Regional District of East Kootenay

Annual Water Systems Report

REGIONAL DISTRICT OF EAST KOOTENAY

2016

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1. RDEK Water Systems Overview

The RDEK strives to provide a safe and reliable water supply to all of its customers. As required by the Drinking Water Protection Act, this annual public report is intended to inform the public of the water systems owned and operated by the RDEK and provide details on water quality, system maintenance and improvements, water conservation tactics, and more. The RDEK's six certified water operators ensure systems operations are in compliance with regulations set out by the BC Interior Health Authority (IHA).

RDEK Operated Water Systems:

Water Systems	EOCP #	# of Connections
Windermere	1098	578
Timber Ridge	1099	346
Holland Creek	N/A	372
Edgewater	649	457
Rushmere	1854	33
Spur Valley	2421	73
Moyie	N/A	69
Elko	N/A	59

2. Water Treatment Objectives

The Canadian Drinking Water Guidelines, developed by Health Canada, are designed to protect the health of community members and in particular those most vulnerable children, the elderly, and individuals with compromised immune systems. The parameters set out in those guidelines are the performance goals every water system should strive to achieve in order to provide the cleanest, safest and most reliable drinking water possible.

A Maximum Acceptable Concentration (MAC) level has been established by Health Canada for microbiological criteria. Each MAC has been designed to safeguard health, assuming a lifelong consumption of drinking water containing the substances at the maximum concentration level.

Aesthetic Objectives (AO) apply to characteristics of drinking water that can affect its acceptance by consumers. These would include such criteria as taste, odour, and appearance. Some AO's, like turbidity, could pose a health risk to some at-risk consumers if the MAC levels are exceeded.

In the East Kootenay, the IHA acts as the water quality regulator by issuing operating permits and placing conditions on those permits. Those conditions are generally found in the BC Drinking Water Protection Act and the Canadian Drinking Water Guidelines.

IHA uses the 4-3-2-1-0 treatment objective to ensure waterborne illnesses are not jeopardizing the public's health:

- Based on Canadian Drinking Water Quality Guidelines.
- 4 log (99.99%) inactivation of viruses.
- 3 log (99.9%) inactivation of or removal of Giardia and Cryptosporidium.

- 2 treatment processes for surface water (typically this includes filtration and disinfection).
- 1 for <1 Nephelometric Turbidity Units (NTU) of turbidity (with a target of 0.1 NTU).
- 0 fecal coliform and E. Coli.

3. Water Quality Monitoring

Monitoring programs are established as required by IHA Regulations, Operating Permit, and the Drinking Water Officer. Bacteriological testing is a major requirement and is performed weekly in every RDEK water system. Samples are submitted to an approved lab where they are tested for Total Coliform and E. Coli Bacteria.

Coliforms:

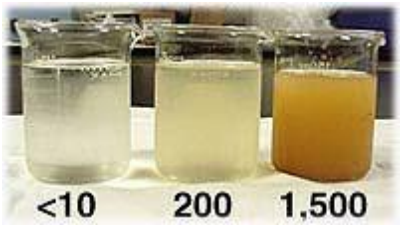
The presence of total coliforms in the water system is an indicator that the system is experiencing re-growth of pathogens, that infiltration has occurred, or that it has not been properly treated at source. It is an indication that potential exists for bacteria causing adverse health effects. The MAC for total coliform in all RDEK operated water systems is 0 per 100 mL. If a sample comes back positive for coliform, operators review sampling practices and system operations anomalies, and a re-sample is conducted. If that result is positive then the main is flushed, monitored, and tested again. If the third result is positive, the main is taken out of service, chlorinated, flushed and remains out of service until acceptable results are obtained.

E. coli:

Escherichia coli is one species in the fecal coliform group and is a definite indicator of the presence of feces in the distribution system. The MAC for E.coli is 0 per 100 ml. An unacceptable MAC test for E.coli triggers an immediate boil water order by the Medical Health Officer which remains in effect until the problem is isolated, identified, resolved, and acceptable test results are obtained.

Turbidity:

Turbidity is a measure of water clarity. Turbid water can look cloudy or opaque and can also affect the color of the water. Turbidity is measured in NTU. The instrument used for measuring is called nephelometer or turbidimeter, which measures the intensity of light scattered at 90 degrees as a beam of light passes through a water sample.



The RDEK monitors turbidity with continuous monitoring instrumentation and verifies values with daily grab samples in all of its surface source water systems, using this as a basis for general water quality. Water Quality Advisories are issued when turbidity levels are greater than 1 NTU. Boil Water Notices are issued at or above 5 NTU. Depending on the treatment system, Health Canada recommends different turbidity level objectives; however, if it is above 1 NTU, a Water Quality Advisory is issued.

Chlorine Disinfection:

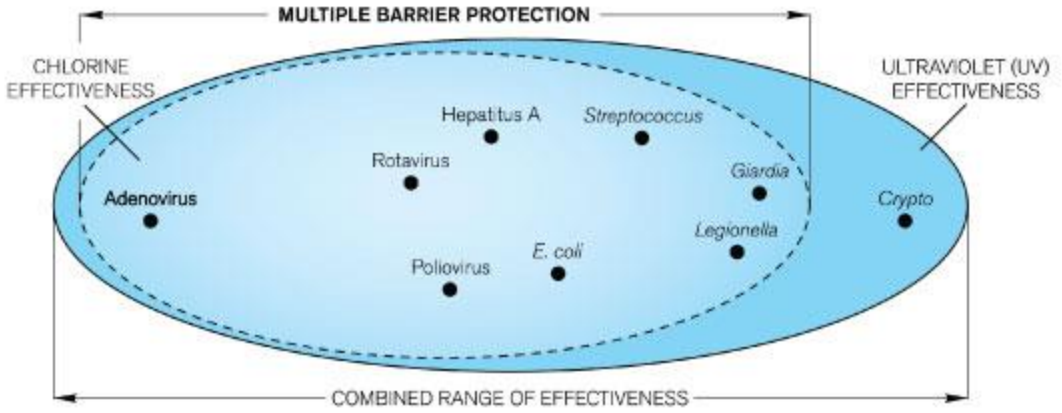
Most RDEK water systems are currently using chlorine to disinfect the water prior to sending it through the distribution system. Maintaining free chlorine residual in all parts of the system is important in keeping the water safe from bacteriological growth and other disease-causing organisms.

To ensure adequate chlorine levels exist, the RDEK has a number of online chlorine analyzers that monitor residuals and will alert an operator should a residual fall below a desired point.

Ultraviolet Light Disinfection:

Ultraviolet light (UV) destroys harmful organisms by causing a molecular change in their DNA makeup that prevents them from multiplying. This process destroys the ability of the organism to spread disease - when pathogens cannot multiply, they are considered to be no longer harmful.

UV is often used in conjunction with chlorination for added protection and to combat organisms such as cryptosporidium. Cryptosporidium is a chlorine resistant protozoan but can easily be inactivated by UV. Another advantage of UV disinfection is that it does not produce any disinfection by-products. The Edgewater Water System has been equipped with a UV disinfection system.



