393216	1.42E+12	1.44E+12	0	0.00E+00	0	0.00E+00	
February	11	48.214	9	37.8216	2	7.351E+06	4.13E+07	43.546	9.36 N	9.36 N	2.00	786432	2.84E+12	2.88E+12	0	0.00E+00	0	0.00E+00	
March	12	50.406	10	42.021	2	7.351E+06	4.13E+07	43.546	10.36 N	10.36 N	3.00	1572864	5.68E+12	5.76E+12	0	0.00E+00	0	0.00E+00	
April	12	50.406	9	37.8216	2	7.351E+06	4.13E+07	40.110	9.54 N	9.54 N	3.00	3145728	1.14E+13	1.16E+13	0	0.00E+00	0	0.00E+00	

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The following spreadsheet shows the amount of thermal energy needed to melt the mass of the ice in the mixing zone. The spreadsheet shows the number of freezing degree days and thawing degree days each month to the extent of the available data (August 2016). The spreadsheet also shows which months ice was created and melted, along with the mass of the ice in the thermal mixing zone and heat of fusion of the mass of ice. The result of the spreadsheet shows that the amount of thermal energy needed to melt the mass of ice in the mixing zone is tens of thousands of times more than the amount of thermal energy in the effluent or river.

	Cooling Degree Day (deg C) (based on 0 deg C)	Heating Degree Day (deg C) (based on 0 deg C)	Freezing Degree Day (deg C) (based on 0 deg C)	Thawing Degree Day (deg C) (based on 0 deg C)	Ice Created (cm), $h = \alpha V / DD$, $\alpha = 1.4$	Ice Thawed (cm), $h = \alpha V / DD$, $\alpha = 1.4$	Ice Thickness (cm)	Ice Thickness (ft)	Ice Thickness (kg/m ³)	Heat of Fusion (kJ/m ²) (Heat of Fusion = 334 kJ/kg)	Heat of Fusion (kJ/kg) for 490 m ² area
8/1/2016	603	0	-603	0	603	0.0	34.4	0.0	0.00	0.000E+00	0.000E+00
9/1/2016	420	0	-420	0	420	0.0	28.7	0.0	0.00	0.000E+00	0.000E+00
10/1/2016	224	4	-220	0	220	0.0	20.8	0.0	0.00	0.000E+00	0.000E+00
11/1/2016	134	34	-100	0	100	0.0	14.0	0.0	0.00	0.000E+00	0.000E+00
12/1/2016	3	361	358	358	0	26.5	0.0	26.5	0.9	242.91	8.113E+04
1/1/2017	4	338	334	334	0	25.6	0.0	25.6	0.8	234.62	7.836E+04
2/1/2017	37	188	151	151	0	17.2	0.0	17.2	0.6	157.76	5.669E+04
3/1/2017	107	116	9	9	0	4.2	0.0	21.4	0.7	196.27	6.555E+04
4/1/2017	181	16	-165	0	165	0.0	18.0	3.4	0.1	31.36	1.048E+04
5/1/2017	388	0	-388	0	388	0.0	27.6	-24.2	-0.8	-221.52	-7.399E+07
6/1/2017	537	0	-537	0	537	0.0	32.4	0.00	0.00	0.000E+00	0.000E+00
7/1/2017	743	0	-743	0	743	0.0	36.2	0.00	0.00	0.000E+00	0.000E+00
8/1/2017	572	0	-572	0	572	0.0	33.5	0.00	0.00	0.000E+00	0.000E+00
9/1/2017	437	0	-437	0	437	0.0	29.3	0.00	0.00	0.000E+00	0.000E+00
10/1/2017	231	18	-213	0	213	0.0	20.4	0.00	0.00	0.000E+00	0.000E+00
11/1/2017	72	97	25	25	0	7.0	0.0	21.7	0.7	198.89	6.643E+04
12/1/2017	28	268	240	240	0	21.7	0.0	22.2	0.7	203.39	6.793E+04
1/1/2018	15	266	251	251	0	22.2	0.0	22.2	0.9	249.93	8.348E+04
2/1/2018	2	381	379	379	0	27.3	0.0	27.3	0.4	116.25	3.883E+04
3/1/2018	24	106	82	82	0	12.7	0.0	12.7	0.1	16.81	5.615E+03
4/1/2018	136	76	-60	0	60	0.0	10.8	1.8	-0.9	-262.99	-8.784E+04
5/1/2018	475	0	-475	0	475	0.0	30.5	-28.7	0.00	0.000E+00	0.000E+00
6/1/2018	560	0	-560	0	560	0.0	33.1	0.00	0.00	0.000E+00	0.000E+00
7/1/2018	636	0	-636	0	636	0.0	35.3	0.00	0.00	0.000E+00	0.000E+00
8/1/2018	628	0	-628	0	628	0.0	35.1	0.00	0.00	0.000E+00	0.000E+00
9/1/2018	376	1	-375	0	375	0.0	27.1	0.00	0.00	0.000E+00	0.000E+00
10/1/2018	167	16	-151	0	151	0.0	17.2	0.4	115.54	3.859E+04	
11/1/2018	34	115	81	81	0	12.6	0.0	12.6	0.5	140.63	4.697E+04
12/1/2018	26	146	120	120	0	15.3	0.0	15.3	0.7	197.22	6.587E+04
1/1/2019	14	250	236	236	0	21.5	0.0	21.5	1.0	285.92	9.550E+04
2/1/2019	4	500	496	496	0	31.2	0.0	31.2	1.6	441.57	1.475E+05
3/1/2019	37	184	147	147	0	17.0	0.0	48.2	1.0	270.29	9.028E+04
4/1/2019	192	14	-178	0	178	0.0	18.7	29.5	0.2	-238.23	-7.957E+04
5/1/2019	283	2	-281	0	281	0.0	23.5	6.0	55.08	1.840E+04	9.015E+06
6/1/2019	522	0	-522	0	522	0.0	32.0	-26.0	-0.9	-238.23	-7.957E+04
7/1/2019	633	0	-633	0	633	0.0	35.2	0.00	0.00	0.000E+00	0.000E+00

APPENDIX D – RESPONSE TO COMMENTS

Comments received during the public comment period will be reviewed and addressed here.