EDMONTON WATERWORKS

ANNUAL REPORT TO ALBERTA ENVIRONMENT AND WATER

Approval Number 638-04-00

2021

2022 ANNUAL REPORT

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1.1 Overview

Through 2021, EPCOR Water Services Inc. (EWSI) continued to satisfy all water demand requirements while meeting our strict water quality criteria. Total demand in 2021 was higher than 2020 and 2019 and in fact set some new peak demand records. EWSI received a new Approval to Operate 638-04-00 effective May 31, 2021.

Both EL Smith and Rossdale WTPs converted to conventional filtration on March 13 in advance of runoff. Due to lower snowpack in the watershed upstream, runoff was minimal and color peaked at 14 TCU. The Home Sniffing Program concluded mid-May with an average result of 96.0% satisfied for the 12 week period, well above the 94.4% PBR target.

High temperatures in late June led to record water demands within the system. Daily demand peaked at 608 ML/d on June 30, exceeding the historical high of 606 ML/d set in 2002. The maximum high 5-day demand was 591 ML/d, exceeding the historical high of 586 ML/d also set in 2002. The treatment plants were able to increase production to meet demands and reservoir levels remained within the normal operating ranges. With the higher demands, there were challenges maintaining normal service pressures in the tertiary and quaternary pressure zones in the SE corner of the city during the extreme evening peak. In response, EPCOR issued a call for voluntary restrictions on non-essential water use in the SE during the evening peak hours, which improved the situation. The restrictions were lifted July 5 after demands decreased.

Raw water conditions remained favourable through the remainder of the summer and fall. EL Smith WTP converted to direct filtration on November 1 and Rossdale WTP converted on November 3. The WTPs achieved 131 days in direct filtration in 2021, exceeding the internal goal of 120 days. Overall, in 2021, total solids discharged to the NSR were reduced by 13.4%, as compared to

baseline conventional operation due to dry weather and stable raw water conditions.

EPCOR continued to assess the impacts of residuals to the NSR by generating better estimates of loads of TSS, dissolved aluminum and total metals from the WTPs, and determining the extent and duration of the exceedances of instream guidelines through a mass balance approach. To improve the ability to calculate loads, EPCOR developed a proposed Waste Stream Monitoring Program, submitted to AEP in December 2021, which will include installing flow monitoring equipment and autosamplers on select waste streams. The monitoring equipment, along with the results from the Waste Stream Monitoring Program, will assist in the calculation of loads and the assessment of both near-field and far-field impacts of WTP discharges on the NSR.

There were zero AEP approval contraventions at the WTPs in 2021. The WTPs continue to improve the integrated safety and environmental management system in accordance with the ISO 14001:2015 and 45001:2018 standard.

EWSI continued to upgrade the water treatment plants and the reservoir assets. Total expenditures in 2021 were approximately $66.9 M. Some of the major projects are as follows:

- E.L. Smith Solar Farm – all regulatory approvals were received in 2020 and construction of the solar farm commenced in 2021. The in-service date for the 13.6MW solar farm and battery energy storage system adjacent to the E.L. Smith WTP is expected to be fall 2022.
- E.L. Smith – ELS filter structural rehabilitation was completed on Stage 1, Filter 3 in 2021. Filter 1 and Filter 2 rehabilitation work commenced in 2021 and will be completed by June 2022. This structural rehabilitation program on all of the Stage 1 and Stage 2 filters is necessary for future deep bed filtration implementation. The ELS Bypass main project was largely completed in 2021

and will be placed in service in early 2022. This new pipe provides additional supply heading north from ELS.

- Rossdale – the SBS Room Upgrade project was completed as was a structural rehabilitation and roof membrane replacement at ROS Reservoir Cell 1.
- Reservoirs – Rehabilitation of Clareview Reservoir commenced and will be completed in early 2022.
- Phosphoric Injection for Lead Control: construction is underway for the facilities at both WTPs and will be in service by the end of 2022.
- Plants Flood Protection: work progressed in 2021 on this multi-year project. Work completed in 2021 included initial public and Indigenous consultation, groundwater transient modeling analysis, preliminary design work for permanent flood barriers, installation of demountable flood barriers at select locations, and detailed risk assessments of all WTP assets to define the detailed scope of the flood mitigation project.

Blackmud Creek Booster Station (4810 Highway 2 Service Road SW) was purchased from CRSWSC and EPCOR assumed operation in January 2021. Parkland Booster Station (10203 186 Street NW) was purchased from CRPWSC and EPCOR assumed operation in December 2021.

In 2021, Water Distribution and Transmission repaired 303 water main breaks on the distribution system in Edmonton, with the majority of main breaks occurring on cast iron pipes. EPCOR generally experiences a higher volume of breaks in the first quarter of the year attributed to deeper frost penetration as we incurred 90 in this time frame. The overall reliability of the water distribution system can be attributed to the water main replacement programs as well as the use of more reliable pipe materials in both replacement and new water main construction.

In 2021, the Uni-Directional Flushing program completed flushing and valve exercising in about 26% of Edmonton (1836 runs).This program is now a six-year

cycle with area prioritization emphasis placed on water quality parameters, percentage of Cast Iron Mains, and the relative success of the previous flush.

In 2021, Water Distribution and Transmission completed a transmission main inspection on the major feed to the West Edmonton and St. Albert/ Parkland Region Water Service Commission (CRPWSC) using inline inspection technology. This inspection identified 3 minor leaks on appurtenances and will be repaired in 2022. Further inspections will be planned in the future to continue the success of this program.

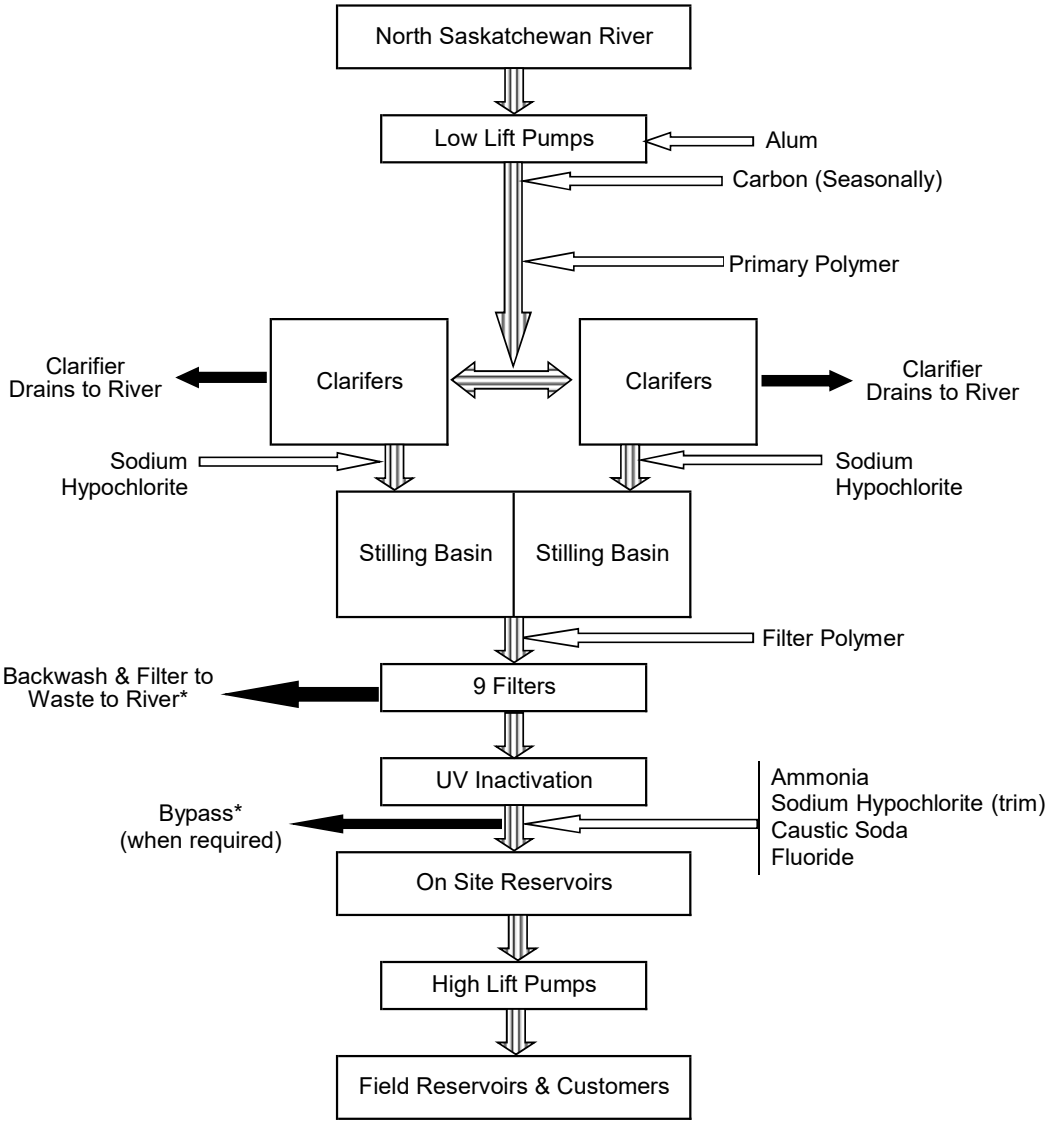
There were 3 AEP approval contraventions Within WDT in 2021 concerning TC+ samples. All samples were determined to be from contaminated hydrants. Issues were addressed by super-chlorinating hydrant barrel and resampling.

EWSI continues to provide water and wastewater services and expertise to numerous communities in Alberta, British Columbia, Saskatchewan, as well as industrial sites in Fort McMurray.

As we move into 2022, we will continue to focus our efforts on the production of and distribution of high quality water, customer satisfaction, protection of the environment, workplace safety and cost effectiveness. We will continue to ensure our customers receive best value for the services we provide them.

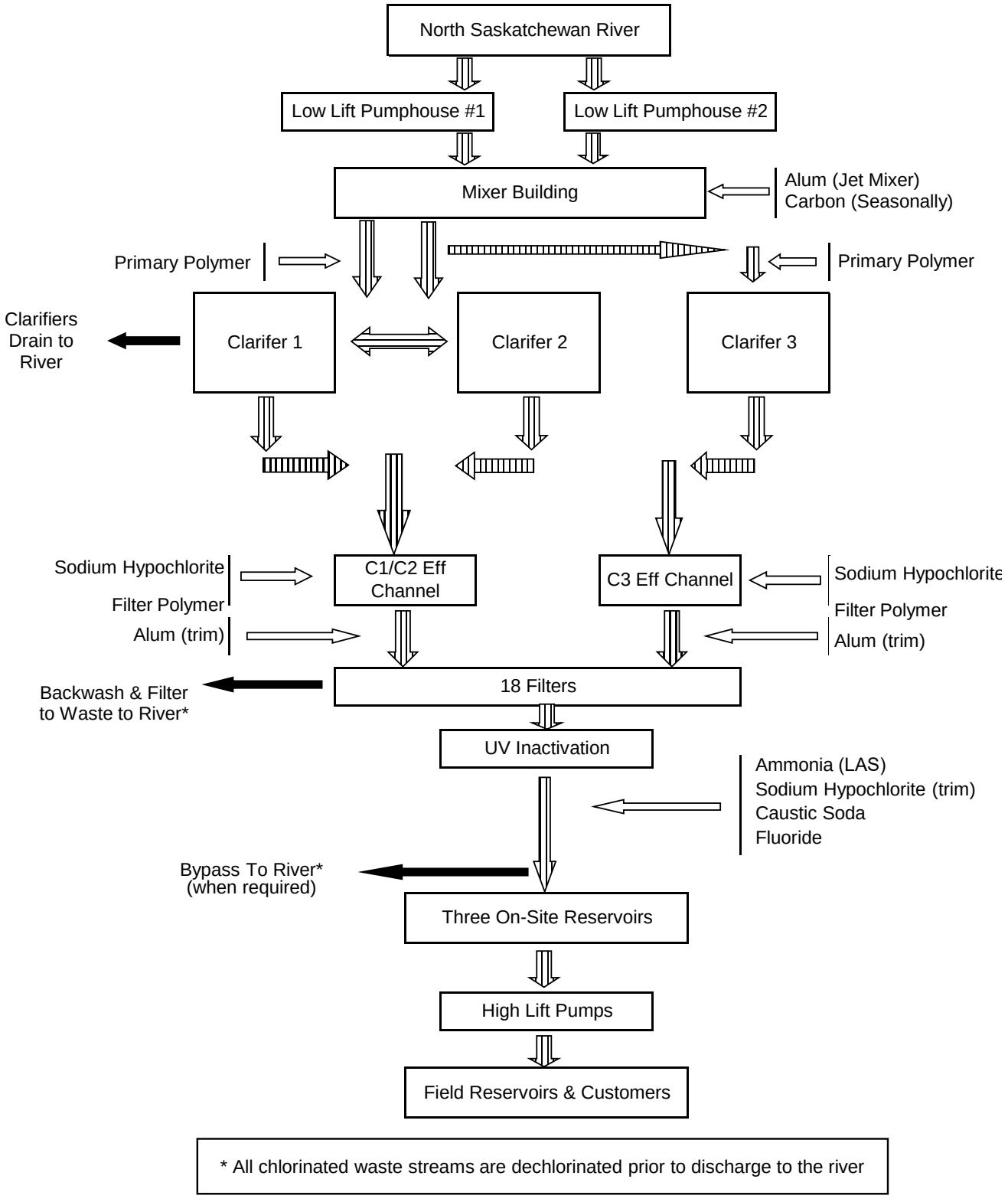
(End of Section)

1.2 Process Schematic - Rossdale (Plants 1 & 2)



* All chlorinated waste streams are dechlorinated prior to discharge to the river

1.3 Process Schematic - E. L. Smith (Plant 4)



1.4 Summary of Violations and Notifications for 2021

EPCOR Incident Number	Description	Date of Incident	AESRD Report File Number
ENV-20210209-911344	On February 9, 2021, an EPCOR crew was pumping water out of a main break excavation into a nearby combined sewer. A hydraulic submersible pump attached to a backhoe experienced a fitting leak and then seized. The operator stopped the pump from his backhoe at that point. The EPCOR crew then noticed that some water mixed with oil had already been pumped out of the excavation at approximately 16:00 hrs. The event was reported to AEP on February 9, 2021 at 17:14 hrs. After the submersible pump seized, the excavation still contained water and hydraulic fluid. An environmental hydro vac was called in to remove the remaining water and hydraulic fluid from the excavation	February 9, 2021	375916
ENV-20210622-713017	On June 22, 2021 an EPCOR crew was excavating for a hydrant replacement. When they reached a depth of about six (6) feet they encountered a hydrocarbon odour. The work was then stopped and the worksite was evaluated the following day by EPCOR Water Canada's Hygienist. The excavated soil was stockpiled and tested and was then disposed of by a third party contractor into a Class 2 landfill offsite.	June 22, 2021	380502
ENV-20210624-513396	Related to ERS ENV-20210622-713017 and was about 15 feet away from the original excavation location.	June 24, 2021	380502

1.4 Summary of Violations and Notifications for 2021

EPCOR Incident Number	Description	Date of Incident	AESRD Report File Number
ENV-20210726-036969	As part of recent routine flushing activities near Stony Plain Road and Connaught Drive, water distribution samples were collected (H1666 and H27088) and brought to the Rossdale Laboratory for regular turnaround testing. Laboratory results indicated detections of BTEX compounds in both pre- and post-flush samples, including MAC exceedances for benzene, resulting in a potential AEP reportable incident within Edmonton's water distribution system. Health Canada's Maximum Acceptable Concentration (MAC) for benzene is 5 µg/L and sample results were up to 7.16 µg/L. Given a MAC was exceeded in the sample, the AEP Action Protocol for Exceedances of Chemical Health Parameters in Drinking Water was followed and the finding was called into AEP's EDGE line (AEP Reference # 381700). An internal investigation was completed and the root cause of the MAC exceedance was the fact that vials/bottles used for sampling had been stored in a cabinet that formerly contained gasoline. Our Water D&T management will be conducting follow-up discussions with field crews on the importance of proper sampling technique as well as sample storage.	July 26, 2021	381700