Disinfection By-Products:

Disinfection by-products are formed when disinfectants used in water treatment react with bromide and/or natural organic matter (i.e., decaying vegetation) present in the source water. Different disinfectants produce different types or amounts of disinfection by-products. Disinfection by-products, for which MAC's have been established, have been identified in drinking water, including trihalomethanes and haloacetic acids.

- Trihalomethanes (THM) are a group of four chemicals that are formed along with other disinfection by-products when chlorine or other disinfectants used to control microbial contaminants in drinking water react with naturally occurring organic and inorganic matter in water. The THM's are chloroform, bromodichloromethane, dibromochloromethane, and bromoform. The Canadian Drinking Water Guidelines have established a MAC to regulate total THM's (TTHM) at a maximum allowable annual average level of 0.1mg/L.

- Haloacetic Acids (HAA) are a group of chemicals that are formed along with other disinfection by-products when chlorine or other disinfectants used to control microbial contaminants in drinking water react with naturally occurring organic and inorganic matter in water. The Canadian Drinking Water Guidelines has established the MAC for haloacetic acids at 0.08mg/L based on a location's running annual average of quarterly samples taken in the distribution system.

The RDEK samples for both THM's and HAA's on a quarterly basis*. Of these samples, there were 2 results exceeding the Canadian Drinking Water thresholds for HAAs in Edgewater. RDEK operators increased the frequency of distribution system flushing and continue to monitor the situation closely. All other tests met the required thresholds.

For more information on specific water quality parameters please contact the RDEK or visit the *Province of BC's Ministry of Healthy Living and Sport* website to find the *Drinking Water Protection Act* and *Regulation* *http://www.health.gov.bc.ca/protect/dw_index.html* or the Health Canada website to find the *Guidelines for Canadian Drinking Water Quality*. http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/index-eng.php#tech_doc

*As per IHA standards, groundwater-sourced systems (Spur Valley, Moyie, Elko, and Holland Creek) are not required to be tested for THMs or HAAs.

4. Water Quality Performance

Parameters	Quality Standards – Sample Monitoring	Frequency	Water Systems	Performance
Total Coliform, E.Coli	Less than one E.Coli and total coliform bacteria detectable per 100ml samples	Weekly	Windermere	100%
		Weekly	Edgewater	100%
		Weekly	Holland Creek	100%
		Weekly	Timber Ridge	100%
		Weekly	Rushmere	100%
		Weekly**	Spur Valley	100%
		Monthly	Moyie	100%
		Monthly	Elko	96%
Free Chlorine Residual	Free chlorine residual minimum of 0.5mg/l entering the system after no less than 20 mins contact time. Minimum of 0.2mg/l at any/all end points of the distribution system	Five days/week	Windermere	98.4% ≥0.5mg/L
		Five days/week	Edgewater	99.2% ≥0.5mg/L
		One day/week	Holland Creek Distribution	100% ≥0.2mg/L
		Five days/week	Timber Ridge Distribution	100% ≥0.2mg/L
		Three days/week	Rushmere	99.4% ≥0.5mg/L
		Three days/week**	Spur Valley	89.6% ≥ 0.5mg/L
Turbidity	Disinfected water shall not be higher than 1 NTU*. Between 1 NTU and under 5 NTU a water quality advisory must be issued. Above 5 NTU a boil water notice is issued. Turbidity of water treated by membrane filtration shall not exceed 0.1 NTU in at least 95% of the samples in any month.	Five days/week	Windermere	66.4% ≤ 1.0 NTU 100% ≤ 5.0 NTU
		Five days/week	Edgewater	100% ≤ 1.0 NTU
		Five days/week	Holland Creek	98.1% ≤0.3 NTU 100% ≤ 1.0 NTU
		Five days/week	Timber Ridge	85.4% ≤ 0.3 NTU 100% ≤1.0 NTU
		Three days/week	Rushmere	71.4% ≤0.1 NTU 100% ≤0.3 NTU 100% ≤1.0 NTU
		Three days/week**	Spur Valley	98.8%≤0.30 NTU 100%≤1.0 NTU
Total Trihalomethanes	Maximum Allowable Annual Average of 0.1mg/L	Quarterly	Windermere	100%
		Quarterly	Edgewater	100%
		Quarterly	Holland Creek	N/A (groundwater)
		Quarterly	Timber Ridge	100%
		Quarterly	Rushmere	N/A
		Quarterly	Spur Valley	N/A (groundwater)
Haloacetic Acids	Maximum Allowable Annual Average of 0.08mg/L	Quarterly	Windermere	100%
		Quarterly	Edgewater	50%
		Quarterly	Holland Creek	N/A (groundwater)
		Quarterly	Timber Ridge	100%
		Quarterly	Rushmere	N/A (small water system)
		Quarterly	Spur Valley	N/A (groundwater)
Edgewater Raw Water Monitoring for Filtration Deferral	E. Coli: < 10% of samples may exceed 20/100 in any 6 month period	Weekly	Edgewater	100%
	Total Coliform: < 10% of samples may exceed 100/100ml in any 6 month period	Weekly	Edgewater	37.25%≥100/100ml 62.75%<100/100ml
	Turbidity: < 1 NTU	Weekly	Edgewater	100%

*NTU: Nephelometric Turbidity Unit
**Commenced testing November 2015

5. Systems at a Glance

Water System	Source Water	Supply Method	Disinfection/ Treatment Process	Pressure Reducing Stations	Reservoir & Capacity	Fire Protection
Windermere	Lake Windermere	Pumped/ Gravity	Chlorine disinfection	2	Concrete 1250m^3 & 1600m^3	yes
Edgewater	Lake Baptiste	Gravity	Chlorine + UV disinfection	3	Steel 800m^3 & 400m^3	yes
Holland Creek	Groundwater Well	Pumped/ Gravity	Chlorine disinfection	1	Supplied by Kinbasket Water and Sewer	yes
Timber Ridge	Lake Windermere	Pumped/ Gravity	Conventional treatment, Chlorine and UV disinfection (By Parr Utilities)	No RDEK owned PRV	Supplied by Parr Utilities	yes
Rushmere	Lake Windermere	Pumped	Ultra Filtration and Chlorine disinfection	0	Polyurethane 17m^3	no
Spur Valley	Groundwater Well	Pumped/ Gravity	Chlorine disinfection	0	Concrete 125m^3 & 222m^3	no
Moyie	Groundwater Well	Pumped/ Gravity	No treatment or disinfection	0	Concrete 71m^3	no
Elko	Groundwater Well	Pumped	No treatment or disinfection	0	No storage	no

6. Water Systems in Detail

6.1 Windermere Water System:

Windermere's water is drawn from Lake Windermere and pumped from the Lake Pumping Station to the Water Pumping Station located beside the Windermere Public Beach. During this transfer, it is disinfected with chlorine gas and pumped again to the distribution system and across Highway 93/95 to a 1250m^3 and a 1600m^3 concrete reservoir. The water in the reservoir is then sent into the distribution system and ultimately to customers. This process is monitored using instrumentation and alarm dialers to notify the operators when a problem occurs. These sites are frequented 5 days per week and processes are verified and recorded.

