Wastewater Annual Report 2014

MoE Permit Number 203

February 26, 2015

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Executive Summary

The Wastewater Annual Report is produced in compliance with Section 5.3 of Waste Discharge Permit 203, issued by the Ministry of Environment to the City of Enderby. Enderby possesses a Class II Wastewater Collections System and a Class III Wastewater Reclamation Facility (WWRP). It provides primary and secondary treatment prior to discharge into the receiving environment.

The WWRP produced excellent quality of effluent in 2014. The average effluent flow was 2,033 m^3 per day, which is an increase of 23 m^3 per day from the 2013 average. However, the maximum daily flow was reduced from its 2013 value of 4,551 m^3 to 3,683 m^3.

There was 1 day, July 24, 2014, when the WWRP operated in excess of its discharge limit. During this period, the quality of effluent remained within permit parameters despite the volume increase. The excess flow was reported to the Ministry of Environment. There were no overflow events. The collection system and, by extension, the WWRP, is affected by areas of high inflow and infiltration.

As of 2014, the City of Enderby has a Systems Operator with Level I Wastewater Treatment certification, a Lead Hand who has completed Wastewater Collections I, a Utility III worker with his Wastewater Treatment I (Multi-Utility) certification, and two junior Operators-in-Training. Corix Utilities provides oversight and guidance in fulfillment of certification requirements.

Overview

The Wastewater Annual Report is produced in compliance with Section 5.3 of Waste Discharge Permit 203, issued by the Ministry of Environment to the City of Enderby. The permit was first issued in October 4, 1967. It was most recently amended on June 25, 2014.

Enderby is located in the North Okanagan Region of British Columbia. It is 4.26 km^2 in size and has a population of 2,932 persons (2011 Census). Enderby possesses a Class II Wastewater Collection System and a Class III Wastewater Reclamation Facility (WWRP). It provides primary and secondary treatment prior to discharge into the receiving environment. The City of Enderby Public Works staff operates the WWRP. Corix Utilities provides oversight and guidance.

The WWRP was built in 1967 and services the majority of the population of the City of Enderby, as well as several customers on the Splatsin reserve. It is located along the bank of the Shuswap River. Effluent from the WWRP is discharged into the Shuswap River. In 2003, the facility was upgraded with the addition of UV disinfection. In 2009, the facility commissioned a new circular clarifier. In 2011, the facility had a centrifuge installed to improve sludge handling.

The WWRP produced excellent quality effluent in 2014. The average effluent flow was 2,033 m^3 per day, which is an increase of 23 m^3 per day from the 2013 average. However, the maximum daily flow experienced a reduction its 2013 high of 4,551 m^3 to 3,683 m^3 on July 24, 2014.

The collection system consists of 23,750 meters of pipe and 9 lift stations located at: Peacher Crescent; Red Rock Crescent; Princess Street; Meadow Crescent; Brickyard Road; Kate Street; Kildonan Avenue; Riverdale Drive; and McGowan Street.

The collection system is operating reasonably well considering the age of the infrastructure. However, it is negatively affected by areas of high inflow and infiltration.

The City of Enderby is also compliant with the Government of Canada Effluent Regulatory Reporting requirements, which includes completion of an Identification Report and quarterly Monitoring Reports.

Permit

Waste Discharge Permit 203 was first issued on October 4, 1967. It was most recently amended on June 25, 2014. In accordance with Permit 203, the City of Enderby is authorized to discharge effluent to the Shuswap River from a municipal sewage plant subject to the following conditions:

1. The maximum authorized rate of discharge is 3,400 m^3 per day.

2. The characteristics of the effluent shall be equivalent or better than:
    a. 5-day Biochemical Oxygen Demand of 45 mg/L;
    b. Total Suspended Solids of 45 mg/L;
    c. When chlorine is used, a free chlorine residual prior to dechlorination of between 0.5 mg/L and 1.0 mg/L and not less than one hour's contact time at average flow rates;
    d. When chlorine is used, dechlorinated prior to discharge to reduce the free chlorine residual below detectable limits;

3. Sample on a monthly basis that is analysed for:
    a. Total Suspended Solids;
    b. Biochemical Oxygen Demand;
    c. Ammonia;
    d. Total Nitrogen;
    e. Total Phosphorus and Orthophosphate;
    f. pH;
    g. Temperature.