1.4 Summary of Violations and Notifications for 2021

EPCOR Incident Number	Description	Date of Incident	AESRD Report File Number
ENV-20210827-041339	On August 24, 2021 an EPCOR crew collected a random grab sample from hydrant H6299. On August 25, 2021 the laboratory results indicated that the sample from that hydrant failed for total coliforms. AEP was notified of these lab results on August 25, 2021. Following AEP's Communication and Action Protocol for Failed Bacteriological Results in Drinking Water (2009), EPCOR arranged to flush the water main and then took four (4) samples at 17:05 hrs on August 25, 2021. One (1) sample was from the failed hydrant (H6299), and three (3) samples were from other hydrants in the surrounding area. All sample points were flushed thoroughly prior to sampling. Note that in-field samples for chlorine and turbidity levels were within normal operating ranges at all sample locations. Results for the sample taken from H6299 tested positive for total coliforms for the second time. The other 3 samples taken outside of the isolated zone passed all lab sampling, indicating that there was no detectable coliform contamination present in the active water distribution network. AEP was notified on August 27, 2021 at 12:05 hrs of this second sample failure. On August 27, 2021 at 15:25 hrs, EPCOR flushed and resampled at the same four (4) locations. On August 28, 2021 at 08:39 hrs, hydrant H6299 was isolated from the distribution system and super chlorinated for 24 hours. On August 29, 2021 at 11:57 hrs. the EPCOR QA lab reported that all samples passed. Hydrant H6299 was recommissioned on August 29, 2021 at 12:12 hrs. It is likely that the original source of coliforms was isolated to hydrant 6299 since the samples taken from other hydrants in the area passed. In addition, both of the failed samples were drawn from this hydrant, whereas three other hydrants produced passing samples from the same water main. It is unknown why this hydrant would have had coliforms present.	August 24, 2021	382862
ENV-20210825-768742	As above (same incident) Second Total coliform positive failure from the same Hydrant (H6299)	August 25, 2021	382862

1.4 Summary of Violations and Notifications for 2021

EPCOR Incident Number	Description	Date of Incident	AESRD Report File Number
ENV-20210903-801248-v1	This incident was a notification within Edmonton's Water Distribution system. A residential complaint sample related to taste and odour was collected and brought to EPCOR's QAE Water Laboratory. A series of water quality tests were conducted, including for metals. Analytical results indicated a lead concentration of 76.1 µg/L, which exceeds Health Canada's Maximum Acceptable Concentration (MAC) for lead (5 µg/L). Given a MAC was exceeded, we've followed AEP's Action Protocol for Exceedances of Chemical Health Parameters in Drinking Water and called the event into AEP's EDGE line (AEP Reference #383154). The concentration of lead was lower than AEP's 'One Day Short Term Exposure Limit' (100 µg/L) within the Chemical Exceedances Protocol. Given the address, the home is not in a lead service line area, so the likely source is lead is from internal plumbing fixtures. A Water Distribution and Transmission (Water D&T) crew was dispatched on September 2, 2021 to resample from within the home (downstairs bathroom). On September 3, additional samples were collected, one from the kitchen tap and one from a nearby hydrant (H7809). Results from all the resampling came back as below the MAC for lead. The hydrant sample confirmed the water quality within the distribution system was satisfactory. The additional in-home samples were also below the MAC and confirmed the kitchen tap as a source was satisfactory.	September 2, 2021	383154
ENV-20210909-739518	On September 9, 2021 an EPCOR contractor was excavating for a water main relocation project. During excavation, the contractor encountered a strong hydrocarbon odour. The work was then stopped and the EPCOR Construction Coordinator contacted a third party (Thurber Engineering) to take soil samples. On September 9, 2021, Thurber Engineering sampled hydrocarbon-impacted soil from six test pits that were excavated by EPCOR south of the Petro-Pass service station and in the northbound lane of 80 Avenue west of a service station. A composite soil sample was collected from the test pit locations for landfill characterization analyses. The results indicated that the soil can be disposed of at a class 2 landfill. The contaminated soil was removed and transported to a Class 2 Landfill.	September 9, 2021	383332

1.4 Summary of Violations and Notifications for 2021

EPCOR Incident Number	Description	Date of Incident	AESRD Report File Number
ENV-20210921-372691	On September 14, 2021 at 13:13 hrs, an EPCOR crew collected a random grab sample from hydrant H18695 as part of EPCOR's random sampling program. On September 15, 2021 at 15:33 hrs, the laboratory results indicated that the sample from hydrant H18695 failed for total coliforms. AEP was notified of these lab results on September 15, 2021 at 16:23 hrs. Following AEP's Communication and Action Protocol for Failed Bacteriological Results in Drinking Water (2009), EPCOR arranged to flush the water main and then took four (4) samples on September 15, 2021 at 21:30 hrs. Two (2) samples were from the failed hydrant (H18695) and two (2) samples were from other hydrants upstream and downstream of hydrant H18695. All sample points were flushed thoroughly prior to sampling. Note that in-field samples for chlorine and turbidity levels were within normal operating ranges at all sample locations. On September 17, 2021 at 09:39 hrs, the EPCOR QA lab reported that all samples passed.	September 14, 2021	383524

1.4 Summary of Violations and Notifications for 2021

EPCOR Incident Number	Description	Date of Incident	AESRD Report File Number
ENV-20211007-170297	On October 6, 2021 at 11:31 hrs, an EPCOR crew sampled hydrant H5229 following a repair to this hydrant. On October 7, 2021 at 15:04 hrs, the laboratory results indicated that the sample from hydrant H5229 failed for total coliforms. AEP was notified of these lab results on October 7, 2021 at 15:19 hrs. Following AEP's Communication and Action Protocol for Failed Bacteriological Results in Drinking Water (2009), EPCOR arranged to flush the water main and then took four (4) samples at 21:30 hrs on October 7, 2021. One (1) sample was from the failed hydrant (H5229), and three (3) samples were taken from hydrants upstream and downstream of the original sample location. All sample points were flushed thoroughly prior to sampling. Following these samples, hydrant H5229 was isolated from the distribution network on October 7, 2021 at 19:54 hrs Results for the October 7, 2021 samples were available from the EPCOR QA lab on October 9, 2021 at 14:11 hrs. The sample taken from hydrant H5229 tested positive for total coliforms for the second time at a concentration of 1.0 organism /100mL. The other 3 samples taken outside of the isolated zone passed all lab tests, indicating that there was no detectable coliform contamination present in the active water distribution network. AEP was notified on October 9, 2021 at 14:11 hrs of the second sample failure. On October 9, 2021, EPCOR super chlorinated hydrant H5229 and on October 10, 2021 at 9:00 hrs, flushing followed by a second set of resamples was completed at the same four (4) hydrants and submitted to the EPCOR QA lab. Results were received on October 11, 2021 at 10:52 hrs. All samples passed for all parameters. Hydrant H5229 was recommissioned on October 11th. It is likely that the original source of coliforms was hydrant H5229. During the super chlorination of the hydrant, it was identified that the bleeders on the hydrant were plugged and that the stem was not fully tightened, so the hydrant was not draining properly. There is potential that this could have resulted in water entering the dry barrel of the hydrant that caused the failed sample result. The problem was resolved after the hydrant was super chlorinated and flushed.	October 6, 2021	384365

(End of Section)

1.5 Alberta Environment Operator Certifications (Effective to year end 2021)

Operator Contact Number: EPCOR Water Services Dispatch (24 hr) (780) 412-4500

ROSSDALE WATER TREATMENT PLANT (LEVEL IV)		
	Director, Edmonton Water Treatment Plants	
	Senior Manager, Operations	**WT II**
Employee Name	Title	Alberta Environment Certification
	Operations Engineer	WT I
	Manager, Operations	WT III, WWT III
	Manager, Transmission Operations	WT III
	Day Foreman	WT III
	Operations Foreman	WT IV
	HEI Foreman	WT IV
	Operations Foreman	WT IV
	Operations Foreman	WT IV
	Operations Foreman	WT IV
	Operations Foreman	WT IV
	Transmission Foreman	WT III
	Training Operator Foreman	WT III
	Lead Hand, Operator	WT II
	Operator I	WT III
	Operator I	WT II
	Lead Hand, Operator	WT II
	Lead Hand, Operator	WT III
	Operator I	WT II
	Operator I	WT III
	Lead Hand, Operator	WT IV, WD III, WWT II, WWC III
	Operator I	WT II
	Lead Hand, Operator	WT II
	Operator I	WT II
	Operator I	WT II, WD II, WWT II, WWC II
	Operator I	WT II, WWT II
	Operator I	WT II
	Operator I	WT II
	Operator I	WT III, WWT III

1.5 Alberta Environment Operator Certifications (Effective to year end 2021)

Operator Contact Number: EPCOR Water Services Dispatch (24 hr) (780) 412-4500

E.L. SMITH WATER TREATMENT PLANT (LEVEL IV)		
	Director, Edmonton Water Treatment Plants	
	Senior Manager, Operations	**WT II**
Employee Name	Title	Alberta Environment
	Operations Engineer	
	Manager, Operations	WT III, WWT III
	Day Foreman	WT IV
	HEI Foreman	WT IV
	Training Operator Foreman	WT IV
	Operations Foreman	WT IV
	Operations Foreman	WT IV
	Operations Foreman	WT III
	Operations Foreman	WT IV
	Operations Foreman	WT III
	Lead Hand, Operator	WT III
	Lead Hand, Operator	WT III
	Lead Hand, Operator	WT III
	Lead Hand, Operator	WT II
	Lead Hand, Operator	WT IV
	Operator I	WT III, WWT II,
	Operator I	WT II
	Operator I	WT II, WD II, WWT I, WWC I
	Operator I	WT II
	Operator I	WT II
	Operator I	WT II
	Operator I	WT IV
	Operator I	WT III, WWT III
	Operator I	

1.5 Alberta Environment Operator Certifications (Effective to year end 2021)

Operator Contact Number: EPCOR Water Services Dispatch (24 hr) (780) 412-4500

DISTRIBUTION SYSTEM (LEVEL IV FACILITY)

WATER DISTRIBUTION (WD) - NETWORK MAINTENANCE

Senior Manager, Maintenance and
Manager, Maintenance and Construction
Manager, Dist. Maint Schedule

Employee Name	Title	Alberta Environment
	Water Network Operator	WD IV WWC I
	Water Network Operator	WD IV
	Foreman III	WD III
	Foreman III	WD II
	Foreman III	WD III
	Foreman III	WD III
	Foreman I	WD III
	Foreman I	WD II
	Foreman I	WD III
	Foreman I	WD II
	Foreman I	WD II
	Foreman I	WD II
	Foreman I	WD II
	Foreman I	WD II
	Foreman I	WD II
	Foreman I	WD III
	Foreman I	WD II
	Foreman I	WD II
	Foreman I	WD IV
	Equipment Operator III	WD II
	Equipment Operator III	WD II
	Equipment Operator III	WD I
	Equipment Operator III	WD II
	Equipment Operator III	WD II
	Equipment Operator III	WD I
	Equipment Operator III	WD I
	Equipment Operator III	WD II
	Equipment Operator III	WD II
	Equipment Operator III	WD II
	Equipment Operator III	WD II
	Equipment Operator III	WD I
	Equipment Operator III	WD II
	Equipment Operator III	WD II

1.5 Alberta Environment Operator Certifications (Effective to year end 2021)

Operator Contact Number: EPCOR Water Services Dispatch (24 hr) (780) 412-4500

DISTRIBUTION SYSTEM (LEVEL IV FACILITY)

WATER DISTRIBUTION (WD) - NETWORK MAINTENANCE

Senior Manager, Maintenance and

Manager, Maintenance and Construction

Manager, Dist. Maint Schedule

Employee Name	Title	Alberta Environment
	Labourer II	WD I
	Labourer II	WD I
	Labourer II	WD I
	Labourer II	WD I
	Labourer III	WD II
	Labourer II	WD I

1.5 Alberta Environment Operator Certifications (Effective to year end 2021)

Operator Contact Number: EPCOR Water Services Dispatch (24 hr) (780) 412-4500

DISTRIBUTION SYSTEM (LEVEL IV FACILITY)

WATER DISTRIBUTION (WD) - NETWORK MAINTENANCE

Senior Manager, Maintenance and
Manager, Maintenance and Construction
Manager, Dist. Maint Schedule

Employee Name	Title	Alberta Environment Certification
	Labourer II	WD I
	Labourer II	WD I
	Labourer II	WD I
	Labourer II	WD II
	Labourer II	WD I
	Labourer II	WD I
	Labourer II	WD I
	Labourer II	WD II
	Labourer II	WD I
	Labourer II	WD II
	Truck Driver III	WD II
	Truck Driver III	WD II
	Truck Driver III	WD I
	Truck Driver III	WD I
	Truck Driver III	WD I
	Foreman III	WD III
	Welder	WD II
	Maintenance Repairman I	WD II
	Maintenance Repairman I	WD I
	Maintenance Repairman I	WD I
	Labourer III	WD I
	Labourer II	WD I
	Foreman I	WD I
	Water Sys Tech Support Specialist	WD II
	Water Sys Tech Support Specialist	WD IV

1.5 Alberta Environment Operator Certifications (Effective to year end 2021)

Operator Contact Number: EPCOR Water Services Dispatch (24 hr) (780) 412-4500

DISTRIBUTION SYSTEM (LEVEL IV FACILITY)

WATER DISTRIBUTION (WD) - FIELD OPERATIONS

Senior Manager, Distribution Operations

Manager, Field Operations

Manager, Metering and Preventative **WD I**

Manager, Water Trouble WD III

Employee Name	Title	Alberta Environment Certification Level
	Foreman III	WD IV
	Foreman III	WD IV
	Foreman I	WD II
	Foreman I	WD II
	Labourer III	WD II
	Labourer III	WD I
	Labourer III	WD II
	Labourer III	WD II
	Labourer III	WD I
	Labourer III	WD I
	Labourer III	WD III
	Labourer II	WD I
	Labourer II	WD II
	Labourer II	WD I
	Labourer II	WD I
	Labourer III	WD I
	Labourer II	WD II
	Labourer II	WD I
	Labourer III	WD I
	Labourer II	WD II

1.5 Alberta Environment Operator Certifications (Effective to year end 2021)

Operator Contact Number: EPCOR Water Services Dispatch (24 hr) (780) 412-4500

DISTRIBUTION SYSTEM (LEVEL IV FACILITY)

WATER DISTRIBUTION (WD) - CUSTOMER SERVICE

Senior Manager, Customer Service

Manager, Dispatch

Manager, Inspections and Customer Service

Employee Name	Title	Alberta Environment
	Team Lead, Dispatch	WD IV, WWC II, WT I, WWT I
	Dispatcher Coordinator	WD I
	Dispatcher Coordinator	WD I
	Dispatcher Coordinator	WD II
	Inspector – Water Metering	WD II
	Inspector – Water Metering	WD I
	Foreman III	WD III
	Water Systems Serviceman	WD II
	Water Systems Serviceman	WD II
	Water Systems Serviceman	WD II
	Water Systems Serviceman	WD II
	Water Systems Serviceman	WD II
	Water Systems Serviceman	WD III
	Water Systems Serviceman	WD II
	Water Systems Serviceman	WD III
	Water Systems Serviceman	WD II
	Water Systems Serviceman	WD II
	Water Systems Serviceman	WD II
	Labourer II	WD I
	Labourer II	WD II
	Manager, Cross Connections	WD II
	Inspector – Cross Connections	WD I