6.1.1 2016 Events and System Improvements:

- Completed a new concrete reservoir to add water storage for fire flow capability and consumption within the distribution system.
- Addition of secondary chlorine injection system at output of reservoirs.
- Began process of selecting new treatment process for community
- Repaired valves and blowoffs
- Update and overhaul north pressure reducing station.

6.1.2 2017 Plans:

- Complete selection of new treatment process and begin implementation
- Backwash and camera lake intake.
- Repair roof on Water Pumping Station.
- Replace 2 hydrants
- South Pressure Reducing Valve overhaul

6.2 Edgewater Water System:

The source water intake for Edgewater is located in Lake Baptiste, approximately two kilometers southeast of town adjacent to the Elk Park Ranches. The water flows from Lake Baptiste, through the treatment plant, to steel reservoirs, and then on to consumers all using the force of gravity.

Edgewater water is disinfected with both UV and chlorine and is stored at the Hewitt Road reservoirs, which provide 1200m^3 of treated storage. The RDEK has the capability to fully monitor the entire process through Edgewater's Supervisory Control and Data Acquisition (SCADA) system which alerts the operators of any potential problems.

6.2.1 2016 Events and System Improvements:

- Replaced valves.
- Continued monitoring of raw water quality for filtration deferral.
- Installed new turbidity analyzer

6.2.2 2017 Plans:

- Leak detection, analysis, and repair (continuous)
- Construct concrete pad at towers
- Install designated water line for eyewash at towers
- Upgrade of Lake Baptiste dam
- Obtain access agreement with Elk Park Ranches owners

6.3 Holland Creek Water System:

The community is supplied with potable water by Kinbasket Water & Sewer Company (KWSC). Well source water is chlorinated to protect against contamination within the distribution system should it become compromised. Water is metered by KWSC before entering Holland Creek. The system contains one PRV station which is located just prior to the first connection.

6.3.1 2016 Events and System Improvements:

- Completed water and sewer agreements with KWSC.

6.3.2 2017 Plans:

- Pressure reducing valve upgrades.
- Install new isolation valve on influent side of PRV on main

6.4 Timber Ridge Water System:

Timber Ridge has a bulk water connection from Parr Utilities Water Treatment Plant where raw water from Lake Windermere is brought to IHA standards that conform to 4-3-2-1-0 treatment objectives. The RDEK operates a reservoir and pump house (Phase 3 Pump House) within Timber Ridge to deliver sufficient pressures. The pump station also provides a point for the RDEK to monitor water quality through chlorine and turbidity level analysis and a location for automatic alarm dialers to alert staff of any problems with the system.

6.4.1 2016 Events and System Improvements:

- Install new operating system in Phase 3 Pump House to reduce pressure inconsistencies.
- First phase of leak detection and analysis

6.4.2 2017 Plans:

- Replace overflow pipe at Phase 3 Pump House.
- Continue leak detection, analysis and repair

6.5 Rushmere Water System:

The community of Rushmere is supplied with treated water from Lake Windermere through a small membrane filtration treatment plant. Treated water is stored within the plant and pumped to the community using two variable frequency distribution pumps. Rushmere water system is solely dedicated to domestic use and not used for fire protection.

The plant is highly automated and operators have remote monitoring and control capability (SCADA). The plant is attended at a minimum of 3 times per week and can alert staff when problems occur.

6.5.1 2016 Events and System Improvements:

- Regular membrane filter chemical cleaning performed using NSF approved citric acid and NSF approved tetrasodium pyrophosphate.
- Install quick connection for water for Forestry fire truck.
- Replace raw water pump

6.5.2 2017 Plans:

- Install and retrofit new membranes (2 banks of 4)
- Install new SCADA system as currently obsolete and not functioning well.

6.6 Spur Valley Water System:

The community of Spur Valley is supplied with water from a groundwater well situated just south of the community. The water is chlorinated and then pumped to two reservoirs before being distributed to residents. The RDEK has the capability to fully monitor the entire process through Spur Valley's SCADA system which alerts the operators of any potential problems. The RDEK assumed ownership and operational control of the Spur Valley water system in October 2015 and operators are on site 2-3 times per week.

6.6.1 2016 Events and System Improvements:

- Eliminated boil water advisory
- Monitored system consumption in preparation for implementation of consumption based billing.

6.6.2 2017 Plans:

- Valve and curbstop repair as required
- Monitor and assess consumption in preparation for introduction of consumption-based billing

6.7 Moyie Water System:

The Moyie Water System receives its groundwater from a 57 meters deep well. Water is pumped from the well using a 15 horsepower well pump up to a 71m^3 reservoir which maintains the pressure in the distribution system. The water is not chlorinated. RDEK operators are on site 2-3 times per week to ensure proper operation and perform monthly bacteriological sampling. The pump house is also outfitted with automatic alarm dialers to alert staff when regular functions are compromised.

6.7.1 2016 Events and System Improvements:

- Replaced water main and two curbstops and installed a blowoff along Madora Lane.
- Disinfected and flushed groundwater well.

6.7.2 2017 Plans:

- Replace 100m of main on Lake Street & 130m of main on Moyie Ave plus services
- New siding on pumphouse shed
- Clean reservoir

6.8 Elko Water System:

The community of Elko receives raw water from a single well located near the pump house. The well is located in a confined aquifer. Water is fed directly to the distribution system using a 30 horsepower submersible well pump. Because there is no storage reservoir in Elko, the water system relies solely on the continuous operation of the 67 meter well to keep up with demand.

RDEK operators are on site 2 to 3 times per week to ensure proper operation and perform bacteriological sampling monthly as required. The pump house is also outfitted with automatic alarm dialers to alert staff when regular functions are compromised.

6.8.1 2016 Events and System Improvements:

- Installed water service to new Firehall.
- Repaired blowoff on Alexander Ave.
- Replaced 100mm valve at Dowsing & Main
- Disinfected and flushed groundwater well.

6.8.2 2017 Plans:

- Pumphouse vegetation control

7. Operator Certification

EOCP Certifications		
Employee	Certification #	Level
Norm Thies	6330	WT-III, WD-II MWWT-I, WWC-II
Ginger Palmer	6821	WT-II, WD-II, MWWT-I, WWC-I, CH
Paul Oaks	6500	WT-I, WD-II, MWWT-I, WWC-I, CH
Krista Goodman	7969	WD-I, MWWT-MU-I, WT-MU-I, CH
Dave Berger	7040	SWS
Brian De Paoli	8973	SWS