4. Samples twice per month for E. coli;

5. Sample the receiving environment upstream and downstream of the outfall on a quarterly basis for ammonia, total nitrogen, total phosphorous, orthophosphate, and E. coli;

6. Sample the compostable sludge twice per year in accordance with the *Organic Matter Recycling Regulation* for Class B biosolids.

7. Complete an Annual Report.

Under the amended permit, the WWRP only needs to use chlorine when its UV system cannot disinfect adequately; this is often the result of high flow rates or high turbidity. The amended permit also specifies requirements for spill reporting and response in the event of compromised operations. The City of Enderby was also required to complete and Inflow and Infiltration Management Plan by December 31, 2014.

Operators

As of December 31, 2014, the City of Enderby has a Systems Operator with Wastewater Treatment I, a Lead Hand who has completed Wastewater Collections I, a Utility Operator III with Wastewater Treatment I, and two Operators-in-Training. Corix Utilities has been retained under contract to provide oversight and fulfill certification requirements.

Operator	Position	Certification
Clayton Castle	Lead Hand	WWC I
Kevin Walters	Systems Operator I	WWT I
Jamie Prevost	Utility Operator III	OIT
Robert Hubley	Utility Operator III	OIT
Ray Brown	Utility Operator III	WWT I
WWT – Wastewater Treatment, WWC – Wastewater Collection, OIT – Operator in Training		

The City commenced its Chief Operator contract with Corix Utilities in 2012 to comply with certification requirements for operating the WWRP. The City has also identified training targets for staff focusing on wastewater operations. In 2015, the Systems Operator I will enroll in Wastewater Treatment II.

Excess Discharges, Overflows, Inflow and Infiltration

Excess Discharges

There was one day of excess discharge in 2014. On July 24, 2014, the daily discharge was 3,683 m^3. During this period, the quality of effluent remained within permit parameters. The excess discharge event was reported to the Ministry of Environment and procedures for compromised operations were followed.

Overflows

There were no overflow events in 2014.

Inflow and Infiltration

Inflow & Infiltration (I/I) refers to rainwater and groundwater entering the sanitary sewer system through defects associated with design or degradation of the system or unlawful connections made to the system. I/I costs money as it contributes unnecessarily to the total flows. This unnecessary flow must, like all other wastewater, be pumped and treated. This capacity is better reserved for future customers, as this helps spread the burden of paying for the operation of the sanitary sewer system. Reducing I/I also helps to defer costly capacity-related infrastructure upgrades. Measures are being undertaken to reduce I/I.

A base infiltration rate of 20-25% of average daily flows is common in most municipalities. This is consistent with the textbook recommendation of 12 m^3 per day per kilometer of sewer line. Given Enderby's 23.75 kilometers of sewer line, the textbook calculation would expect a base infiltration rate of 285 m^3 per day. Assuming an average daily flow of 1,200 m^3 per day, Enderby's base infiltration should be 240-300 m^3 per day; however, base infiltration is approximately 500 m^3 per day , which is 65% higher than typical values.

The City of Enderby was required, as part of its amended permit, to produce an Inflow and Infiltration (I/I) Management Plan. This plan was submitted to the Ministry of Environment on December 31, 2014. It was received by Enderby City Council in public meeting on February 16, 2015.

This Plan commits to four targets: reducing I/I from 65% to 50% of base daily flows within 10 years, reducing maximum daily flows to less than the maximum daily discharge as specified in the Permit for extreme weather events with less than a 5-year return interval within 10 years, completing a flood response strategy for the mitigation of I/I impacts prior to 2016, and reporting regularly on I/I in the Wastewater Annual Report.

In 2014, the City spent, or has committed to spending, $117,000 to renew the Mill Avenue sanitary sewer main from George Street to Maud Street, and along Belvedere Street from Cliff Avenue to Mill Avenue. During reconstruction of Mill Avenue, a roof drain was observed to be plumbed into the sanitary sewer system; the property owner has been given a timeline for re-

plumbing the roof drains. In December 2014, an abandoned, uncapped service line near George Street was discovered and plugged in order to address a significant source of infiltration. Moreover, cracked asphalt around a number of sanitary sewer manholes has been renewed.

In 2015, the City intends to commence planning for separating the combined sewer on Peacher Crescent, Red Rock Crescent, and potentially a storm drain on Revel Crescent. Remediation will prove to be capital-intensive and likely subject to grant funding.