1.5 Alberta Environment Operator Certifications (Effective to year end 2021)

Operator Contact Number: EPCOR Water Services Dispatch (24 hr) (780) 412-4500

DISTRIBUTION SYSTEM (LEVEL IV FACILITY) WATER METERING (WD)		
	Manager, Metering Operations	**WD I**
Employee Name	Title	Alberta Environment
	Foreman III	WD II
	Meter Installer II	WD II
	Meter Mechanic II	WD II
	Meter Installer II	WD III
	Meter Installer I	WD II
	Meter Installer I	WD II
	Meter Installer I	WD II
	Meter Mechanic I	WD II
	Meter Installer I	WD II
	Meter Installer I	WD I
	Meter Installer I	WD III
	Meter Installer I	WD I
	Meter Mechanic I	WD II
	Meter Installer I	WD I
	Meter Installer I	WD II
	Meter Installer I	WD I
	Meter Installer I	WD III
	Meter Installer I	WD I

1.6 Demand/Production Statistics (Estimated HLP Flow)

December 2021

Month	ROSSDALE ZONE			E.L.SMITH ZONE			SYSTEM TOTAL			RESERVOIR PUMPAGE		
	Monthly Prod'n (ML)	Max Daily Prod'n (ML)	Peak Daily Demand (ML)	Monthly Prod'n (ML)	Max Daily Prod'n (ML)	Peak Daily Demand (ML)	Monthly Prod'n (ML)	Max Daily Prod'n (ML)	Peak Daily Demand (ML)	Rossdale Zone (ML)	E.L.Smith Zone (ML)	Total (ML)
JANUARY	3,493	126	160	6,825	240	243	10,317	356	341	993	2,480	3,473
FEBRUARY	3,481	143	228	6,129	260	266	9,610	392	355	1,050	2,289	3,339
MARCH	3,734	136	153	6,883	239	245	10,617	365	352	1,052	2,558	3,609
APRIL	3,879	142	167	6,514	244	242	10,392	377	375	1,055	2,527	3,582
MAY	4,248	184	214	7,271	286	322	11,519	470	465	1,382	2,880	4,262
JUNE	5,084	237	257	8,407	339	373	13,491	561	608	1,505	3,363	4,868
JULY	6,343	292	279	8,556	339	312	14,898	631	580	1,641	3,543	5,184
AUGUST	4,866	232	231	8,180	316	313	13,046	523	511	1,526	3,166	4,692
SEPTEMBER	4,293	192	199	6,902	275	305	11,195	451	412	1,384	2,894	4,278
OCTOBER	3,926	223	263	7,047	262	269	10,973	423	380	1,122	2,847	3,969
NOVEMBER	3,995	176	217	6,441	246	270	10,436	401	359	724	2,480	3,203
DECEMBER	4,504	169	201	6,214	226	253	10,718	390	360	854	2,505	3,359

2021 - HIGH 5-DAY DEMAND

	PLANTS PROD (ML/d)	RES. GAIN / LOSS (%)	RES. GAIN / LOSS (ML)	TOTAL DEMAND (ML)
27-Jun-2021	550	-1.3	-7.9	558
28-Jun-2021	561	-6.7	-41.9	602
29-Jun-2021	550	-8.8	-55.6	606
30-Jun-2021	552	-9.0	-56.5	608
01-Jul-2021	631	8.0	50.4	580
			AVERAGE:	591

Year to Date Data	2021	2020	% CHANGE
TOTAL PRODUCTION TO DATE (ML)	137,212	129,825	5.7
AVG. DAILY DEMAND TO DATE (ML)	376	355	6.0
PEAK DAILY DEMAND TO DATE (ML)	608	441	37.8
PEAK HOURLY DEMAND TO DATE (ML)	865	568	52.3
HIGH 5-DAY AVERAGE TO DATE (ML)	591	429	37.8

Peak daily demand of 608 ML/d occurred on June 30, 2021

Peak hourly demand of 865 ML/d occurred on June 28th at 20:00.

1.7 Energy Consumption and Usage

Energy Consumption

Power Consumption (kWh):

	2021	2020	Change %
Rossdale WTP	30,231,847	28,560,112	5.85%
E.L Smith WTP.	44,602,862	44,368,668	0.53%
Field Pump Stations	15,083,368	13,441,946	12.21%
TOTAL	89,918,078	86,370,726	4.11%

Gas Consumption (GJ):

	2021	2020	Change %
Plants	96,754	98,536	-1.81%
Pumping Stations	4,309	3,387	27.22%
TOTAL	101,062	101,923	-0.84%

Water Production/Pumpage(ML):

	2021	2020	Change %
Rossdale WTP	51,847	45,608	13.68%
E.L Smith WTP.	85,368	83,949	1.69%
Field Pump Stations	43,972	45,371	-3.08%
TOTAL	137,215	129,557	5.91%

Note: The reservoirs and booster stations are not included into these totals.

Energy Usage

	2021	2020
Energy Consumption for Treatment and Pumpage (kWh)	89,918,078	86,370,726
Energy in kW.h per ML pumped	665	667
Gas Consumption – All Facilities (GJ)	101,062	101,923
Gas Consumption – All Field Pump Stations (GJ)	4,309	3,387

1.8 Summary of Changes to the Operations Program

A summary of the significant changes to the 2022 Operations Program document from the previous year is as follows:

1. References to the now ended EnviroVista program have been removed, and throughout the document references to the Operating Approval have been update to the new approval received in May 2021 (00000638-04-00).

2. Section 1 Watershed Protection Program. EPCOR now is supporting the development of THREATS (The Healthy River Ecosystem AssessmenT System) which will amalgamate available water quality, quantity, and landuse/cover data into a publically available geospatial tool for the NSR watershed. In addition, the Total Loadings Strategy that is part of the Integrated Watershed Management Strategy will be updated in 2022.

3. Section 2.1 Treatment Process Overviews. Clarified that in the water treatment process downstream of UV disinfection, ammonium hydroxide is added at Rossdale, and ammonium sulfate at EL Smith.

4. Section 2.5.1.2 Communication to AEP and other sections of the document. The approvals engineer contact was updated from Mohammad M. Rahman to Fengqin Wang.

5. Section 3.1.1 Water Supply Overview. Noted that there are now 14 pumping stations. As of December 17, 2021 that the Capital Region Parkland Water Service Commission (CRPWSC) portion of the Parkland Booster Station was acquired by EPCOR.

6. Section 4.2 Water Quality Monitoring Plan. Updated the algorithm for calculating the number of required routine bacteriological samples in the distribution system. It was updated based on based on the latest Statistics Canada municipal 2021 census assessment. The population within the City of Edmonton was 1,010,899, up 8.3% from the 2016 census. On April 1 the minimum number of samples required per month will be increased from 190 to 195.

7. Section 5.3.1 WTP Solids Residuals Reduction. EPCOR is working towards upgrading the stage one and stage two filters (1-12 out of 18) at the EL Smith WTP to deep bed filters. Pilot studies have shown that deep bed filters will allow EPCOR to operate in extended direct filtration operation reliably and at a higher throughput. EPCOR is also looking to explore opportunities to efficiently manage clarifiers and filters at EL Smith WTP by adopting right digitalization and artificial intelligence tools. Both of these initiatives are intended to reduce residuals

8. Section 6.2 Drinking Water Safety Plan (DWSP) Procedure. In the 2022 review of the DWSP, 2 new risks were identified. A focus for this review was to refresh the existing action plans associated with the risk register. Additionally risks were edited to include

more information under current monitoring and control, risk factor statements, causes or threats. There are currently 22 key risks in progress or new in our registry. There were no action plans that were fully completed and thus removed from the 2021 list. Finally, as per the 2020 Guidance Document for Managing Lead in Municipal Drinking Water Systems: Phase 1 (v1.3), lead risks were consider in the Customer and Network Risk portions of the DWSP and action plans were updated accordingly.

9. Section 7 Edmonton Water Capital Program. Note the extension of the current Performant Based Rate (PBR) regulation from 2022 to 2026. The total approved capital expenditures for this new period is $429 million. Updates terminology for capital projects to note that Project Sponsors are responsible for project delivery.
10. Operator Training and Certification. Updated the CEU requirements for operators as stipulated by Alberta Environment and Parks. Changes included a limit on allowable safety training towards certification, and that training must be discipline specific.

2.1 Storage Capacities of Reservoirs

Station	Available (ML)	Fire Storage (ML)	Operating Storage (ML)	Dead/ Emergency (ML)	Gross (ML)
Water Treatment Plant Reservoir					
Rossdale Total	80.42	0.00	80.42	16.98	97.40
E.L. Smith Total	95.20	0.00	95.20	42.30	137.50
Sub Total	**175.62**	**0.00**	**175.62**	**59.28**	**234.90**
Field Reservoir					
Rosslyn	97.54	12.56	110.10	12.93	123.04
Clareview	50.51	2.95	53.46	11.14	64.60
Papaschase	66.80	9.71	76.51	5.63	82.14
Londonderry	39.10	2.58	41.68	3.56	45.24
North Jasper Place	29.74	4.66	34.40	11.66	46.06
Ormsby	37.41	2.99	40.40	4.87	45.27
Thorncliff	37.10	2.93	40.03	3.40	43.43
Kaskitayo	21.78	3.96	25.74	3.20	28.94
Mill Woods	46.98	5.92	52.90	3.33	56.23
Castle Downs	22.70	2.41	25.11	8.93	34.04
Discovery Park	5.01	1.22	6.23	0.70	7.10
Sub Total	**454.67**	**51.89**	**506.56**	**69.35**	**576.09**
Grand Total	**630.29**	**51.89**	**682.18**	**128.63**	**810.99**

(End of Section)

2.2 Pumping Station Operating Pressure Ranges

		Current Alarms					
Treatment Plants Highlift Pump Stations	**Elevation, m**	**LOLO**	**LO**	**HI**	**HIHI**	**Low Pressure SD**	**High Pressure Setpoints**
ELS North	620.85	910	940	1080	1100		
ELS South	620.85	910	940	1080	1100		
Rossdale West	622.25	800	830	950	980		
Rossdale South	622.25	800	830	950	980		
Reservoir Pumping Stations	**Elevation, m**	**LOLO**	**LO**	**HI**	**HIHI**	**Low Pressure SD**	**High Pressure Setpoints**
Rosslyn 1 Discharge	669.87	295	345	475	595		
Rosslyn 2 Discharge	671.42	280	330	465	580		
Clareview Intake	649.73	365	410	640	670		
Clareview Discharge	648.95	500	530	620	640		
Papaschase 1 In/Disch	693.3	45	95	270	385		
Londonderry Intake	677.91	170	220	380	480		
Londonderry Discharge	670.21	400	450	500	525		535
Rosslyn 3 Discharge	669.14	510	540	630	700		610
Ormsby LE Discharge	679.38	525	575	680	710		
NJP Discharge	675.12	320	345	440	585		
Ormsby Primary Discharge	679.41	325	355	460	490		
Ormsby Intake	679.41	295	325	1000	1000		
Thorncliff Discharge	672.02	350	380	495	515		
Thorncliff Intake	672.02	310	340	480	500		
Castledowns Intake	678.96	230	260	400	430		
Castledowns Discharge	677.99	400	450	530	710		520
Kaskitayo Discharge	673.84	490	550	690	720		
Kaskitayo Intake	673.84	280	315	480	550		
Millwoods Discharge	678.83	490	520	620	650		
Millwoods Intake	678.82	220	250	400	430	60/140	
Papachase 2 Discharge	690.42	350	380	500	530		
Papachase 2 Intake	689.06	40	70	700	700		
Discovery Park Intake		350	400	460	510		
Discovery Park Discharge		280	330	470	520		
Booster Pumping Stations	**Elevation, m**	**LOLO**	**LO**	**HI**	**HIHI**	**Low Pressure SD**	**High Pressure Setpoints**
Parkland Intake	682.353	270	290	380	400		
Parkland Discharge 300mm	682.4	555	605	700			
Parkland Discharge 600mm	682.4	555	605	700			
Big Lake Intake	677.6					60/140	
Big Lake Discharge	677.6	315	365	475	625		
Terwillegar Discharge	683.00	440	480	650	690		
Terwillegar Intake	682.16	240	257	750	750	60/140	
Burnewood Discharge	695.05	520	550	610	640		
Burnewood Intake	695.05	210	240	700	700	60/140	
Laurel Intake		230	280	300	350	60/140	
Laurel Discharge		280	300	400	450		
Ellerslie Discharge	695.23	490	540	580	600		
Ellerslie Intake	695.2	250	280	500	540	60/140	
Walker Intake	723.6					60/140	
Walker Discharge	723.6	360	410	500	650		
Blackmud Creek Intake	690.104						
Blackmud Creek Discharge		630	680	830	880		

(End of Section)

2.3 Fire Stations & Other City Pressure Monitors

		Current Alarms					
Firehall Stations	**Elevation, m**	**LOLO**	**LO**	**HI**	**HIHI**	**Low Pressure SD**	**High Pressure Setpoints**
Fire Hall #1 (Headquarters)	661.759	310	360	550	700	N/A	N/A
Fire Hall #2 (Downtown)	667.018	270	320	495	645	N/A	N/A
Fire Hall #3 (University)	667.792	370	420	520	670	N/A	N/A
Fire Hall #5 (Norwood)	663.986	235	285	515	665	N/A	N/A
Fire Hall #6 (Mill Creek)	663.863	360	410	520	670	N/A	N/A
Fire Hall #7 (Highlands)	655.873	280	330	550	700	N/A	N/A
Fire Hall #8 (Hagman)	674.153	295	345	450	600	N/A	N/A
Fire Hall #9 (Roper Station)	693.967	240	290	460	610	N/A	N/A
Fire Hall #11 (Capilano)	665	260	310	475	625	N/A	N/A
Fire Hall #15 (Coronet)	675.232	285	335	470	625	N/A	N/A
Fire Hall 12 (Meadowlark)	673.546	250	300	445	595	N/A	N/A
Fire Hall 13 (Rainbow Valley)	669.812	285	335	515	665	N/A	N/A
Fire Hall #16 (Mill Woods)	693.516	260	310	430	580	N/A	N/A
Fire Hall #17 (Castledowns)	680.669	230	280	470	620	N/A	N/A
Fire Hall #20 (Kaskitayo)	679.57	230	280	430	580	N/A	N/A
Fire Hall #22 (Oliver)	668.561	230	280	520	670	N/A	N/A
Fire Hall #24 (Terwillegar)	686	265	315	450	600	N/A	N/A
Fire Hall #26 (Meadows)	712.5m	295	345	475	525	N/A	N/A
Firehall #27 (Ellerslie)	686	375	425	470	615	N/A	N/A
Fire Hall #28 (Heritage Valley)	695.408	290	300	400	550	N/A	N/A
Other City Pressure Monitoring Stations	**Elevation, m**	**LOLO**	**LO**	**HI**	**HIHI**	**Low Pressure SD**	**High Pressure Setpoints**
U of A #1 (Sask Dr)	669.63					N/A	N/A
U of A #2 (83 Ave)	670.762					N/A	N/A
U of A #3 (116st)		330	360	460	490	N/A	N/A
Sobeys	682	305	355	490	640	N/A	N/A
Northest Line		420	450	580	610	N/A	
Westview	696.7	320	340	500		N/A	N/A
HD Windermere	682.7	410	460	550	770	N/A	N/A
HD 17st	707.6	340	390	490	640	N/A	N/A
TAMS	assume 679.44	270	320	410	560	N/A	N/A
Clover Bar		300	350	540	590	N/A	N/A

(End of Section)

2.3 Fire Stations & Other City Pressure Monitors

LOCATION		Elevation	m T. Head		kPa	
		m	Min.	Max.	Min.	Max.
#	**Fire Hall**					
1	10351 96 St.	661.759	703	722	400	540
2	10217 107 St.	667.018	708	717	400	490
3	11226 76 Ave.	667.792	708	717	395	485
5	9020 111 Ave.	663.986	708	717	430	520
6	8105 96 St.	663.863	708	717	430	520
7	5025 118 Ave.	655.873	705	713	480	560
8	12503 128 St.	674.153	708	713	330	410
9	5604 50 St.	693.967	730	740	350	455
11	6110 98 Ave.	664.07*	708	717	430	520
12	9020 156 St.	673.546	711	720	360	450
13	4035 119 St.	669.812	716	723	450	520
15	5120 97 St.	675.232	708	715	320	390
16	2940 66 St.	693.516	730	740	350	455
17	15505 Castledowns Rd.	680.669	715	740	340	585
20	2303 105 St.	679.57	713	720	325	395
22	10124 123 St.	668.561	708	716	385	465
24	131 Haddow Cl.	685*	717	730	305	430
26	2803 34 St.	712.5	742	766	295	525
27	1203 Ellwood Rd. SW	686	724	749	375	615
28	12110 26 Ave. SW	695	719	756	230	625
	Other City Points					
	Westview Village	696.7	729	742	320	450
	Sobeys 167 Ave 91 St	682*	720	735	370	520
	Home Depot 17 St	707.6*	748	757	400	480
	Home Depot Windermere	684*	730	742	400	660
	Clover Bar	731.87	803	762	300	700
	TAMS	750.14	778	807	270	560

NOTE: 50 kPa ALLOWANCE FOR ALARM LIMITS AT MIN. and MAX.