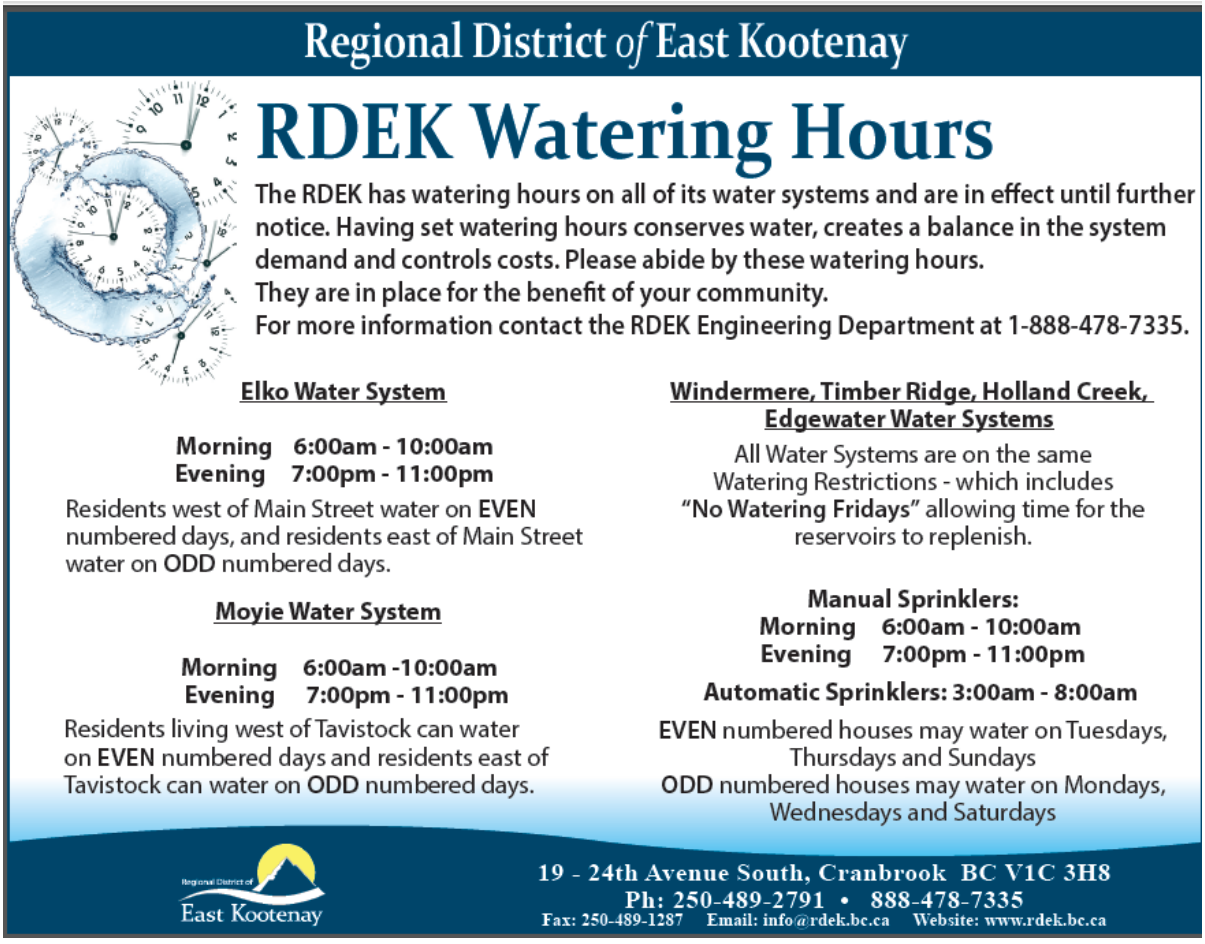
*WT: Water Treatment
*WD: Water Distribution
*MWWT: Wastewater Treatment
*WWC: Wastewater Collection
*CH: Chlorine Handling
*SWS: Small Water Systems
*MU: Multi Utility

8. Water Conservation

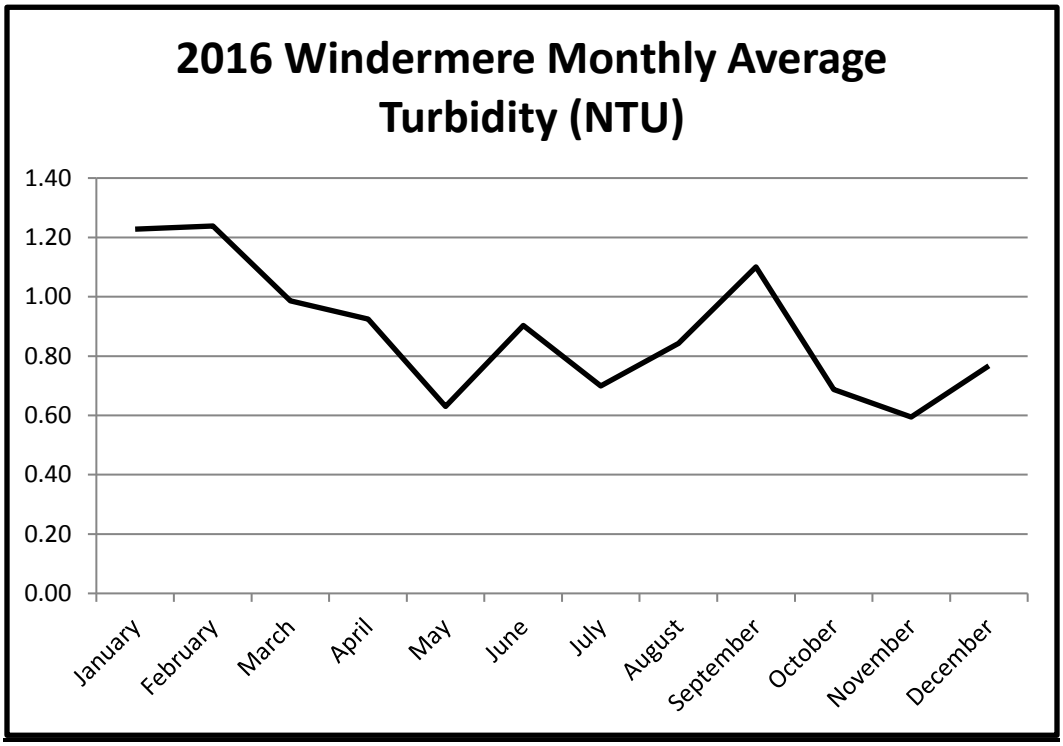
Water is essential to life on earth. We need water to grow food, keep clean, provide power, control fire, and last but not least, we need it to stay alive!