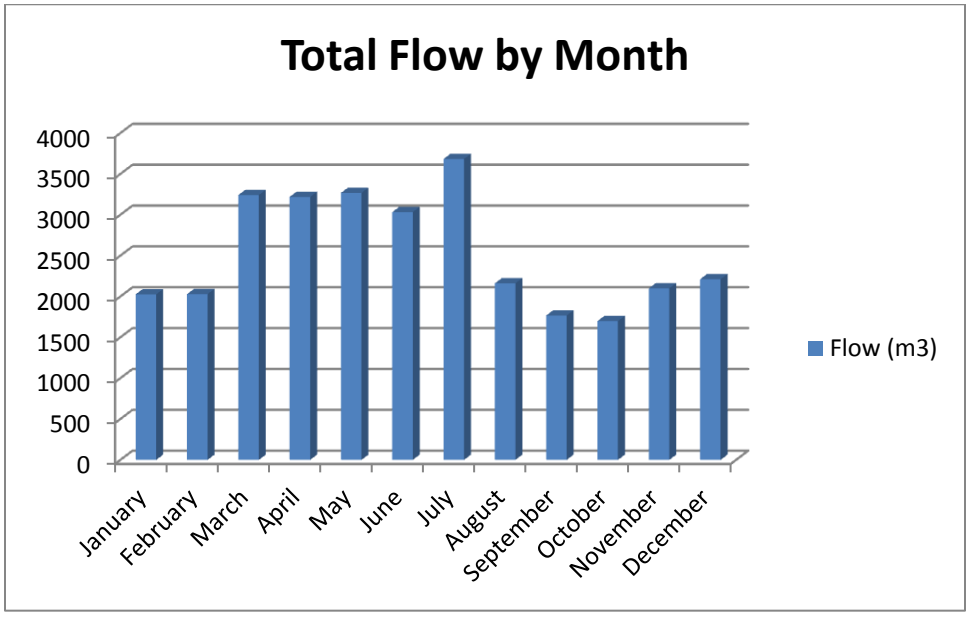
Infrastructure Value, Deficit and Renewal

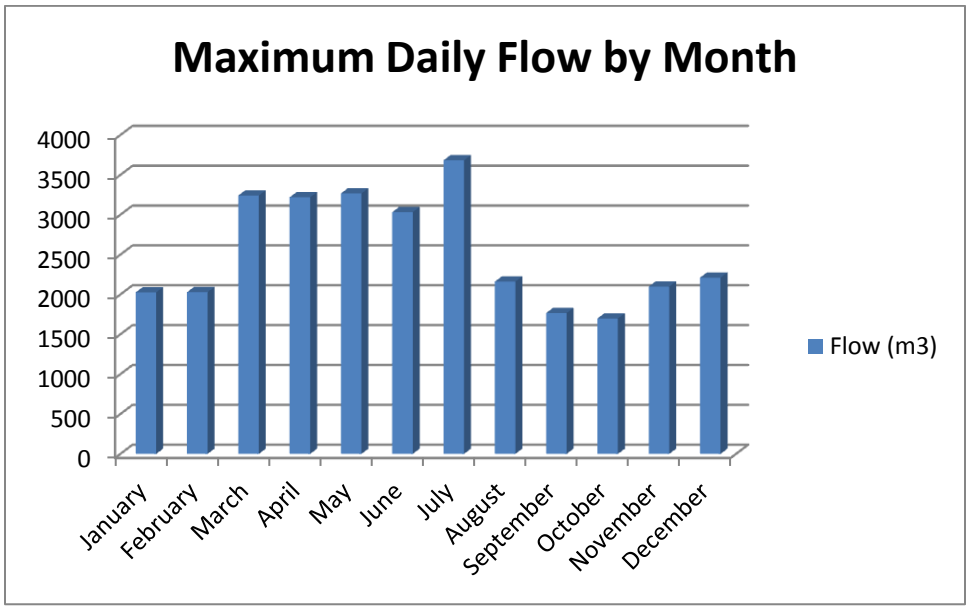
The City of Enderby's wastewater system, inclusive of treatment and collection, has a replacement value of $24,332,896. The total loss in value to the system, representing the City's infrastructure deficit, is $11,722,936. The remaining value is $12,609,960. In 2014, the City contributed $128,231 to its sewer reserve fund. It withdrew 44,554 from its sewer reserve fund. After adding interest earned, the balance as of December 31, 2014 is $409,090.