* appoximate elevation

(End of Section)

2.4 Regional Customers

Customer	Elevation (m)	Minimum		Normal Range			
		HGL (m)	Pressure (kPa)	HGL (m)	Pressure (kPa)	HGL (m)	Pressure (kPa)
Regional Water Customer Group*							
CRPWSC (Parkland)	682.353	708	250	712	290	715	320
Sturgeon County	692	717	240	723	304	723	354
Strathcona County	664.384	700	349	703	379	709	438
Morinville	662.65	698	383	702	422	707	471
St. Albert Sturgeon	685.173	703	175	707	214	712	263
St. Albert Oakmont	655.45	696	402	700	441	706	491
CRNWSC (Northeast)	643.05	691	470	696	519	702	578
CRSWSC (Southwest)**	716	755.7	390	759.8	430	766.4	495
Bulk Customers*							
Enoch Cree Nation	703.7	717	128	720	160	728	240
Namao	681.495	710	280	713	309	726	437

*Based on Water Supply Agreements

**Point of Delivery: Discovery Parm Reservoir intake.

(End of Section)

2.5 Pumping Facilities

Facilities	Year Built	Number of Pumps			Maximum Design Discharge Flow by Pump (ML/d)
		Total	Fixed Speed	Variable Speed	
Water Treatment Plants Highlift Pump Stations					
Rossdale Plant	1947	6	4	2	4 @ 100, 2 @ 105
E.L. Smith Plant	1976	4	2	2	2 @ 95, 2 @ 205
Field Reservoir & Booster Pump Stations					
Primary Zone					
Clareview	1979	3	1	2	1 @ 14, 2 @ 30
Rosslyn 1	1955	3	3	0	3 @ 20
Rosslyn 2	1969	1	1	0	1 @ 22
North Jasper Place	1974	4	3	1	2 @ 13, 2 @ 26
Thorncliff	1970	3	3	0	3 @ 12
Ormsby	1969	3	2	1*	2 @ 16, 1@ 32
Papaschase 1	1976/82	2	2	0	2 @ 20
North Secondary Zone					
Londonderry	1974/79	3	1	2	2 @ 15, 1 @ 21
Castledowns	1979	3	1	2	3 @ 17
Rosslyn 3	1963	3	3**	0	2 @ 26; 1@18
West Secondary & Big Lake Zones					
Parkland Booster St.	1973	5	3	2	1 @ 2, 1 @ 4, 1 @ 10, 1 @ 14, 1 @ 25
Ormsby, Lewis Estates	1969	3	0	3	1 @ 20, 1@ 15, 1 @ 5
Big Lake Booster St.	2016	5	0	5	2 @ 8, 2 @ 25, 1 @ 34
South Secondary Zone					
Papaschase 2	1968/71	3	2	1	2 @ 13, 1 @ 23
Mill Woods	1977	6	3	2	3 @ 16, 1 @ 24, 1 @ 32, 1 @ 18
Kaskitayo	1980	5	3	2	3 @ 10, 2 @ 15
Terwillegar Booster St.	1998	3	2	1	3 @ 17
South Tertiary Zone					
Burnewood Booster St.	1985	4	2	2	3 @ 19, 1 @ 14
Ellerslie Booster St.	2007	2	0	2	2 @ 6
Laurel Booster St.	2018	2	0	2	2 @ 2
Blackmud Creek Booster S	1982	3	0	3	1@17, 1@34, 1@2.6
Discovery Park	2020	5	0	5	1@1.12,2@2.68,2@11.2
South Quaternary Zone					
Walker Booster St.	2015	5	0	5	2 @ 2, 2 @ 7, 1@ 17
TOTAL		**88**	**38**	**45**	

*Ormsby Pump #3 can be used to support Primary Pressure Zone or West Secondary Pressure Zone depending on the discharge header valve configuation. The totals include this pump once.

(End of Section)

2.6 Production Summary

Water Production	2021	2020	2019
Treated and Pumped into the System	137,214	129,825	130,166
Water Treated at Rossdale Plants	51,848	45,877	43,172
Water Treated at E. L. Smith Plant	85,366	83,948	86,994
Supplied to Residential Customers	69,534	66,604	62,370
Supplied to Commercial/Industrial Customers	22,342	21,407	26,133
Supplied to Suburban Customers	37,659	33,610	33,970
Percentage Accounted for from:			
Metered & Bulk Sources	94%	94%	95%
Assumed System Leakage	6%	6%	5%
Average Day Pumpage (ML)	376	355	357
Peak Day Demand (ML)	608	441	489

Population Served	2021	2020	2019
Approximate Population Served (City)	1,057,181	1,047,003	972,223
Approximate Population Served (Region)	359,000	354,000	349,000
Approximate Population Served (Total)	1,416,181	1,401,003	1,321,223

Per Capita Consumption (L/cap)	2021	2020	2019
Average Day Demand	265	253	270
Peak Day Demand	429	315	370

(End of Section)

2.7 Raw Water Intake (ML)

2021

Month	Rossdale									E.L. Smith				Plants Combined Total
	Plant 1				Plant 2				Plant Total	Min	Max	Avg	Plant Total	
	Min	Max	Avg	Total	Min	Max	Avg	Total						
January	49	60	53	1,628	66	80	72	2,220	3,848	136	281	257	7,955	11,803
February	21	59	51	1,439	27	99	84	2,351	3,790	51	301	264	7,385	11,175
March	45	58	54	1,671	57	88	78	2,420	4,092	248	281	266	8,254	12,345
April	50	60	56	1,667	70	96	85	2,549	4,216	135	281	262	7,852	12,068
May	34	75	57	1,716	0.0	115	97	2,999	4,715	74	341	282	8,751	13,466
June	50	92	68	2,039	76	163	117	3,501	5,540	260	386	323	9,704	15,245
July	50	125	77	2,374	78	175	138	4,268	6,642	246	381	312	9,669	16,311
August	55	125	93	2,881	0.0	120	74	2,304	5,185	113	354	297	9,204	14,389
September	0.0	86	27	807	2.5	173	127	3,796	4,603	118	320	269	8,070	12,673
October	12	119	77	2,392	0.0	170	61	1,883	4,275	5.0	301	266	8,257	12,532
November	29	65	53	1,601	42	120	94	2,832	4,432	31	301	270	8,101	12,533
December	25	60	58	1,806	42	121	99	3,076	4,882	74	273	238	7,385	12,267
Annual Total				22,022				34,198	56,219				100,589	156,808
Annual Min/Max/Avg	0.0	125	60		0.0	175	94			5.0	386	276		

2.8 Treated Water Production (ML)

2021

Month	Rossdale (Plant 1 & Plant 2)				E.L. Smith								Plants Combined	
	Flow Meters				Flow Meters				Estimated (Highlift Flow)				Avg	Total
	Min	Max	Avg	Total	Min	Max	Avg	Total	Min	Max	Avg	Total		
January	33	210	113	3,492	0.0	295	216	6,686	0.0	301	220	6,824	333	10,317
February	0.0	207	124	3,481	0.0	305	215	6,018	0.0	473	219	6,129	343	9,609
March	0.0	209	120	3,733	0.0	299	218	6,756	0.0	305	222	6,884	342	10,617
April	0.0	209	129	3,879	0.0	299	213	6,396	0.0	305	217	6,513	346	10,393
May	0.0	212	137	4,248	0.0	337	231	7,169	0.0	344	235	7,271	372	11,519
June	0.1	300	169	5,085	192	374	279	8,367	195	381	280	8,407	450	13,492
July	0.0	304	205	6,343	194	376	275	8,513	198	383	276	8,556	481	14,899
August	0.0	301	157	4,867	0.0	351	262	8,121	0.0	358	264	8,180	421	13,047
September	0.0	246	143	4,293	0.0	317	228	6,847	0.0	333	230	6,902	373	11,194
October	0.0	290	127	3,926	0.0	287	225	6,961	0.0	467	227	7,047	354	10,973
November	0.0	205	133	3,995	0.0	288	211	6,339	0.0	294	215	6,441	348	10,436
December	2.3	206	145	4,505	0.0	263	204	6,338	0.0	271	200	6,214	346	10,719
Annual Total				51,848				84,511				85,366		137,214
Annual Min/Max/Avg	0.0	304	142		0.0	376	232		0.0	473	234		376	

NOTES: ' -- ' indicates plant offline

- Estimated flows are based on UV effluent flow meters to address inaccuracy of highlift flow meters.
- As of July 1, 2009, plants combined data is the sum of Rossdale flow meters and E.L. Smith estimated flow data.

3.1 Raw Water Quality - North Saskatchewan River

2021

Month	Rossdale									E.L. Smith								
	Turbidity (NTU)			pH			Colour (TCU)			Turbidity (NTU)			pH			Colour (TCU)		
	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
January	1.3	2.0	1.6	8.0	8.2	8.1	2.0	6.9	4.5	1.2	2.3	1.7	8.0	8.2	8.1	3.5	6.3	4.8
February	1.5	13	2.3	8.0	8.2	8.1	4.1	7.5	5.7	1.4	5.5	2.3	7.9	8.2	8.0	4.5	7.7	6.0
March	1.8	7.1	3.6	7.9	8.2	8.1	3.6	14.6	8.0	1.9	7.3	3.2	7.9	8.2	8.0	4.5	14.1	7.6
April	2.0	100	19	8.1	8.4	8.2	2.8	5.2	3.7	2.3	120	26	7.9	8.3	8.1	2.6	6.3	3.9
May	5.7	160	24	8.1	8.4	8.3	2.7	31.0	11.9	6.8	170	28	8.1	8.4	8.3	2.9	31.8	12.5
June	7.2	240	35	8.2	8.7	8.3	4.7	23.3	11.1	3.8	270	45	8.0	8.5	8.3	6.2	23.8	12.0
July	2.4	120	11	8.2	8.5	8.4	2.1	9.3	4.7	4.3	170	14	8.1	8.5	8.4	2.4	9.1	5.4
August	1.8	8.8	3.2	8.2	8.4	8.4	1.7	5.2	2.8	3.3	19	5.5	8.1	8.5	8.3	1.5	5.5	3.0
September	2.0	32	5.8	8.2	8.4	8.4	2.8	12.5	4.6	2.6	39	7.6	8.1	8.4	8.3	2.3	12.3	4.7
October	1.6	17	2.9	8.2	8.4	8.3	2.5	4.4	3.1	1.9	25	3.4	7.9	8.4	8.2	1.7	4.8	3.1
November	2.2	21	4.1	8.1	8.2	8.2	2.1	3.3	2.7	2.5	28	4.6	8.0	8.3	8.2	1.9	4.7	2.9
December	1.3	6.8	2.8	7.8	8.2	8.1	2.2	5.7	2.8	1.4	8.0	3.0	7.9	8.3	8.1	2.0	5.6	2.8
Annual Min/Max/Avg	1.3	240	9.7	7.8	8.7	8.2	1.7	31.0	5.5	1.2	270	12	7.9	8.5	8.2	1.5	31.8	5.7

NOTES: ' -- ' indicates plant offline

3.2 Treated Water Quality Entering the Distribution System

2021

Month	Rossdale														E.L. Smith											
	Turbidity (NTU)			Chloramine Residual (mg/L)			pH			Fluoride Residual (mg/L)			Total Hardness (mg/L as $CaCO_3$)	Colour (TCU)	Turbidity (NTU)			Chloramine Residual (mg/L)			pH			Fluoride Residual (mg/L)			Total Hardness (mg/L as $CaCO_3$)	Colour (TCU)
	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Avg	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Avg	Avg
January	0.03	0.08	0.06	1.90	2.26	2.06	8.0	8.2	8.1	0.63	0.77	0.71	185	0.8	0.04	0.07	0.04	1.83	2.08	1.93	7.7	8.1	8.0	0.65	0.81	0.77	182	1.1
February	0.03	0.08	0.06	1.90	2.32	2.09	8.0	8.2	8.1	0.60	0.81	0.74	191	1.1	0.04	0.07	0.04	1.83	2.11	1.94	7.8	8.1	7.9	0.64	0.86	0.73	187	1.3
March	0.02	0.08	0.04	1.90	2.36	2.09	7.7	8.1	8.0	0.66	0.79	0.72	178	0.9	0.04	0.04	0.04	1.81	2.08	1.97	7.5	8.2	7.8	0.63	0.70	0.66	176	0.9
April	0.02	0.08	0.04	1.90	2.36	2.04	7.3	8.0	7.9	0.67	0.77	0.73	164	0.4	0.03	0.07	0.04	1.90	2.06	1.96	7.6	8.1	7.9	0.63	0.79	0.67	163	0.7
May	0.02	0.13	0.06	1.80	2.26	2.03	7.6	7.9	7.8	0.62	0.80	0.72	174	0.7	0.04	0.05	0.04	1.81	2.22	1.98	7.5	8.0	7.8	0.61	0.70	0.65	174	0.9
June	0.03	0.11	0.06	1.80	2.52	2.06	7.7	8.2	7.8	0.60	0.84	0.72	178	0.6	0.04	0.05	0.05	1.88	2.08	1.97	7.4	7.8	7.7	0.64	0.79	0.70	178	1.0
July	0.04	0.16	0.06	1.70	2.26	1.99	7.7	8.0	7.9	0.58	0.84	0.71	170	0.4	0.04	0.06	0.05	1.82	2.12	1.96	7.6	7.8	7.7	0.65	0.81	0.75	170	0.6
August	0.04	0.11	0.06	1.80	2.36	2.08	7.8	8.0	7.9	0.62	0.78	0.72	148	0.2	0.04	0.07	0.04	1.81	2.22	2.08	7.6	8.1	7.7	0.53	0.75	0.65	149	0.5
September	0.04	0.10	0.05	1.90	2.20	2.07	7.6	8.0	7.8	0.65	0.80	0.73	155	0.4	0.04	0.06	0.05	1.84	2.11	1.99	7.5	8.0	7.7	0.64	0.79	0.72	156	0.5
October	0.04	0.10	0.05	1.90	2.21	2.07	7.6	8.0	7.8	0.52	0.78	0.71	164	0.4	0.04	0.06	0.05	1.88	2.11	1.98	7.7	7.8	7.7	0.65	0.81	0.75	163	0.4
November	0.04	0.08	0.06	1.90	2.26	2.07	7.6	8.2	8.0	0.60	0.80	0.73	165	0.6	0.05	0.12	0.06	1.89	2.12	2.01	7.4	7.9	7.7	0.62	0.76	0.71	164	0.6
December	0.04	0.08	0.06	1.90	2.16	2.05	7.8	8.0	7.9	0.69	0.80	0.77	173	0.5	0.05	0.08	0.06	1.88	2.08	1.95	7.5	7.8	7.7	0.72	0.81	0.77	172	0.6
Annual Min/Max/ Avg	0.02	0.16	0.05	1.70	2.52	2.06	7.3	8.2	7.9	0.52	0.84	0.73	170	0.6	0.03	0.12	0.05	1.81	2.22	1.98	7.4	8.2	7.8	0.53	0.86	0.71	169	0.7