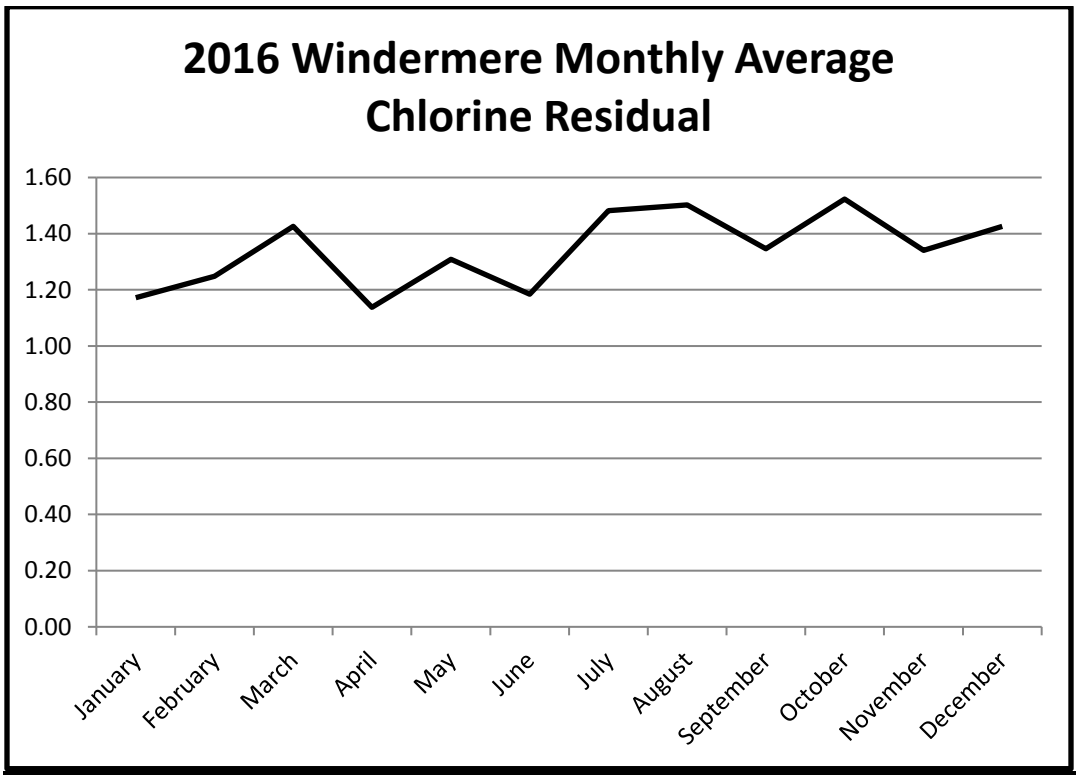
To provide enough clean fresh water for people, water is cleaned at drinking water treatment plants before it is used. And after water is used, it is cleaned again at wastewater treatment plants or by a septic system before being put back into the environment. Saving water is good for the earth, your family and your community.

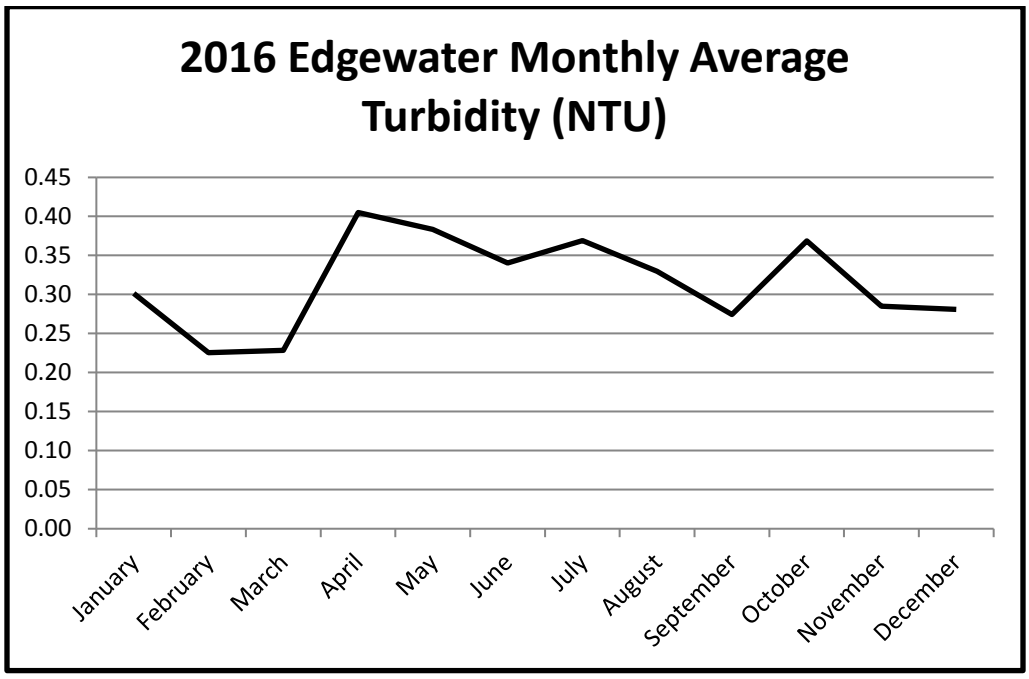
As part of its Water Conservation Strategy, the RDEK devotes resources to system monitoring and leak detection in all of its water systems. The RDEK has also adopted a Watering Hours Schedule for all of the operated water systems (see information below).