In order to deal with its infrastructure deficit, the City has committed to increasing its sewer revenues by a minimum of 1% per year, which will be invested in recapitalization. While this amount represents a relatively small proportion of the shortfall, it is hoped that the demonstrated commitment to infrastructure renewal and asset management can position the City to partner with senior government on future infrastructure grant programs.

Note that there were some changes made to the overall valuation of the water system as a result of the completion of the City's asset management inventory in early 2014, which resulted in a reduction of the replacement and depreciation values.

Flow Data Monthly and Historical Trends





There was a decrease in both the average daily flows and the maximum daily flows in 2014.

All units in m^3	2014	2013	2012	2011	2010	2009	2008
Average Daily Flow	2033	2010	2165	1954	1690	1787	1725
Maximum Daily Flow	3683	4551	5681	3305	3152	2981	2631

Effluent Laboratory Analytical Data

January

Nitrogen, Nitrate as N	21.3
Nitrogen, Nitrite as N	<0.010
Phosphate, Ortho as P	2.53
Temperature	21.1
BOD, 5-day Carbonaceous	<10
Chemical Oxygen Demand	19
Nitrogen, Ammonia as N, Total	0.071
Nitrogen, Total Kjeldahl	4.58
Phosphorus, Total Kjeldahl	2.94
Phosphorus, Total Kjeldahl Dissolved	2.62
Solids, Total Suspended	3
Solids, Volatile Suspended	3
Turbidity	2.6
pH	6.98
Conductivity (EC)	542
Nitrogen, Ammonia as N, Un-Ionized	<0.001
Nitrogen, Nitrate+Nitrite as N	21.3
Nitrogen, Total	25.9
Coliforms, Total (MPN)	23
Coliforms, Fecal (MPN)	9.1
E. coli (MPN)	9.1

February

Nitrogen, Nitrate as N	13.6
Nitrogen, Nitrite as N	<0.010
Phosphate, Ortho as P	1.26
Temperature	22.5
BOD, 5-day Carbonaceous	<10
Chemical Oxygen Demand	28
Nitrogen, Ammonia as N, Total	0.156
Nitrogen, Total Kjeldahl	2.27
Phosphorus, Total Kjeldahl	3.52
Phosphorus, Total Kjeldahl Dissolved	2.38
Solids, Total Suspended	1
Solids, Volatile Suspended	1

Turbidity	1.9
pH	7.08
Conductivity (EC)	507
Nitrogen, Ammonia as N, Un-Ionized	0.001
Nitrogen, Nitrate+Nitrite as N	13.6
Nitrogen, Total	15.8
Coliforms, Total (MPN)	93
Coliforms, Fecal (MPN)	9.1
E. coli (MPN)	3.6

March

Nitrogen, Nitrate as N	7.83
Nitrogen, Nitrite as N	<0.010
Phosphate, Ortho as P	0.01
Temperature	22.7
BOD, 5-day Carbonaceous	<10
Chemical Oxygen Demand	19
Nitrogen, Ammonia as N, Total	0.132
Nitrogen, Total Kjeldahl	1.93
Phosphorus, Total Kjeldahl	0.61
Phosphorus, Total Kjeldahl Dissolved	0.57
Solids, Total Suspended	1
Solids, Volatile Suspended	1
Turbidity	1.7
pH	7.74
Conductivity (EC)	743
Nitrogen, Ammonia as N, Un-Ionized	0.003
Nitrogen, Nitrate+Nitrite as N	7.83
Nitrogen, Total	9.76
Coliforms, Total (MPN)	23
Coliforms, Fecal (MPN)	<3.0
E. coli (MPN)	<3.0

April

Nitrogen, Nitrate as N	12.2
Nitrogen, Nitrite as N	<0.010
Phosphate, Ortho as P	0.64
Temperature	22
BOD, 5-day Carbonaceous	<10