NOTES: ' -- ' indicates plant offline

3.2 - 1 Treated Water Quality Entering the Distribution System

2021

Month	Rossdale									E.L Smith								
	Temperature (°C)			pH			Hourly Flow (ML per day)			Temperature (°C)			pH			Hourly Flow (ML per day)		
	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
June	14.4	26.5	19.3	7.7	8.2	7.8	0	290	170	13.9	25.9	18.8	7.4	7.8	7.7	197	378	284
July	18.3	26.6	22.1	7.7	8.0	7.9	76	303	205	18.2	26.0	21.6	7.6	7.8	7.7	201	382	280
August	14.3	23.2	19.3	7.8	8.0	7.9	0	292	157	13.9	22.5	18.7	7.6	8.1	7.7	0	356	268
September	11.9	17.0	14.5	7.6	8.0	7.8	0	240	143	11.6	17.0	14.1	7.5	8.0	7.7	0	318	233
October	4.3	12.9	7.5	7.6	8.0	7.8	0	275	127	4.1	13.2	7.3	7.7	7.8	7.7	0	291	228
November	0.5	3.2	0.9	7.6	8.2	8.0	0	203	133	0.7	1.0	1.1	7.4	7.9	7.7	0	289	215
December	0.5	1.3	0.5	7.8	8.2	7.9	0	205	145	0.4	0.9	0.7	7.5	7.8	7.7	0	251	205
Annual Min/Max/Avg	**0.5**	**26.6**	**12.0**	**7.6**	**8.2**	**7.9**	**0**	**303**	**154**	**0.4**	**26.0**	**11.8**	**7.4**	**8.1**	**7.7**	**0**	**382**	**245**

3.3 Rossdale Filters 1 - 9 Particle Counts (no./mL >2um)

2021

Filter	1			2			3			4			5			6			7			8			9		
Month	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**
January	1	33	2	1	26	3	1	40	2	1	32	4	1	23	3	3	28	8	1	27	4	3	35	8	1	25	6
February	1	44	4	1	44	3	1	24	2	1	38	5	1	24	4	2	41	10	1	43	4	3	39	8	--	--	--
March	1	45	3	1	22	2	1	29	1	1	36	3	1	29	3	1	28	11	1	30	3	3	34	8	--	--	--
April	1	27	4	1	34	3	1	24	2	1	32	5	1	30	4	1	30	7	1	33	5	1	45	9	--	--	--
May	1	45	9	1	43	8	1	36	6	1	43	8	1	38	8	1	41	7	1	44	10	1	45	9	--	--	--
June	1	44	5	1	29	2	1	19	2	1	45	2	1	20	2	1	12	1	1	23	2	1	44	1	--	--	--
July	1	27	2	1	29	2	1	38	2	1	23	3	1	23	2	1	25	2	1	26	2	1	40	3	1	24	2
August	1	43	1	1	34	2	1	34	3	1	34	5	1	39	2	1	37	2	1	26	2	1	16	1	1	15	1
September	1	42	4	1	27	3	1	28	4	1	29	5	1	34	4	1	27	4	1	31	5	1	23	3	1	22	3
October	1	43	2	1	29	3	1	42	2	1	41	2	1	32	3	1	26	2	1	26	5	1	28	2	1	40	2
November	1	42	4	1	44	3	1	41	4	1	44	4	1	47	5	1	33	3	1	43	8	1	24	3	1	45	5
December	1	24	3	1	39	2	1	34	2	1	36	2	1	43	4	1	44	3	1	36	9	1	27	2	1	24	3
Annual Min/Max/Avg	1	45	4	1	44	3	1	42	3	1	45	4	1	47	4	1	44	5	1	44	5	1	45	5	1	45	3

NOTE: ' -- ' indicates filter offline

3.4 E.L. Smith Filters 1 - 9 Particle Counts (no./mL >2um)

2021

Filter	1			2			3			4			5			6			7			8			9		
Month	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**
January	3	32	17	1	44	5	--	--	--	1	33	4	1	31	3	1	44	5	1	30	5	1	35	4	1	35	5
February	9	36	16	--	--	--	--	--	--	1	33	4	1	26	2	1	44	8	1	45	7	1	36	6	1	44	8
March	9	34	16	1	32	2	--	--	--	1	32	2	1	30	2	1	44	3	1	29	4	1	29	3	1	35	3
April	5	40	20	1	32	5	--	--	--	1	33	5	1	33	5	1	33	5	1	37	7	1	32	6	1	36	6
May	1	45	13	1	36	7	--	--	--	1	38	7	1	35	7	1	38	8	1	45	10	1	40	9	1	45	9
June	1	40	7	1	33	5	1	44	8	1	39	5	1	35	5	1	36	6	1	42	9	1	32	8	1	37	7
July	--	--	--	1	37	5	1	24	5	1	45	5	1	25	5	1	32	6	1	43	8	1	38	7	1	42	6
August	--	--	--	1	26	5	1	43	5	1	29	6	1	33	5	1	32	6	1	39	7	1	34	6	1	27	6
September	--	--	--	1	36	7	1	37	7	1	45	6	1	37	7	1	35	6	1	44	9	1	39	8	1	44	8
October	--	--	--	1	33	5	1	35	5	1	41	5	1	37	5	1	38	6	1	41	8	1	34	7	1	39	8
November	--	--	--	--	--	--	1	42	7	1	35	6	1	25	6	1	32	7	1	43	9	1	36	8	1	32	7
December	--	--	--	--	--	--	1	25	3	1	29	3	1	27	3	1	37	5	1	31	4	1	35	4	1	31	4
Annual Min/Max/Avg	1	45	15	1	44	6	1	44	6	1	45	5	1	37	5	1	44	6	1	45	7	1	40	6	1	45	6

NOTE: ' -- ' indicates filter offline

3.5 E.L. Smith Filters 10 - 18 Particle Counts (no./mL >2um)

2021

Filter	10			11			12			13			14			15			16			17			18		
Month	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**
January	2	45	10	1	22	4	1	33	6	2	45	9	1	32	5	2	45	8	1	45	6	1	45	7	1	45	6
February	1	45	12	1	44	6	1	44	9	2	45	10	1	45	6	1	45	8	1	44	7	1	45	8	1	45	7
March	1	45	4	1	25	3	1	30	4	1	45	5	1	41	4	1	44	5	1	42	3	1	45	3	1	44	4
April	1	34	6	1	29	6	1	34	7	1	43	7	1	35	7	1	41	7	1	35	5	1	33	5	1	28	5
May	1	37	9	1	43	8	1	45	10	1	41	10	1	39	11	1	41	10	1	38	7	1	41	8	1	42	8
June	1	30	8	1	34	7	1	40	8	1	43	8	1	40	8	1	44	8	1	35	6	1	35	6	1	32	6
July	1	44	6	1	27	6	1	40	7	1	44	7	1	36	7	1	38	7	1	30	5	1	41	6	1	42	6
August	1	41	6	1	31	6	1	44	6	1	40	8	1	35	6	1	43	6	1	44	4	1	35	5	1	31	4
September	1	41	8	1	42	9	1	43	9	3	40	13	1	41	9	1	39	8	1	35	6	1	38	7	1	44	6
October	1	45	8	1	34	7	1	36	8	3	44	15	1	38	9	1	45	8	1	38	6	1	26	7	1	34	7
November	1	40	8	1	41	7	1	40	8	5	36	18	1	36	8	1	39	9	1	36	7	1	28	7	1	42	6
December	1	44	6	1	38	4	1	36	5	3	43	16	1	29	4	1	26	5	1	45	5	1	36	4	1	33	4
Annual Min/Max/Avg	1	45	8	1	44	6	1	45	7	1	45	10	1	45	7	1	45	7	1	45	6	1	45	6	1	45	6

NOTES: ' -- ' indicates filter offline

3.6 Rossdale Filters 1 - 9 Turbidity (NTU)

2021

Filter	1			2			3			4			5			6			7			8			9		
Month	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**
January	0.01	0.10	0.03	0.01	0.08	0.04	0.00	0.07	0.02	0.01	0.09	0.03	0.00	0.09	0.05	0.01	0.07	0.02	0.02	0.10	0.04	0.01	0.09	0.04	0.01	0.08	0.04
February	0.02	0.08	0.03	0.03	0.08	0.04	0.01	0.08	0.02	0.02	0.08	0.03	0.02	0.08	0.05	0.01	0.08	0.02	0.03	0.08	0.04	0.01	0.08	0.04	--	--	--
March	0.01	0.07	0.02	0.02	0.07	0.03	0.01	0.07	0.02	0.02	0.08	0.03	0.02	0.07	0.03	0.01	0.06	0.02	0.03	0.08	0.03	0.01	0.07	0.02	--	--	--
April	0.01	0.06	0.02	0.02	0.06	0.03	0.01	0.08	0.01	0.01	0.07	0.02	0.02	0.08	0.02	0.01	0.06	0.01	0.02	0.06	0.03	0.01	0.06	0.02	--	--	--
May	0.01	0.07	0.03	0.02	0.08	0.03	0.01	0.08	0.02	0.01	0.08	0.02	0.02	0.08	0.03	0.01	0.08	0.02	0.03	0.08	0.03	0.01	0.08	0.03	--	--	--
June	0.01	0.07	0.03	0.02	0.08	0.03	0.01	0.05	0.02	0.01	0.07	0.02	0.02	0.06	0.03	0.01	0.05	0.02	0.02	0.07	0.03	0.01	0.06	0.03	--	--	--
July	0.01	0.06	0.02	0.02	0.07	0.03	0.01	0.06	0.01	0.01	0.07	0.02	0.02	0.08	0.02	0.01	0.08	0.01	0.02	0.06	0.03	0.01	0.05	0.02	0.02	0.06	0.02
August	0.02	0.08	0.02	0.02	0.05	0.03	0.00	0.08	0.01	0.01	0.05	0.01	0.01	0.05	0.02	0.01	0.07	0.01	0.02	0.05	0.03	0.01	0.07	0.02	0.02	0.05	0.02
September	0.02	0.07	0.03	0.02	0.07	0.03	0.01	0.06	0.02	0.01	0.08	0.02	0.02	0.06	0.02	0.01	0.05	0.01	0.02	0.06	0.03	0.01	0.06	0.02	0.02	0.06	0.02
October	0.02	0.07	0.03	0.02	0.06	0.03	0.01	0.06	0.01	0.01	0.07	0.02	0.01	0.07	0.02	0.00	0.05	0.01	0.02	0.06	0.03	0.01	0.06	0.02	0.02	0.06	0.02
November	0.02	0.08	0.03	0.02	0.08	0.03	0.01	0.08	0.02	0.01	0.08	0.02	0.02	0.08	0.03	0.01	0.08	0.02	0.02	0.08	0.03	0.01	0.08	0.03	0.02	0.09	0.03
December	0.02	0.08	0.04	0.02	0.08	0.03	0.01	0.08	0.02	0.01	0.08	0.03	0.02	0.08	0.03	0.01	0.08	0.02	0.03	0.08	0.04	0.01	0.08	0.03	0.02	0.08	0.03
Annual Min/Max/Avg	0.01	0.10	0.03	0.01	0.08	0.03	0.00	0.08	0.02	0.01	0.09	0.02	0.00	0.09	0.03	0.01	0.08	0.02	0.02	0.10	0.03	0.01	0.09	0.03	0.01	0.09	0.03

NOTES: ' -- ' indicates filter offline

3.7 E.L. Smith Filters 1 - 9 Turbidity (NTU)

2021

Filter	1			2			3			4			5			6			7			8			9		
Month	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**
January	0.02	0.09	0.03	0.01	0.06	0.01	--	--	--	0.01	0.08	0.02	0.02	0.09	0.03	0.01	0.10	0.02	0.02	0.09	0.03	0.03	0.10	0.05	0.02	0.09	0.03
February	0.02	0.09	0.03	--	--	--	--	--	--	0.01	0.08	0.02	0.02	0.09	0.03	0.01	0.08	0.02	0.02	0.09	0.03	0.03	0.09	0.05	0.02	0.10	0.03
March	0.02	0.07	0.03	0.00	0.08	0.01	--	--	--	0.00	0.07	0.01	0.01	0.07	0.02	0.01	0.07	0.02	0.02	0.08	0.03	0.03	0.08	0.04	0.01	0.08	0.02
April	0.02	0.07	0.02	0.01	0.08	0.01	--	--	--	0.00	0.07	0.01	0.01	0.08	0.02	0.01	0.07	0.02	0.01	0.08	0.03	0.03	0.08	0.04	0.01	0.08	0.02
May	0.02	0.08	0.03	0.02	0.08	0.03	--	--	--	0.01	0.08	0.02	0.01	0.08	0.02	0.01	0.08	0.02	0.01	0.08	0.03	0.02	0.08	0.04	0.01	0.08	0.02
June	0.02	0.08	0.03	0.02	0.08	0.03	0.01	0.08	0.03	0.01	0.08	0.03	0.01	0.08	0.02	0.01	0.07	0.02	0.02	0.08	0.03	0.02	0.08	0.04	0.01	0.08	0.02
July	--	--	--	0.02	0.07	0.03	0.01	0.08	0.02	0.02	0.08	0.03	0.01	0.07	0.02	0.01	0.07	0.02	0.01	0.08	0.03	0.03	0.08	0.04	0.01	0.07	0.02
August	--	--	--	0.01	0.06	0.03	0.01	0.08	0.02	0.01	0.06	0.02	0.01	0.07	0.02	0.01	0.05	0.01	0.01	0.06	0.02	0.02	0.08	0.03	0.01	0.08	0.01
September	--	--	--	0.02	0.08	0.04	0.02	0.08	0.02	0.01	0.07	0.02	0.01	0.08	0.02	0.01	0.08	0.02	0.01	0.07	0.02	0.03	0.08	0.04	0.01	0.07	0.02
October	--	--	--	0.03	0.07	0.03	0.02	0.07	0.02	0.02	0.08	0.03	0.01	0.07	0.02	0.01	0.07	0.02	0.01	0.08	0.02	0.03	0.08	0.04	0.01	0.08	0.02
November	--	--	--	--	--	--	0.02	0.07	0.03	0.02	0.08	0.03	0.01	0.08	0.02	0.01	0.08	0.02	0.01	0.08	0.03	0.03	0.08	0.04	0.01	0.08	0.02
December	--	--	--	--	--	--	0.02	0.08	0.03	0.02	0.09	0.03	0.01	0.09	0.02	0.01	0.09	0.02	0.01	0.09	0.02	0.03	0.09	0.04	0.01	0.09	0.02
Annual Min/Max/Avg	0.02	0.09	0.03	0.01	0.08	0.03	0.01	0.08	0.03	0.00	0.09	0.02	0.01	0.09	0.02	0.01	0.10	0.02	0.01	0.09	0.03	0.02	0.10	0.04	0.01	0.10	0.02