9. Water System Data






2016 Edgewater Monthly Average Turbidity (NTU)
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
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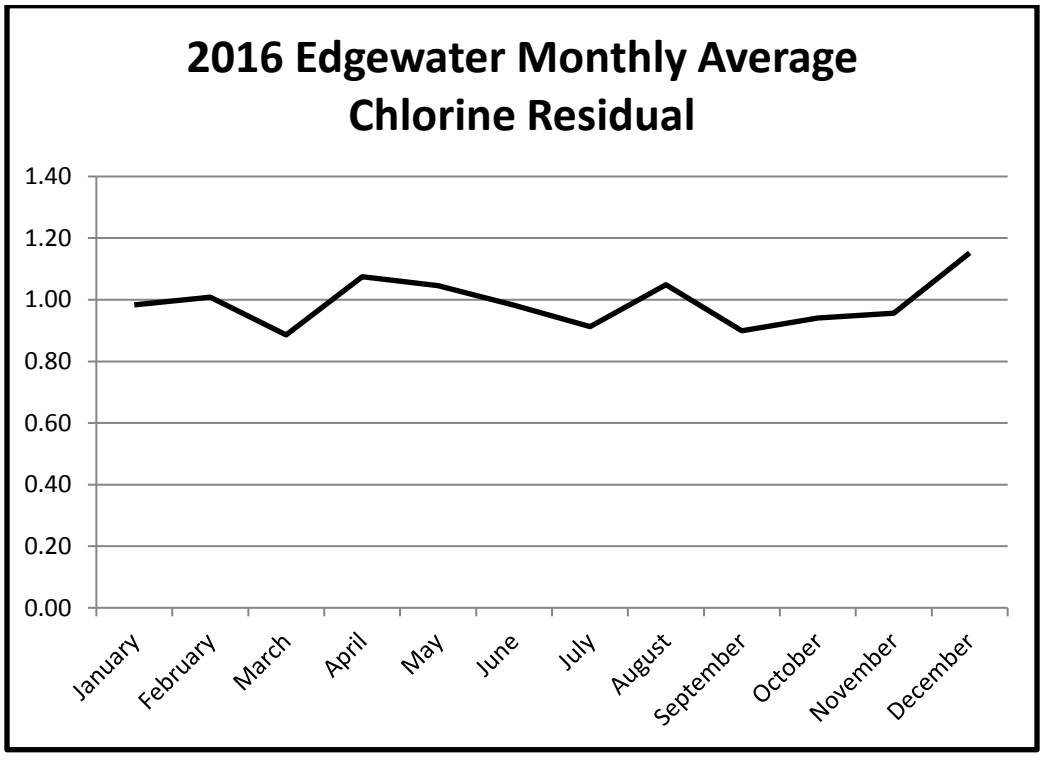
2016 Edgewater Monthly Average Chlorine Residual
1.40
1.20
1.00
0.80
0.60
0.40
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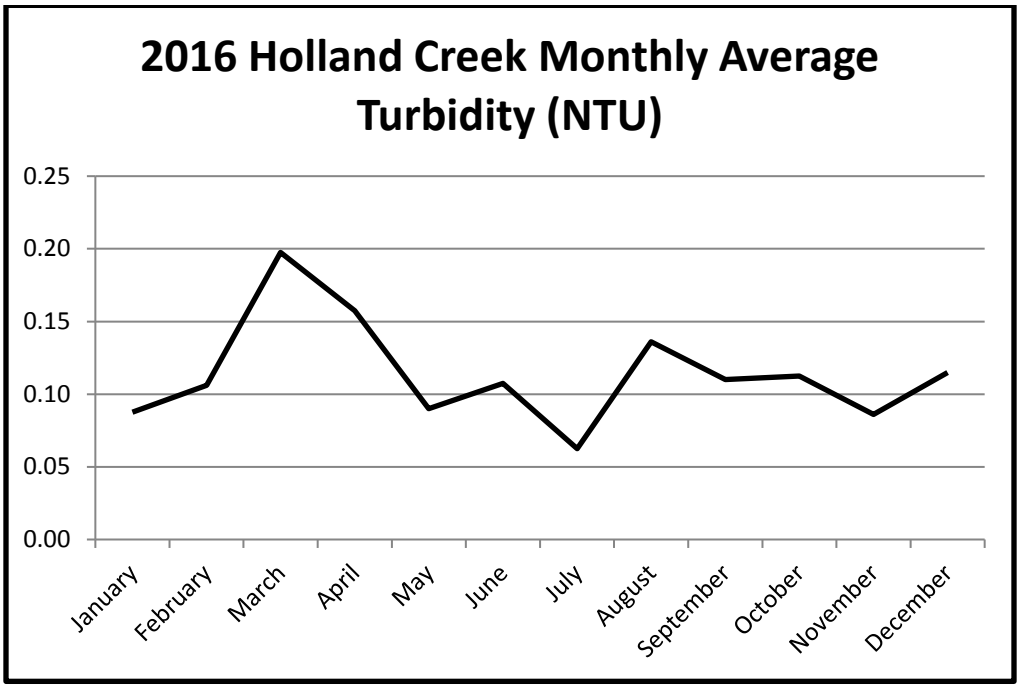
2016 Holland Creek Monthly Average Turbidity (NTU)
0.25
0.20
0.15
0.10
0.05
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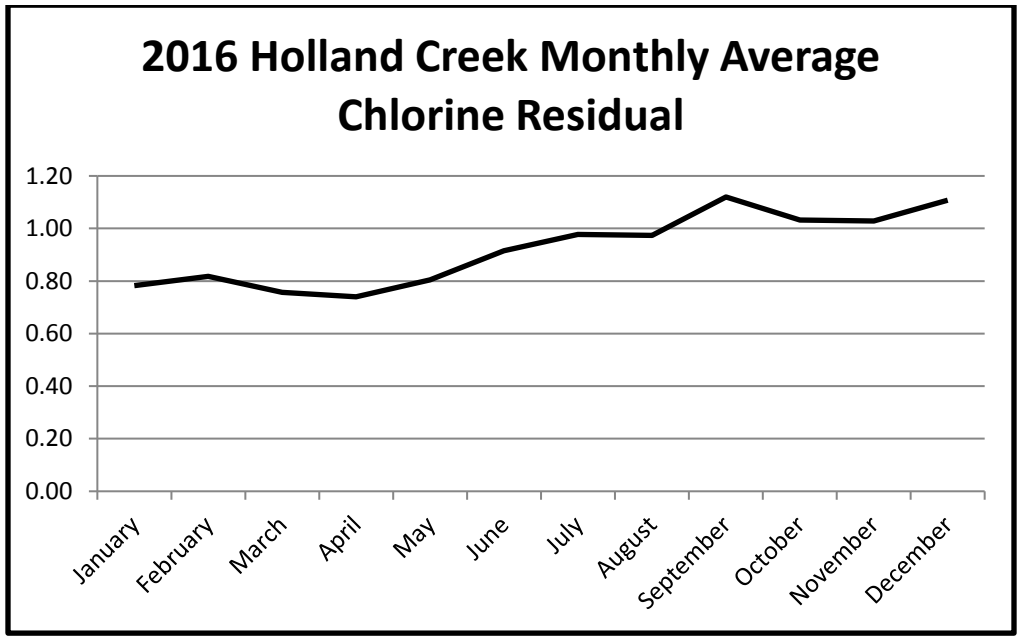
2016 Holland Creek Monthly Average Chlorine Residual
1.20
1.00
0.80
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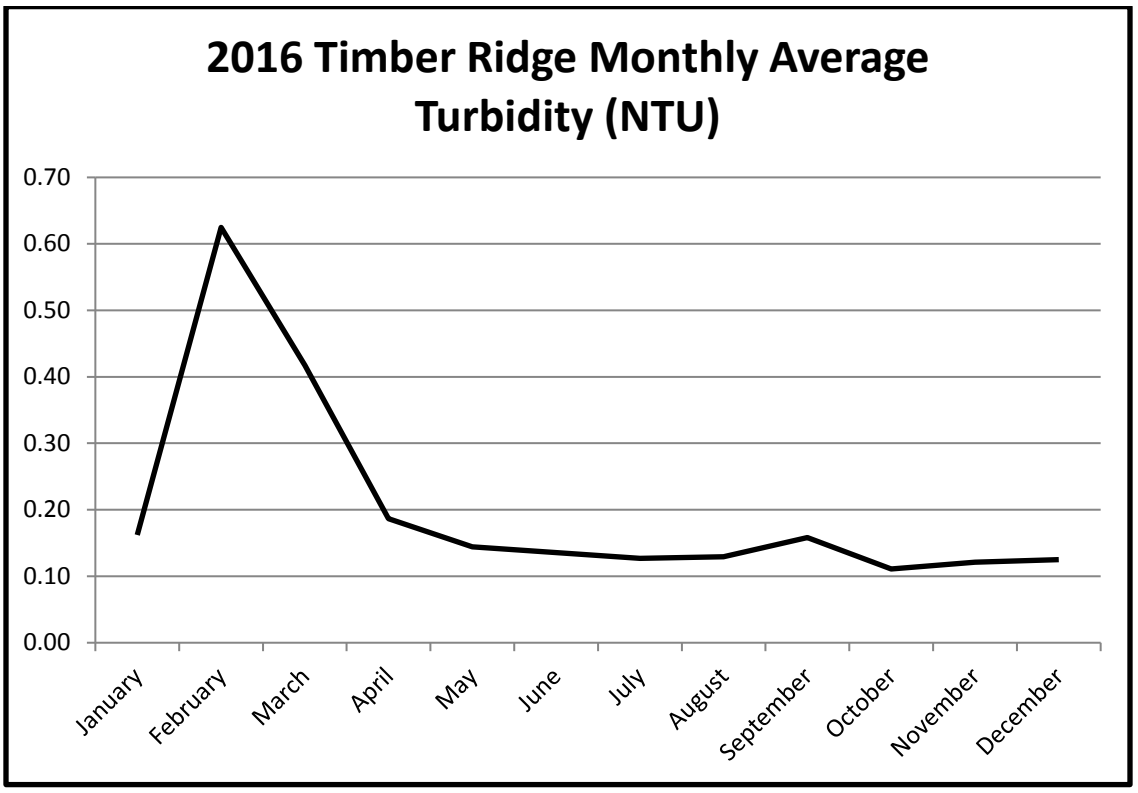
2016 Timber Ridge Monthly Average Turbidity (NTU)
0.70
0.60
0.50
0.40