Chemical Oxygen Demand	24
Nitrogen, Ammonia as N, Total	0.051
Nitrogen, Total Kjeldahl	1.54
Phosphorus, Total Kjeldahl	1.77
Phosphorus, Total Kjeldahl Dissolved	1.69
Solids, Total Suspended	2
Solids, Volatile Suspended	2
Turbidity	1.8
pH	7.44
Conductivity (EC)	682
Nitrogen, Ammonia as N, Un-Ionized	<0.001
Nitrogen, Nitrate+Nitrite as N	12.2
Nitrogen, Total	13.7
Coliforms, Total (MPN)	150
Coliforms, Fecal (MPN)	43
E. coli (MPN)	43

May

Nitrogen, Nitrate as N	16.3
Nitrogen, Nitrite as N	<0.010
Phosphate, Ortho as P	0.36
Temperature	22
BOD, 5-day Carbonaceous	<10
Chemical Oxygen Demand	22
Nitrogen, Ammonia as N, Total	0.076
Nitrogen, Total Kjeldahl	1.42
Phosphorus, Total Kjeldahl	3.75
Phosphorus, Total Kjeldahl Dissolved	2.62
Solids, Total Suspended	2
Solids, Volatile Suspended	2
Turbidity	2.2
pH	7.5
Conductivity (EC)	603
Nitrogen, Ammonia as N, Un-Ionized	0.001
Nitrogen, Nitrate+Nitrite as N	16.3
Nitrogen, Total	17.7
Coliforms, Total (MPN)	9.1
Coliforms, Fecal (MPN)	3.6
E. coli (MPN)	<3.0

June

Nitrogen, Nitrate as N	11.5
Nitrogen, Nitrite as N	<0.010
Phosphate, Ortho as P	1.18
Temperature	21
BOD, 5-day Carbonaceous	<10
Chemical Oxygen Demand	14
Nitrogen, Ammonia as N, Total	0.046
Nitrogen, Total Kjeldahl	1.29
Phosphorus, Total Kjeldahl	2.09
Phosphorus, Total Kjeldahl Dissolved	1.9
Solids, Total Suspended	3
Solids, Volatile Suspended	8
Turbidity	1.7
pH	6.93
Conductivity (EC)	586
Nitrogen, Ammonia as N, Un-Ionized	<0.001
Nitrogen, Nitrate+Nitrite as N	11.5
Nitrogen, Total	12.8
Coliforms, Total (MPN)	6.2
Coliforms, Fecal (MPN)	<3.0
E. coli (MPN)	<3.0

July

Coliforms, Total	DGT8
Background Colonies	> 200
E. coli	<1
Coliforms, Total	DGT14
Background Colonies	> 200
E. coli	<1
Alkalinity, Total as CaCO3	
Nitrogen, Nitrate as N	21.5
Nitrogen, Nitrite as N	<0.010
Phosphate, Ortho as P	1.94
Temperature	22
BOD, 5-day Carbonaceous	<10
Chemical Oxygen Demand	16
Nitrogen, Ammonia as N, Total	0.076
Nitrogen, Total Kjeldahl	0.84
Phosphorus, Total Kjeldahl	8.59
Phosphorus, Total Kjeldahl	4.91

Dissolved	
Solids, Total Suspended	2
Solids, Volatile Suspended	2
Turbidity	1.8
pH	7
Conductivity (EC)	559
Nitrogen, Ammonia as N, Un-Ionized	<0.001
Nitrogen, Nitrate+Nitrite as N	21.5
Nitrogen, Total	22.3
Coliforms, Total (MPN)	150
Coliforms, Fecal (MPN)	<3.0
E. coli (MPN)	<3.0

August

Coliforms, Total (MPN)	240
Coliforms, Fecal (MPN)	3.6
E. coli (MPN)	3.6
Alkalinity, Total as CaCO3	
Nitrogen, Nitrate as N	22.1
Nitrogen, Nitrite as N	0.074
Phosphate, Ortho as P	1.22
Temperature	23
BOD, 5-day Carbonaceous	<10
Chemical Oxygen Demand	23
Nitrogen, Ammonia as N, Total	0.147
Nitrogen, Total Kjeldahl	1.84
Phosphorus, Total Kjeldahl	3.19
Phosphorus, Total Kjeldahl Dissolved	3.09
Solids, Total Suspended	<1
Solids, Volatile Suspended	<1
Turbidity	1.5
pH	7.26
Conductivity (EC)	499
Nitrogen, Ammonia as N, Un-Ionized	0.001
Nitrogen, Nitrate+Nitrite as N	22.1
Nitrogen, Total	24
Coliforms, Total (MPN)	1100
Coliforms, Fecal (MPN)	93
E. coli (MPN)	93