NOTES: ' -- ' indicates filter offline

3.8 E.L. Smith Filters 10 - 18 Turbidity (NTU)

2021

Filter	10			11			12			13			14			15			16			17			18		
Month	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**
January	0.02	0.10	0.03	0.03	0.09	0.04	0.02	0.07	0.03	0.04	0.09	0.05	0.03	0.09	0.04	0.03	0.09	0.04	0.03	0.09	0.04	0.02	0.09	0.04	0.02	0.09	0.04
February	0.01	0.08	0.02	0.03	0.09	0.04	0.02	0.07	0.03	0.04	0.09	0.05	0.03	0.09	0.04	0.03	0.09	0.04	0.03	0.09	0.04	0.03	0.09	0.04	0.03	0.09	0.04
March	0.01	0.05	0.01	0.02	0.08	0.04	0.02	0.08	0.02	0.04	0.08	0.05	0.03	0.08	0.04	0.03	0.08	0.03	0.03	0.08	0.04	0.03	0.08	0.03	0.02	0.08	0.04
April	0.00	0.08	0.01	0.02	0.08	0.04	0.02	0.08	0.03	0.03	0.08	0.04	0.03	0.08	0.04	0.03	0.08	0.04	0.02	0.08	0.04	0.02	0.08	0.04	0.03	0.08	0.04
May	0.01	0.07	0.01	0.03	0.08	0.04	0.02	0.08	0.03	0.03	0.08	0.03	0.03	0.08	0.04	0.03	0.08	0.04	0.03	0.08	0.04	0.03	0.08	0.04	0.03	0.08	0.04
June	0.00	0.08	0.03	0.02	0.08	0.04	0.02	0.08	0.03	0.03	0.08	0.04	0.03	0.08	0.04	0.03	0.08	0.04	0.03	0.08	0.04	0.02	0.08	0.04	0.03	0.08	0.04
July	0.02	0.08	0.03	0.03	0.08	0.04	0.02	0.07	0.03	0.03	0.08	0.04	0.03	0.08	0.04	0.03	0.08	0.04	0.02	0.08	0.04	0.02	0.08	0.04	0.03	0.08	0.04
August	0.02	0.07	0.03	0.02	0.07	0.03	0.02	0.05	0.02	0.03	0.06	0.03	0.03	0.07	0.03	0.03	0.07	0.03	0.03	0.07	0.03	0.02	0.07	0.03	0.03	0.07	0.03
September	0.02	0.07	0.03	0.00	0.08	0.02	0.02	0.08	0.03	0.03	0.06	0.04	0.03	0.08	0.04	0.03	0.08	0.04	0.03	0.08	0.04	0.03	0.08	0.04	0.04	0.08	0.04
October	0.02	0.08	0.04	0.00	0.08	0.02	0.02	0.08	0.03	0.03	0.08	0.04	0.03	0.08	0.04	0.03	0.08	0.04	0.03	0.08	0.04	0.03	0.08	0.04	0.03	0.08	0.05
November	0.03	0.08	0.05	0.01	0.08	0.03	0.02	0.08	0.04	0.03	0.08	0.04	0.03	0.08	0.05	0.03	0.08	0.04	0.03	0.08	0.05	0.03	0.08	0.04	0.03	0.08	0.05
December	0.03	0.10	0.04	0.01	0.09	0.02	0.02	0.09	0.03	0.03	0.09	0.04	0.03	0.09	0.04	0.03	0.09	0.04	0.04	0.09	0.05	0.03	0.09	0.04	0.04	0.09	0.05
Annual Min/Max/Avg	0.01	0.10	0.03	0.00	0.09	0.03	0.02	0.09	0.03	0.03	0.09	0.04	0.03	0.09	0.04	0.03	0.09	0.04	0.02	0.09	0.04	0.02	0.09	0.04	0.02	0.09	0.04

NOTES: ' -- ' indicates filter offline

3.9 Combined Filter Effluent Water Quality

2021

Month	Rossdale						E.L. Smith					
	Particle Counts (no./mL,>2um)			Turbidity (NTU)			Particle Counts (no./mL,>2um)			Turbidity (NTU)		
	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
January	2	13	4	0.01	0.08	0.05	1	16	6	0.03	0.05	0.03
February	1	19	5	0.03	0.08	0.04	1	26	7	0.01	0.04	0.03
March	1	17	4	0.03	0.10	0.04	1	14	4	0.02	0.04	0.03
April	1	15	5	0.01	0.08	0.03	1	13	7	0.02	0.07	0.03
May	1	32	7	0.01	0.09	0.03	1	21	9	0.02	0.04	0.03
June	1	19	2	0.01	0.09	0.03	2	19	7	0.02	0.04	0.03
July	1	12	2	0.02	0.10	0.04	2	14	6	0.02	0.04	0.03
August	1	23	2	0.01	0.08	0.03	1	16	5	0.01	0.06	0.03
September	1	18	4	0.01	0.09	0.03	1	19	7	0.01	0.05	0.03
October	1	19	2	0.02	0.08	0.02	1	19	7	0.01	0.04	0.03
November	1	20	4	0.01	0.08	0.03	1	25	8	0.01	0.05	0.03
December	1	19	3	0.03	0.10	0.04	1	21	5	0.01	0.05	0.03
Annual Min/Max/Avg	1	32	4	0.01	0.10	0.04	1	26	7	0.01	0.07	0.03

NOTES: ' -- ' indicates plant offline

3.10 Rossdale UV Disinfection - Filters 1 - 3

2021

Filter	1						2						3						Transmittance (%)		
Month	Dosage (mJ/cm²)			Flow (MLD)			Dosage (mJ/cm²)			Flow (MLD)			Dosage (mJ/cm²)			Flow (MLD)					
	Min	Max	Avg	Min	Max	Total	Min	Max	Avg	Min	Max	Total	Min	Max	Avg	Min	Max	Total	Min	Max	Avg
January	34.4	61.2	42.1	11.2	30.2	442.9	34.2	67.2	43.4	10.4	29.8	408.0	34.7	67.4	43.4	10.6	29.5	403.7	93.0	95.4	94.5
February	34.6	78.6	36.1	12.4	29.9	443.9	34.6	69.9	37.8	7.8	30.9	451.7	33.7	60.0	39.0	11.0	29.5	401.1	91.0	94.6	92.9
March	34.3	75.0	38.0	13.1	29.4	456.7	34.4	89.1	40.0	9.5	28.7	488.0	33.4	56.0	40.0	12.3	27.5	451.2	92.0	96.2	94.2
April	35.3	161.6	49.1	10.4	30.4	486.1	36.6	156.9	51.4	7.9	31.5	478.9	35.3	141.0	50.4	8.9	30.0	488.8	95.0	97.2	96.5
May	34.9	63.8	39.2	13.6	32.2	522.6	34.5	134.2	39.0	10.4	32.8	574.0	34.6	105.7	38.2	11.1	31.6	512.3	88.8	97.0	93.2
June	34.8	69.2	35.6	16.9	41.5	565.9	34.3	68.8	35.7	11.0	43.8	666.9	34.4	57.5	36.1	14.0	43.6	599.1	90.8	95.0	93.0
July	34.7	57.8	37.9	17.9	42.1	772.0	34.0	59.4	38.6	16.3	43.5	758.8	34.5	77.9	37.7	15.0	45.0	751.3	93.5	97.5	95.3
August	34.8	125.2	51.7	15.7	39.3	566.5	35.2	193.6	52.1	18.9	37.4	538.5	35.0	189.5	51.0	15.7	37.7	491.5	94.5	98.9	97.2
September	34.9	66.5	41.5	15.4	36.0	418.9	34.2	58.8	41.6	15.8	36.3	521.9	33.8	77.0	42.4	15.1	36.3	507.6	93.4	97.2	92.8
October	35.1	151.8	53.1	14.1	36.7	457.0	34.2	109.2	47.7	12.6	34.3	419.9	35.1	139.9	54.2	12.3	35.3	417.4	94.9	97.2	96.7
November	35.3	98.5	52.2	10.3	34.2	455.5	35.1	137.3	47.9	10.8	32.2	459.7	35.2	86.3	52.2	10.1	33.6	424.7	92.2	97.3	96.0
December	34.7	116.6	46.4	10.6	30.9	426.5	35.0	79.1	44.1	10.1	33.2	536.0	34.9	105.7	47.5	10.2	30.7	515.9	95.4	96.7	96.1
Annual Total						6015						6302						5964			
Annual Min/Max/ Avg	34.3	161.6	43.6	10.3	42.1		34.0	193.6	43.1	7.8	43.8		33.4	189.5	44.2	8.9	45.0		88.8	98.9	94.9

NOTES: - Each filter has a UV reactor

- Transmittance (%) is a grab sample of the filter effluent prior to the UV reactor of a random online filter

' -- ' indicates filter and UV reactor offline

3.11 Rossdale UV Disinfection - Filters 4 - 6

2021

Filter	4						5						6						Transmittance (%)		
Month	Dosage (mJ/cm²)			Flow (MLD)			Dosage (mJ/cm²)			Flow (MLD)			Dosage (mJ/cm²)			Flow (MLD)					
	Min	Max	Avg	Min	Max	Total	Min	Max	Avg	Min	Max	Total	Min	Max	Avg	Min	Max	Total	Min	Max	Avg
January	35.0	63.1	41.5	11.8	28.6	414.6	34.3	99.1	48.3	12.3	27.4	405.7	34.4	72.6	43.8	11.5	31.9	344.0	93.0	95.4	94.5
February	34.7	70.3	36.5	11.9	29.5	428.8	34.3	58.0	38.5	10.1	28.6	401.8	33.9	68.8	36.6	10.7	33.0	493.1	91.0	94.6	92.9
March	34.1	78.2	38.2	11.8	29.1	478.0	33.6	146.6	45.9	10.1	26.2	452.8	34.6	55.5	39.0	10.6	30.6	509.7	92.0	96.2	94.2
April	35.2	102.1	48.1	10.4	29.9	488.1	38.8	174.9	58.2	11.0	28.3	491.3	35.4	112.9	51.3	8.9	32.6	531.7	95.0	97.2	96.5
May	34.8	90.6	38.3	8.0	31.8	539.5	33.6	69.3	57.9	9.3	31.1	502.8	33.9	60.5	38.1	13.1	34.5	628.0	88.8	97.0	93.2
June	34.8	58.4	36.4	14.1	44.3	601.1	33.5	44.9	35.6	13.0	37.4	671.8	34.1	58.2	35.6	16.2	42.4	704.3	90.8	95.0	93.0
July	34.7	70.0	40.4	15.3	44.8	735.7	33.3	59.5	38.9	17.5	37.1	715.3	34.3	57.8	37.0	16.2	46.0	782.3	93.5	97.5	95.3
August	34.8	250.5	58.7	18.1	35.7	578.8	34.0	173.6	55.5	17.4	35.1	498.7	35.0	126.6	47.4	17.3	44.7	580.8	94.5	98.9	97.2
September	34.8	115.7	44.9	16.2	36.2	443.6	33.9	70.7	44.5	17.3	33.8	439.0	33.9	71.3	41.2	16.0	38.9	570.8	93.4	97.2	92.8
October	34.8	181.7	61.6	12.3	37.3	460.3	33.7	96.0	54.8	11.1	31.6	429.0	34.9	100.9	51.1	13.7	37.3	450.8	94.9	97.2	96.7
November	37.1	92.4	58.1	10.4	32.1	438.5	34.4	78.9	48.5	10.4	28.6	412.0	35.4	87.0	50.2	10.2	30.7	491.5	92.2	97.3	96.0
December	35.3	103.9	53.8	10.6	32.2	537.6	33.5	86.4	44.5	10.4	29.1	468.6	34.1	97.9	48.1	9.5	33.6	536.2	95.4	96.7	96.1
Annual Total						6145						5889						6623			
Annual Min/Max/ Avg	34.1	250.5	46.2	8.0	44.8		33.3	174.9	47.4	9.3	37.4		33.9	126.6	43.2	8.9	46.0		88.8	98.9	94.9

NOTES: - Each filter has a UV reactor

- Transmittance (%) is a grab sample of the filter effluent prior to the UV reactor of a random online filter

' -- ' indicates filter and UV reactor offline

3.12 Rossdale UV Disinfection - Filters 7 - 9

2021

Filter	7						8						9						Transmittance (%)		
Month	Dosage (mJ/cm²)			Flow (MLD)			Dosage (mJ/cm²)			Flow (MLD)			Dosage (mJ/cm²)			Flow (MLD)					
	Min	Max	Avg	Min	Max	Total	Min	Max	Avg	Min	Max	Total	Min	Max	Avg	Min	Max	Total	Min	Max	Avg
January	33.5	57.1	38.6	11.1	33.5	516.1	34.9	72.9	37.5	9.0	33.2	502.5	33.8	89.9	38.0	7.6	31.1	245.3	93.0	95.4	94.5
February	33.9	59.0	35.8	11.2	33.9	527.3	33.8	65.2	35.9	8.3	33.3	509.9	--	--	--	--	--	0.0	91.0	94.6	92.9
March	33.7	53.3	37.1	10.5	32.9	543.5	34.5	55.9	36.8	10.6	32.3	537.4	--	--	--	--	--	0.0	92.0	96.2	94.2
April	35.1	147.6	44.0	13.0	33.3	503.5	34.5	102.3	43.6	10.4	34.6	572.2	--	--	--	--	--	0.0	95.0	97.2	96.5
May	34.4	83.4	36.7	8.0	34.6	586.2	34.3	59.5	37.0	11.7	36.4	620.4	--	--	--	--	--	0.0	88.8	97.0	93.2
June	33.3	69.0	35.6	11.7	46.3	735.5	34.2	57.0	35.6	8.5	45.7	753.9	--	--	--	--	--	0.0	90.8	95.0	93.0
July	33.9	45.6	35.8	15.3	46.4	880.2	34.5	56.1	36.3	16.6	46.3	780.6	33.1	52.9	37.7	15.1	38.4	347.7	93.5	97.5	95.3
August	33.5	151.6	38.5	16.7	42.6	597.1	34.9	112.1	41.7	16.7	40.3	626.5	33.3	131.3	44.8	18.5	43.2	584.6	94.5	98.9	97.2
September	34.0	52.6	36.0	19.0	39.2	516.3	34.3	88.3	36.9	15.2	39.0	566.5	33.4	79.2	35.8	19.1	38.4	467.9	93.4	97.2	92.8
October	33.8	122.1	39.6	14.2	42.6	530.3	34.6	122.3	40.3	13.2	38.9	478.1	33.3	107.2	42.3	14.3	41.4	441.4	94.9	97.2	96.7
November	33.2	58.5	38.0	10.5	35.0	500.7	34.3	83.9	40.3	10.7	35.6	494.4	34.8	110.7	49.3	11.6	37.3	540.1	92.2	97.3	96.0
December	33.1	82.0	37.7	10.5	34.1	551.1	33.8	89.6	38.2	10.3	35.5	576.6	34.5	91.0	47.1	10.1	35.4	575.5	95.4	96.7	96.1
Annual Total						6988						7019						3202			
Annual Min/Max/ Avg	33.1	151.6	37.7	8.0	46.4		33.8	122.3	38.3	8.3	46.3		33.1	131.3	43.1	7.6	43.2		88.8	98.9	94.9

NOTES: - Each filter has a UV reactor

- Transmittance (%) is a grab sample of the filter effluent prior to the UV reactor of a random online filter