0.30
0.20
0.10
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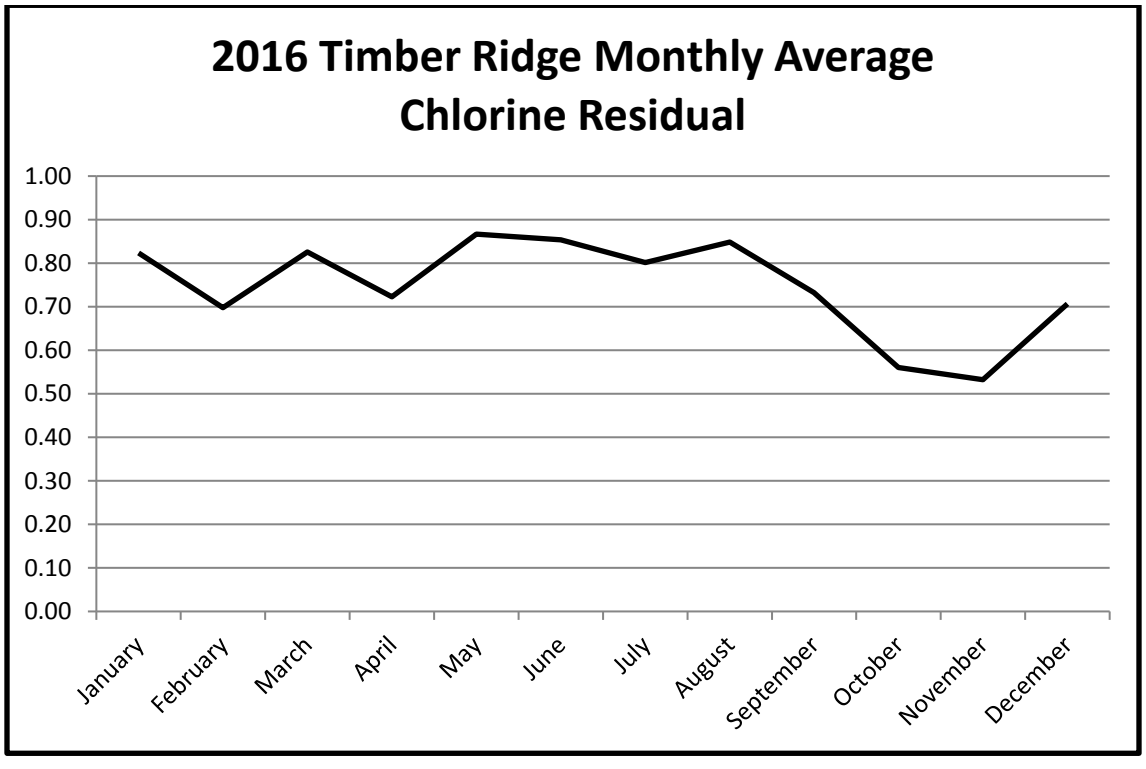
2016 Timber Ridge Monthly Average Chlorine Residual
1.00
0.90
0.80
0.70
0.60
0.50
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0.30
0.20
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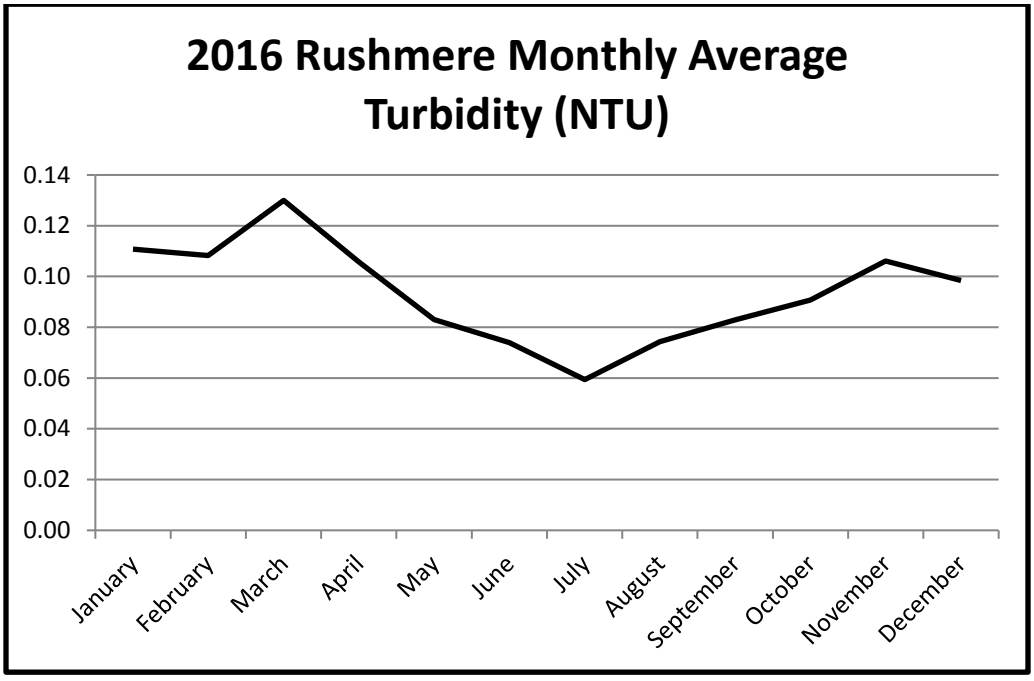
2016 Rushmere Monthly Average Turbidity (NTU)
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
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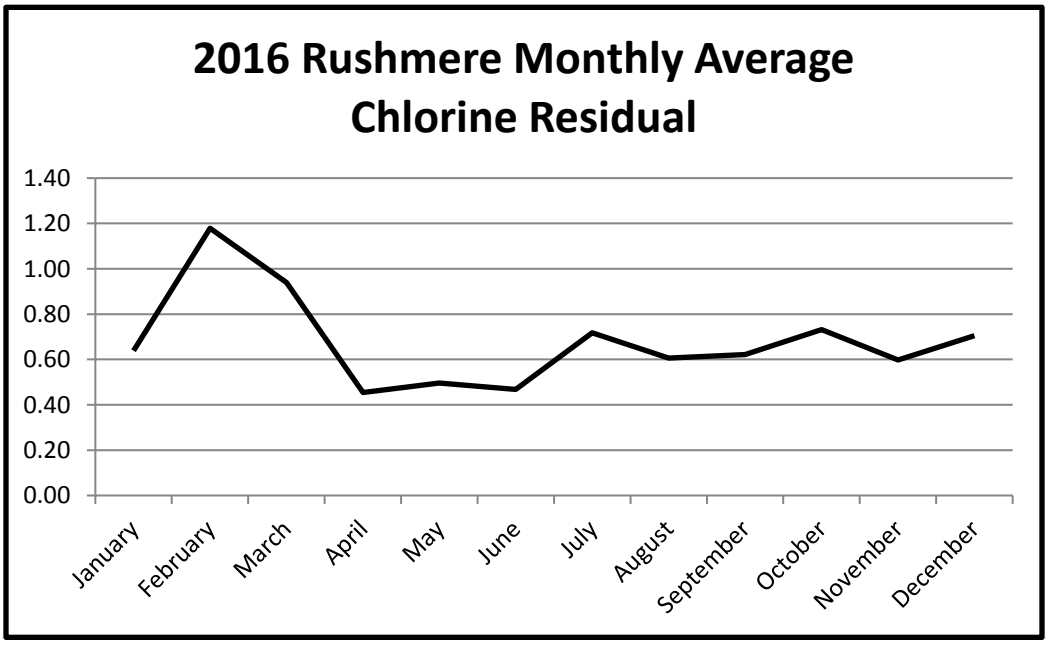
2016 Rushmere Monthly Average Chlorine Residual
1.40
1.20
1.00
0.80
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0.40
0.20
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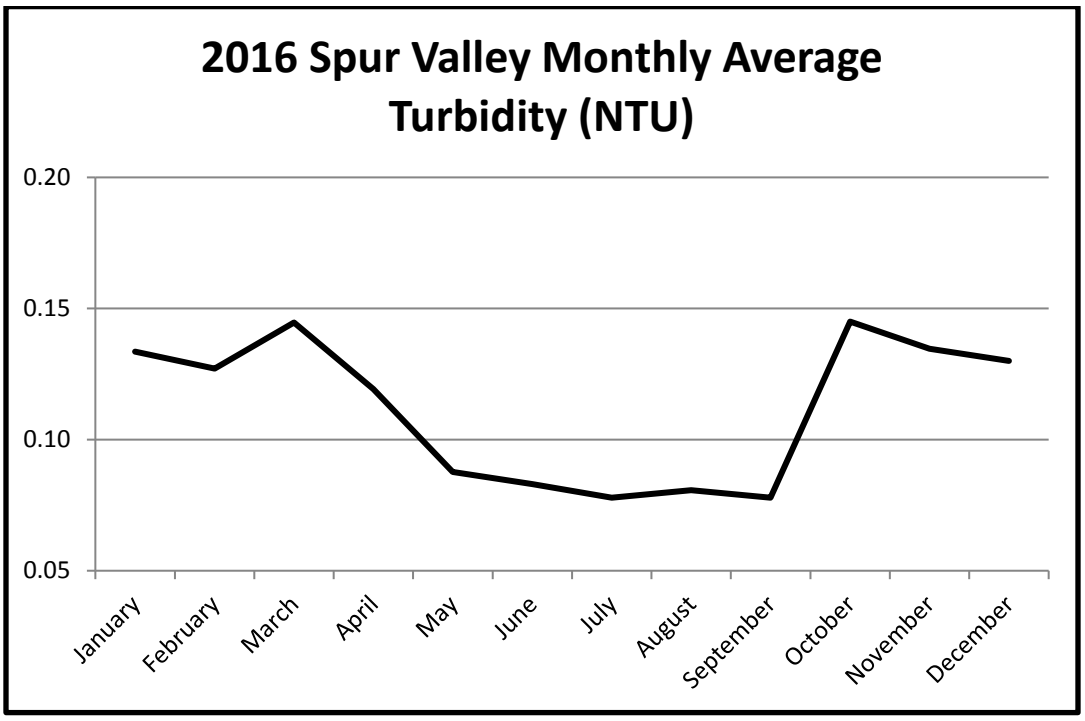
2016 Spur Valley Monthly Average Turbidity (NTU)