September

Coliforms, Total (MPN)	43
Coliforms, Fecal (MPN)	9.1
E. coli (MPN)	3.6
Coliforms, Total (MPN)	23
Coliforms, Fecal (MPN)	3.6
E. coli (MPN)	3.6
Coliforms, Total (MPN)	93
Coliforms, Fecal (MPN)	15
E. coli (MPN)	9.1
Nitrogen, Nitrate as N	23
Nitrogen, Nitrite as N	0.022
Phosphate, Ortho as P	1.07
Temperature	22
Alkalinity, Total as CaCO3	
BOD, 5-day Carbonaceous	<10
Chemical Oxygen Demand	17
Nitrogen, Ammonia as N, Total	0.114
Nitrogen, Total Kjeldahl	1.6
Phosphorus, Total Kjeldahl	4.45
Phosphorus, Total Kjeldahl Dissolved	3.14
Solids, Total Suspended	3
Solids, Volatile Suspended	3
Turbidity	2.4
pH	6.93
Conductivity (EC)	463
Nitrogen, Ammonia as N, Un-Ionized	<0.001
Nitrogen, Nitrate+Nitrite as N	23
Nitrogen, Total	24.6
Coliforms, Total (MPN)	43
Coliforms, Fecal (MPN)	23
E. coli (MPN)	9.1

October

Coliforms, Total (MPN)	4600
Coliforms, Fecal (MPN)	23
E. coli (MPN)	3.6
Nitrogen, Nitrate as N	29.5
Nitrogen, Nitrite as N	0.034
Phosphate, Ortho as P	1.04
Temperature	21

Alkalinity, Total as CaCO3	
BOD, 5-day Carbonaceous	<10
Chemical Oxygen Demand	10
Nitrogen, Ammonia as N, Total	0.145
Nitrogen, Total Kjeldahl	1.54
Phosphorus, Total Kjeldahl	5
Phosphorus, Total Kjeldahl Dissolved	3.62
Solids, Total Suspended	3
Solids, Total Volatile	184
Solids, Volatile Suspended	
Turbidity	1.7
pH	7.02
Conductivity (EC)	481
Nitrogen, Ammonia as N, Un-Ionized	<0.001
Nitrogen, Nitrate+Nitrite as N	29.5
Nitrogen, Total	31
Coliforms, Total (MPN)	4600
E. coli (MPN)	3.6

November

Coliforms, Total (MPN)	91
E. coli (MPN)	3.6
Nitrogen, Nitrate as N	24.3
Nitrogen, Nitrite as N	0.078
Phosphate, Ortho as P	2.59
Temperature	21
Alkalinity, Total as CaCO3	
BOD, 5-day Carbonaceous	<10
Chemical Oxygen Demand	13
Nitrogen, Ammonia as N, Total	0.093
Nitrogen, Total Kjeldahl	1.58
Phosphorus, Total Kjeldahl	3.32
Phosphorus, Total Kjeldahl Dissolved	2.62
Solids, Total Suspended	1
Solids, Volatile Suspended	1
Turbidity	1.2
pH	7.4
Conductivity (EC)	493
Nitrogen, Ammonia as N, Un-Ionized	<0.001
Nitrogen, Nitrate+Nitrite as N	24.4

Nitrogen, Total	26
Coliforms, Total (MPN)	460
Coliforms, Fecal (MPN)	43
E. coli (MPN)	43

December

Nitrate as N	17.7
Nitrite as N	0.115
Phosphate, Ortho as P	1.73
Temperature	22
Alkalinity, Total as CaCO3	
BOD, 5-day Carbonaceous	<10
Chemical Oxygen Demand	16
Ammonia as N, Total	0.072
Nitrogen, Total Kjeldahl	1.32
Phosphorus, Total Kjeldahl	2.21
Phosphorus, Total Kjeldahl Dissolved	1.74
Solids, Total Suspended	<1
Solids, Volatile Suspended	<1
Turbidity	0.8
pH	7.72
Conductivity (EC)	599
Ammonia as N, Un-Ionized	0.002
Nitrate+Nitrite as N	17.8
Nitrogen, Total	19.1
Coliforms, Total (MPN)	3.6
Coliforms, Fecal (MPN)	<3.0
E. coli (MPN)	<3.0