' -- ' indicates filter and UV reactor offline

3.13 E.L. Smith UV Disinfection - UV Reactors 1 - 4

2021

Filter	1						2						3						4						Transmittance (%)		
Month	Dosage (mJ/cm²)			Flow (MLD)			Dosage (mJ/cm²)			Flow (MLD)			Dosage (mJ/cm²)			Flow (MLD)			Dosage (mJ/cm²)			Flow (MLD)					
	Min	Max	Avg	Min	Max	Total	Min	Max	Avg	Min	Max	Total	Min	Max	Avg	Min	Max	Total	Min	Max	Avg	Min	Max	Total	Min	Max	Avg
January	60.2	112.8	71.5	54.8	93.2	1,412.3	58.8	98.5	73.2	42.9	90.7	1,115.9	43.2	110.9	71.7	52.8	94.2	2,445.0	46.9	89.9	51.8	37.0	89.3	2,246.5	92.7	95.3	94.2
February	--	--	--	--	--	0.0	45.0	106.0	65.3	54.1	112.9	2,160.9	46.0	111.5	64.3	54.6	101.0	2,282.3	39.8	93.2	47.2	53.1	93.2	2,169.0	90.9	94.7	92.8
March	--	--	--	--	--	0.0	50.6	163.1	66.1	51.9	98.3	2,482.6	47.7	157.6	64.2	51.3	96.3	2,447.7	46.6	141.3	47.7	66.9	89.5	2,488.4	92.3	96.5	94.6
April	68.0	76.2	73.0	54.7	95.0	72.7	56.1	90.4	70.4	52.9	94.8	2,364.3	59.6	165.7	69.7	50.6	93.0	2,226.6	46.8	81.7	48.7	51.9	90.9	2,363.2	95.1	97.5	96.4
May	45.6	98.9	65.0	32.3	110.9	914.1	45.2	125.9	62.1	32.0	106.2	2,033.0	44.9	99.4	62.1	59.2	112.4	2,564.4	40.6	91.1	47.5	39.2	102.2	2,275.6	88.7	97.3	93.5
June	45.0	131.9	73.2	40.7	115.1	1,276.9	49.0	121.7	70.9	52.0	112.9	2,422.4	45.4	119.0	70.0	55.4	122.2	2,723.8	40.4	78.6	47.1	30.6	98.7	2,401.1	90.4	95.3	93.0
July	45.5	143.6	61.8	43.5	93.9	1,323.4	45.7	140.4	62.0	49.4	106.5	2,386.5	45.3	139.3	62.5	60.1	116.6	2,794.5	43.3	112.3	47.2	54.6	101.6	2,362.3	93.0	97.2	95.1
August	57.7	89.5	75.5	36.2	105.7	1,480.5	49.1	91.4	71.5	49.0	107.4	2,550.6	57.5	101.0	77.1	51.2	113.0	2,800.8	46.7	101.5	47.4	59.1	103.0	1,792.2	95.2	98.1	97.0
September	56.7	116.9	78.1	35.7	93.2	119.7	45.6	166.5	61.4	33.7	104.0	2,366.3	47.7	121.0	68.4	49.6	114.9	2,454.2	46.8	122.1	47.8	55.3	98.3	2,328.8	92.7	97.4	96.0
October	54.4	153.4	66.8	42.0	108.8	1,363.1	54.3	166.7	67.2	50.3	97.6	1,178.2	65.7	177.6	79.3	59.9	103.8	2,514.6	46.9	106.6	47.3	58.0	94.8	2,353.5	96.0	98.0	93.6
November	--	--	--	--	--	0.0	47.7	162.6	58.6	33.4	95.1	2,290.8	53.4	189.4	68.5	35.9	98.4	2,399.9	46.8	134.6	47.3	34.5	91.3	2,255.6	93.2	97.7	95.9
December	57.4	158.0	74.0	29.5	76.8	19.2	45.6	144.9	55.2	37.0	89.6	2,153.4	58.0	156.2	70.6	44.5	92.1	2,274.0	46.9	156.6	47.9	49.6	84.5	2,138.6	93.8	98.0	95.9
Annual Total						7,982						25,505						29,928						27,175			
Annual Min/Max/ Avg	45.0	158.0	69.7	29.5	115.1		45.0	166.7	65.0	32.0	112.9		43.2	189.4	69.0	35.9	122.2		39.8	156.6	47.9	30.6	103.0		88.7	98.1	94.8

NOTES: ' -- ' indicates UV reactor offline

- Transmittance (%) is a grab sample of the combined filter effluent prior to the UV reactor

3.14 Log Removal

2021

Month	Rossdale									E.L. Smith								
	Log Removal									Log Removal								
	Giardia			Virus			*Cryptosporidium*			*Giardia*			Virus			*Cryptosporidium*		
	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
January	7.6	8.6	7.9	12	16	14	6.5	6.5	6.5	6.5	6.8	6.7	6.0	9.2	7.5	6.5	6.5	6.5
February	7.4	8.3	7.6	11	16	13	6.5	6.5	6.5	6.6	6.7	6.7	6.3	10	7.7	6.5	6.5	6.5
March	7.5	8.7	8.0	12	16	14	6.5	7.0	6.8	6.6	7.2	7.0	5.9	9.9	7.7	6.5	7.0	6.8
April	8.0	8.8	8.3	12	21	15	7.0	7.0	7.0	7.1	7.3	7.2	6.6	13	8.3	7.0	7.0	7.0
May	8.5	15.8	9.6	18	33	24	7.0	7.0	7.0	7.2	7.5	7.3	9.6	22	14	7.0	7.0	7.0
June	7.5	12.6	10.5	9.3	40	31	7.0	7.0	7.0	7.3	7.8	7.5	14	32	20	7.0	7.0	7.0
July	8.0	12.6	10.4	26	43	33	6.9	7.0	7.0	7.4	8.0	7.6	17	39	24	7.0	7.0	7.0
August	9.2	13.9	11.0	24	42	31	7.0	7.0	7.0	7.3	7.6	7.5	15	27	21	7.0	7.0	7.0
September	7.9	11.5	9.3	16	35	25	7.0	7.0	7.0	7.2	7.5	7.3	11	20	15	7.0	7.0	7.0
October	7.6	9.7	8.8	9.3	25	19	6.7	7.0	7.0	7.2	7.3	7.2	8.5	15	11	7.0	7.0	7.0
November	7.3	8.5	7.6	12	17	14	6.5	7.0	6.5	6.6	7.2	6.7	5.1	10	6.8	6.5	7.0	6.5
December	7.2	8.1	7.4	12	15	13	6.2	6.5	6.5	6.3	6.7	6.7	5.0	8.4	6.8	6.2	6.5	6.5
Annual Min/Max/Avg	7.2	15.8	8.9	9.3	43	21	6.2	7.0	6.8	6.3	8.0	7.1	5.0	39	13	6.2	7.0	6.8

NOTES: ' -- ' indicates plant offline

4.1 Liquid Alum Chemical Consumption

2021

Month	Dosage (mg/L)			Consumption (kg)			
	Rossdale		E.L. Smith	Rossdale			E.L. Smith
	Plant 1	Plant 2		Plant 1	Plant 2	Plant Total	
January	5.17	5.17	5.00	17,403	23,673	41,076	82,055
February	5.78	5.78	5.53	17,239	28,213	45,453	84,334
March	21.6	21.6	25.4	74,553	104,344	178,897	433,283
April	26.3	26.3	27.8	90,249	138,450	228,699	452,365
May	50.4	50.4	67.0	179,339	302,878	482,217	1,216,772
June	45.9	46.0	62.6	190,060	315,671	505,731	1,232,779
July	26.1	26.0	32.2	128,288	230,936	359,224	648,418
August	22.2	21.8	20.8	130,669	106,198	236,867	395,569
September	25.6	23.2	26.1	42,981	179,798	222,779	431,283
October	19.8	20.0	20.5	98,517	77,859	176,376	345,992
November	6.25	6.28	5.27	20,466	36,804	57,270	87,864
December	5.02	5.00	5.01	18,656	31,707	50,363	76,186
Annual Total				1,008,419	1,576,531	2,584,950	5,486,900
Annual Avg	21.5	21.5	25.4				

NOTES : ' -- ' indicates plant offline
- Liquid alum consumption (kg) at 100% by weight (solution delivered to sites at a concentration of 48.5%)

4.2 Primary Polymer (Magnafloc LT 27AG) Chemical Consumption 2021

Month	Dosage (mg/L)			Consumption (kg)			
	Rossdale		E.L. Smith	Rossdale			E.L. Smith
	Plant 1	Plant 2		Plant 1	Plant 2	Plant Total	
January	0.10	0.10	--	163	222	384	--
February	0.10	0.10	--	144	235	379	--
March	0.20	0.20	0.27	326	465	791	1,335.76
April	0.25	0.25	0.21	416	637	1,053	1,681.32
May	0.32	0.32	0.24	541	940	1,481	2,092.80
June	0.28	0.28	0.22	582	1,003	1,585	2,141.19
July	0.21	0.21	0.18	514	916	1,430	1,788.82
August	0.20	0.19	0.12	576	452	1,028	1,075.98
September	0.20	0.20	0.13	162	759	922	1,068.44
October	0.21	0.22	0.11	493	408	901	908.95
November	0.11	0.11	0.05	171	304	474	42.45
December	0.10	0.10	--	181	308	488	--
Annual Total				4,269	6,648	10,917	12,136
Annual Avg	0.19	0.19	0.18				

NOTES: ' -- ' indicates plant offline

- Primary polymer consumption (kg) at 100% by weight mixed at the sites to required solution

4.3 Carbon Chemical Consumption

2021

Month	Dosage (mg/L)			Consumption (kg)			
	Rossdale		E.L. Smith	Rossdale			E.L. Smith
	Plant 1	Plant 2		Plant 1	Plant 2	Plant Total	
January	--	--	--	--	--	--	--
February	--	--	--	--	--	--	--
March	8.80	8.40	10.6	4,221	6,252	10,473	19,714
April	0.39	0.62	--	22	48	70	--
May	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--
August	--	--	--	--	--	--	--
September	--	--	--	--	--	--	--
October	--	--	--	--	--	--	--
November	--	--	--	--	--	--	--
December	--	--	--	--	--	--	--
Annual Total				4,243	6,300	10,544	19,714
Annual Avg	7.96	7.62	10.6				

NOTES: ' -- ' indicates carbon not being used

4.4 Sodium Hypochlorite Chemical Consumption

2021

Month	Rossdale					E.L. Smith	
	Dosage (mg/L)		Consumption (kg)			Dosage (mg/L)	Consumption (kg)
	Plant 1	Plant 2	Plant 1	Plant 2	Plant Total		
January	3.02	2.97	613,642	823,074	1,436,716	2.97	3,102,697
February	3.04	3.04	548,533	896,051	1,444,584	3.13	3,033,764
March	3.10	3.03	647,740	916,801	1,564,541	3.07	3,330,931
April	2.87	2.78	596,740	886,661	1,483,401	2.79	2,887,268
May	3.12	3.08	668,668	1,152,893	1,821,561	3.43	3,955,113
June	3.14	3.20	804,589	1,407,757	2,212,347	3.55	4,547,990
July	2.82	2.83	843,652	1,517,863	2,361,515	3.18	4,068,429
August	3.00	2.79	1,085,811	831,413	1,917,224	2.69	3,251,235
September	2.74	2.73	292,884	1,330,582	1,623,466	3.00	3,168,545
October	2.68	2.53	823,398	620,494	1,443,892	2.91	3,158,691
November	2.77	2.74	556,222	968,679	1,524,900	2.81	2,996,816
December	2.80	2.79	633,359	1,075,235	1,708,593	2.76	2,682,631
Annual Total			8,115,238	12,427,502	20,542,740		40,184,112
Annual Avg	2.93	2.89				3.02	

NOTES: ' -- ' indicates plant offline

- Sodium hypochlorite consumption (kg) at 0.8% by weight (sodium hypochlorite generated onsite at a concentration of 0.8%)
- Plant 1 was converted to sodium hypochlorite from chlorine on Feb 2, 2015.
- Plant 2 was converted to sodium hypochlorite from chlorine on Feb 10, 2015.
- Plant Total Consumption is the combined addition of Plant 1, Plant 2 and Post Filter Trim.

4.4-1 Chlorine and Sodium Hypochlorite Chemical Consumption

2021

Month	Chlorine					Sodium Hypochlorite	
	Rossdale					E.L. Smith	
	Dosage (mg/L)		Consumption (kg)			Dosage (mg/L)	Consumption (kg)
	Plant 1	Plant 2	Plant 1	Plant 2	Plant Total		
January	--	--	--	--	--	2.97	3,102,697
February	--	--	--	--	--	3.13	3,033,764
March	--	--	--	--	--	3.07	3,330,931
April	--	--	--	--	--	2.79	2,887,268
May	--	--	--	--	--	3.43	3,955,113
June	--	--	--	--	--	3.55	4,547,990
July	--	--	--	--	--	3.18	4,068,429
August	--	--	--	--	--	2.69	3,251,235
September	--	--	--	--	--	3.00	3,168,545
October	--	--	--	--	--	2.91	3,158,691
November	--	--	--	--	--	2.81	2,996,816
December	--	--	--	--	--	2.76	2,682,631
Annual Total			--	--	--		40,184,112
Annual Avg	--	--				3.02	

NOTES: ' -- ' indicates plant offline

- Chlorine consumption (kg) at 100% by weight (chlorine gas tonners delivered to the Rossdale WTP)
- Sodium hypochlorite consumption (kg) at 0.8% by weight (sodium hypochlorite generated onsite at a concentration of 0.8% at the E.L. Smith WTP)
- Sodium hypochlorite dosage is chlorine equivalent
- Rossdale plant 1 converted to onsite generated 0.8% sodium hypochlorite on Feb 2nd.
- Rossdale plant 2 converted to onsite generated 0.8% sodium hypochlorite on Feb 13th.