0.20
0.15
0.10
0.05
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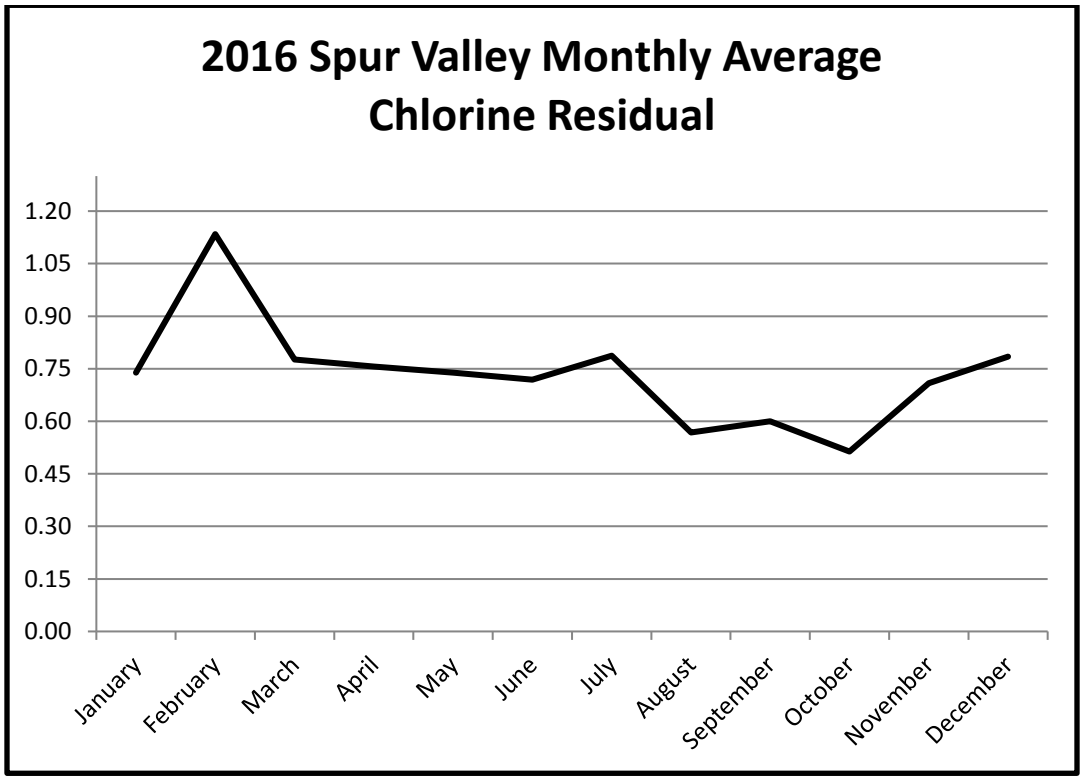
2016 Spur Valley Monthly Average Chlorine Residual
1.20
1.05
0.90
0.75
0.60
0.45
0.30
0.15
0.00
January
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December

10. Summary

The RDEK is committed to providing safe potable water in as efficient a manner as possible. Working with the IHA to plan for future improvements while facing obstacles as they are presented is a major part of what we do. This report represents a way of communicating facts and keeping the public apprised of what happened in 2016 as well as things to come in the future. We hope it has helped shed some light on current operation processes of our water services in the East Kootenay.