4.5 Filter Polymer (Magnafloc LT 7995) Chemical Consumption

2021

Month	Dosage (mg/L)		Consumption (kg)	
	Rossdale	E.L. Smith	Rossdale	E.L. Smith
January	0.39	0.42	1,436	3,384
February	0.41	0.65	1,498	4,830
March	0.22	0.30	852	2,485
April	0.15	0.15	587	1,199
May	0.30	0.19	1,329	1,677
June	0.38	0.10	1,973	1,003
July	0.23	0.10	1,525	1,015
August	0.15	0.10	775	951
September	0.15	0.17	648	1,383
October	0.15	0.16	635	1,320
November	0.37	0.43	1,573	3,499
December	0.39	0.24	1,820	1,762
Annual Total			14,650	24,507
Annual Avg	0.27	0.25		

NOTES: ' -- ' indicates plant offline

- Filter polymer consumption (kg) at 100% by weight mixed at the sites to required solution

4.6 Aqua Ammonia Chemical Consumption

2021

Month	Dosage (mg/L)		Consumption (kg)	
	Rossdale	E.L. Smith	Rossdale	E.L. Smith
January	0.62	0.58	12,018	22,100
February	0.62	0.58	11,939	20,184
March	0.62	0.58	12,797	21,549
April	0.61	0.58	12,929	14,918
May	0.61	0.58	14,426	4,825
June	0.63	--	17,477	--
July	0.63	--	21,523	--
August	0.63	--	16,788	--
September	0.63	--	14,761	--
October	0.63	--	13,539	--
November	0.64	--	14,229	--
December	0.65	--	16,056	--
Annual Total			178,480	83,575
Annual Avg	0.63	0.58		

NOTES: ' -- ' indicates plant offline
- Aqua ammonia consumption (kg) at 100% by weight (solution delivered to sites at a concentration of 19.0%)

4.6 - 1 LAS Ammonia Chemical Consumption

2021

Month	Dosage (mg/L)	Consumption (kg)
	E.L Smith	E.L Smith
January	-	-
February	-	-
March	0.58	2,117
April	0.58	11,941
May	0.58	34,550
June	0.58	49,206
July	0.58	49,346
August	0.59	48,036
September	0.61	42,143
October	0.59	42,003
November	0.59	39,517
December	0.59	37,373
Annual Total		356,232
Annual Avg	0.59	

NOTES: ' -- ' indicates LAS system offline
- LAS consumption (kg) at 100% by weight (solution delivered to sites at a concentration of 40.0%)

4.7 Caustic Soda Chemical Consumption

2021

Month	Dosage (mg/L)		Consumption (kg)	
	Rossdale	E.L. Smith	Rossdale	E.L. Smith
January	--	--	--	--
February	--	--	--	--
March	3.18	8.80	16,277	79,243
April	1.63	6.82	13,139	96,154
May	5.59	15.9	47,963	252,066
June	4.33	14.0	43,219	243,478
July	0.64	4.61	1,993	82,518
August	--	2.14	--	22,861
September	--	5.30	--	28,499
October	--	--	--	--
November	--	--	--	--
December	--	--	--	--
Annual Total			122,592	804,830
Annual Avg	3.56	8.94		

NOTES: ' -- ' indicates plant offline
- Caustic soda consumption (kg) at 100% by weight (solution delivered to sites at a concentration of 50.0%)

4.8 Fluoride Chemical Consumption

2021

Month	Dosage (mg/L)		Consumption (kg)	
	Rossdale	EL Smith	Rossdale	EL Smith
January	0.67	0.64	11,323	21,112
February	0.67	0.63	11,156	19,019
March	0.67	0.64	12,027	21,588
April	0.69	0.64	12,817	20,654
May	0.68	0.64	13,873	22,878
June	0.66	0.63	16,013	25,642
July	0.65	0.63	19,311	25,639
August	0.66	0.63	15,302	24,397
September	0.67	0.64	13,621	21,058
October	0.65	0.63	12,195	21,300
November	0.67	0.63	12,961	20,025
December	0.67	0.63	14,519	18,992
Annual Total			165,117	262,304
Annual Avg	0.67	0.63		

NOTES: ' -- ' indicates plant offline

- Fluoride consumption (kg) at 100% by weight (solution delivered to sites at a concentration of 21.8%)

4.9 Sodium Bisulfite Chemical Consumption
2021

Month	Rossdale			E.L. Smith		
	Dosage (mg/L)	Consumption (kg)	De-chlorinated Waste Stream to Outfall (ML)	Dosage (mg/L)	Consumption (kg)	De-chlorinated Waste Stream to Outfall (ML)
January	19.7	17,290	341	13.2	38,870	1,111
February	23.1	18,088	298	12.6	40,392	1,238
March	20.9	18,778	339	12.5	44,313	1,327
April	17.9	15,229	325	13.9	46,413	1,292
May	19.4	22,257	456	15.7	63,457	1,444
June	21.1	24,542	450	12.8	42,303	1,260
July	28.1	20,476	285	12.3	35,916	1,081
August	30.5	23,745	307	16.7	43,651	995
September	28.7	20,659	301	14.8	44,297	1,131
October	26.4	22,915	343	18.2	45,803	1,179
November	22.9	24,271	424	12.3	53,840	1,646
December	28.3	27,145	370	14.9	44,264	1,144
Annual Total		255,395	4,240		543,517	14,848
Annual Avg	23.9			14.2		

NOTES: ' -- ' indicates Plant Offline
- Sodium bisulfite consumption (kg) at 38% by weight (solution delivered to sites at a concentration of 38.0%)

5.1 Waste Stream Volumes (ML)

2021

Month	Rossdale						E.L. Smith								
	Clarifier Blowdown	Clarifier Washdown	Backwash Water	Filter to Waste	Bypass	Plant Total	Clarifier Blowdown	Clarifier Washdown	Backwash Water	Filter to Waste	Bypass	LLP Flush	HLP Cooling	Plant Total	De-chlorinated Waste Flow to Outfall
January	192	12	123	27	0.0	355	618	--	352	108	24	0.6	21	1,122	1,111
February	136	--	117	39	7.2	299	598	--	440	145	44	0.5	21	1,249	1,238
March	206	--	115	31	6.5	358	667	--	414	153	104	0.6	22	1,360	1,327
April	204	--	101	26	4.5	336	589	--	429	195	71	0.5	24	1,309	1,292
May	257	--	140	50	18	464	667	--	402	263	108	0.6	23	1,463	1,444
June	295	12	99	31	24	460	673	13	347	208	19	0.6	33	1,292	1,260
July	168	--	103	25	1.8	298	696	10	242	105	28	0.6	31	1,113	1,081
August	128	41	98	28	38	333	686	--	204	80	16	0.6	31	1,017	995
September	124	7.8	97	35	15	278	692	--	284	139	38	0.5	28	1,182	1,131
October	205	7.8	97	31	16	357	665	--	271	160	75	0.6	31	1,202	1,179
November	226	--	152	50	8.8	437	698	--	453	441	29	1.8	26	1,649	1,646
December	171	--	154	44	7.8	377	595	--	314	194	22	7.5	27	1,160	1,144
Annual Total	2,312	80	1,395	417	147	4,352	7,844	23	4,152	2,190	577	15	318	15,119	14,848

NOTES: - Clarifier washdown volume(s) estimated for clarifier cleaning
- LLP flush, HLP cooling and chlorinated waste flow to outfall are not applicable to the Rossdale WTP
- De-chlorinated waste flow to outfall is the estimated chlorinated waste flow to outfall for dechlorination

5.2 Rossdale Clarifier Blowdown Clarifier Washdown and Backwash Water Waste Stream Data

2021

Month	Clarifier Blowdown		Clarifier Washdown		Backwash Water	
	TSS (kg)	Aluminum (kg)	TSS (kg)	Aluminum (kg)	TSS (kg)	Aluminum (kg)
January	23,384	1,798	38	4	10,912	3,777
February	32,385	1,984	0	0	13,801	4,777
March	80,365	7,735	0	0	8,654	2,995
April	318,136	10,001	0	0	3,976	1,376
May	343,018	20,891	0	0	3,382	1,171
June	517,137	22,331	1,102	39	3,576	1,238
July	238,521	15,684	0	0	2,743	950
August	88,239	10,310	432	64	2,347	812
September	98,096	9,721	128	16	3,488	1,207
October	55,183	7,681	147	13	3,509	1,215
November	44,639	2,569	0	0	24,180	8,370
December	31,837	2,197	0	0	23,753	8,222
Annual Total	1,870,940	112,902	1,847	137	104,321	36,111

NOTES: '--' indicates that clarifier washdown did not occur
- Clarifier washdown waste stream solids, TSS and aluminum are calculated values

5.3 Rossdale Waste Stream Data

2021

Month	De-Chlorinated Waste Flow to Waste Stream 3						De-Chlorinated Waste Flow to Waste Stream 7					
	Total Chlorine (mg/L)			Sulfite (mg/L)			Total Chlorine (mg/L)			Sulfite (mg/L)		
	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
January	0.00	0.00	0.00	0.22	20.0	7.77	0.00	0.00	0.00	0.10	20.0	7.51
February	0.00	0.00	0.00	0.47	20.0	8.15	0.00	0.00	0.00	0.33	20.0	6.13
March	0.00	0.00	0.00	0.16	20.0	7.75	0.00	0.00	0.00	0.79	20.0	6.32
April	0.00	0.00	0.00	0.48	20.0	9.19	0.00	0.00	0.00	1.90	20.0	7.66
May	0.00	0.00	0.00	0.10	20.0	9.95	0.00	0.00	0.00	0.10	20.0	8.86
June	0.00	0.00	0.00	0.16	20.0	6.79	0.00	0.00	0.00	0.10	20.0	6.24
July	0.00	0.00	0.00	0.87	20.0	5.30	0.00	0.00	0.00	1.50	20.0	8.79
August	0.00	0.00	0.00	0.74	20.0	5.33	0.00	0.00	0.00	0.18	20.0	7.55
September	0.00	0.00	0.00	1.10	20.0	8.51	0.00	0.00	0.00	1.37	20.0	8.21
October	0.00	0.00	0.00	0.72	20.0	6.49	0.00	0.00	0.00	0.24	20.0	9.01
November	0.00	0.00	0.00	0.97	20.0	6.93	0.00	0.00	0.00	0.30	20.0	5.56
December	0.00	0.00	0.00	0.11	20.0	9.73	0.00	0.00	0.00	2.23	20.0	10.0
Annual Min/Max/Avg	0.00	0.00	0.00	0.10	20.0	7.65	0.00	0.00	0.00	0.10	20.0	7.68

5.4 E.L. Smith Clarifier Blowdown Clarifier Washdown and Backwash Water Waste Stream Data

2021

Month	Clarifier Blowdown		Clarifier Washdown		Backwash Water	
	TSS (kg)	Aluminum (kg)	TSS (kg)	Aluminum (kg)	TSS (kg)	Aluminum (kg)
January	52,851	3,581	0	0	26,868	9,300
February	55,365	3,681	0	0	33,455	11,581
March	141,247	18,913	0	0	24,122	8,350
April	516,946	19,745	0	0	12,507	4,329
May	757,279	52,563	0	0	14,904	5,159
June	907,505	53,333	1,401	49	15,434	5,342
July	392,071	27,773	154	23	6,430	2,226
August	162,435	16,854	0	0	6,146	2,128
September	188,350	18,469	0	0	8,272	2,863
October	112,090	15,023	0	0	10,085	3,491
November	95,162	3,835	0	0	56,141	19,433
December	58,195	3,325	0	0	36,131	12,507
Annual Total	3,439,496	237,095	1,555	72	250,494	86,710

NOTES: '--' indicates that clarifier wash did not occur

- Clarifier washdown waste stream solids, TSS and aluminum are calculated values

5.5 E.L. Smith Waste Stream Data

2021

Month	De-chlorinated Waste Flow to Outfall								
	Sulphite (mg/L)			Total Chlorine (mg/L)			pH		
	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
January	0.18	20.0	9.58	0.00	0.00	0.00	6.49	10.5	7.62
February	0.10	20.0	9.28	0.00	0.00	0.00	6.60	8.09	7.17
March	0.16	20.0	8.08	0.00	0.00	0.00	6.85	7.85	7.41
April	0.28	20.0	7.19	0.00	0.00	0.00	7.03	8.14	7.72
May	0.16	20.0	4.42	0.00	0.00	0.00	6.90	7.90	7.48
June	0.20	20.0	5.03	0.00	0.00	0.00	7.36	8.13	7.71
July	0.11	20.0	3.96	0.00	0.00	0.00	6.66	8.20	7.73
August	0.10	20.0	4.60	0.00	0.00	0.00	6.16	7.71	7.47
September	0.10	20.0	5.16	0.00	0.00	0.00	6.77	7.70	7.47
October	0.21	20.0	4.33	0.00	0.00	0.00	7.01	7.82	7.63
November	0.10	20.0	3.29	0.00	0.00	0.00	6.75	8.08	7.81
December	0.32	20.0	4.36	0.00	0.00	0.00	6.94	8.09	7.85
Annual Min/Max/Avg	0.10	20.0	5.75	0.00	0.00	0.00	6.2	10.5	7.6

6.0 Reservoir Chlorine Residual (mg/L) - Part 1

2021

Reservoir	Papaschase 1			Ormsby			Clareview Discharge			Millwoods Discharge			Kaskitayo			Discovery Park		
Day	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
Jan	1.67	2.11	1.76	1.80	2.13	2.03	1.79	2.23	1.98	1.71	2.18	2.03	1.75	2.19	2.03	1.19	2.54	1.70
Feb	1.71	2.14	1.82	1.94	2.16	2.05	1.79	2.21	2.00	1.73	2.23	2.03	1.60	2.24	2.07	1.02	1.47	1.26
Mar	1.57	2.11	1.75	1.69	2.12	1.97	1.82	2.22	2.00	1.68	2.16	2.02	1.55	2.17	2.00	1.01	2.50	1.54
Apr	1.67	2.17	1.77	1.57	2.16	1.98	1.75	2.26	2.01	1.73	2.09	2.00	1.87	2.11	1.99	0.98	1.39	1.15
May	1.36	2.00	1.60	1.58	2.01	1.84	1.55	2.03	1.86	1.75	2.10	1.91	1.67	2.06	1.89	1.10	1.62	1.22
Jun	1.22	2.04	1.40	1.35	1.84	1.71	1.47	1.97	1.77	1.71	2.06	1.84	1.59	1.99	1.83	0.88	1.48	1.12
Jul	1.04	1.92	1.28	1.45	2.14	1.65	1.41	1.83	1.64	1.67	2.05	1.77	1.54	1.90	1.76	0.78	1.28	0.99
Aug	0.93	2.04	1.27	1.43	1.90	1.73	1.35	1.96	1.65	1.68	2.14	1.85	1.50	2.04	1.86	0.77	1.30	1.11
Sep	1.16	2.01	1.38	1.49	2.14	1.78	1.26	1.88	1.68	1.75	2.06	1.89	1.61	2.02	1.89	0.77	1.31	1.03
Oct	0.72	1.05	0.91	1.50	2.35	1.90	1.49	2.12	1.81	1.63	2.09	1.96	1.56	2.23	1.97	1.07	2.25	1.42
Nov	1.22	2.20	1.70	1.40	2.16	2.03	--	--	--	1.95	2.12	2.05	1.81	2.34	2.07	0.85	1.28	1.07
Dec	1.57	2.11	1.87	1.73	2.13	2.01	--	--	--	1.78	2.15	1.99	1.75	2.20	2.03	0.78	1.22	0.93
Monthly Min/Max/ Avg	0.72	2.20	1.60	1.35	2.35	1.88	1.26	2.26	1.84	1.63	2.23	1.94	1.50	2.34	1.95	0.77	2.26	1.84

NOTES: '--' Indication Analyzer Offline

6.1 Reservoir Chlorine Residual (mg/L) - Part 2

2021

Reservoir	Rosslyn 1			Londonderry			N. Jasper Place			Rosslyn 2			Thorncliffe			Blackmud Creek		
Day	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**	**Min**	**Max**	**Avg**
Jan	1.73	1.83	1.79	1.65	2.12	2.00	1.66	2.08	1.74	1.82	2.35	1.93	1.80	2.19	1.90	1.81	2.01	1.90
Feb	1.78	1.92	1.86	1.78	2.12	1.98	1.72	2.16	1.79	1.89	2.35	1.97	1.83	2.29	1.94	1.79	2.18	1.90
Mar	1.72	1.86	1.78	1.72	2.08	1.97	1.56	2.10	1.68	1.77	2.29	1.90	1.68	2.19	1.85	1.67	1.90	1.80
Apr	1.72	1.88	1.79	1.73	2.12	2.00	1.59	2.02	1.67	1.68	2.32	1.88	1.65	2.15	1.84	1.63	2.34	1.73
May	1.47	1.84	1.67	1.46	2.05	1.81	1.47	2.04	1.63	1.46	2.25	1.78	1.55	2.23	1.74	1.48	1.86	1.71
Jun	1.45	1.71	1.56	1.41	2.02	1.76	1.39	1.98	1.49	1.30	2.31	1.59	1.41	2.14	1.56	1.47	1.72	1.59
Jul	1.28	1.65	1.42	1.29	1.92	1.58	1.09	1.85	1.27	1.19	2.20	1.45	1.13	2.15	1.43	1.39	2.32	1.56
Aug	1.27	1.65	1.49	1.31	1.87	1.61	1.02	2.03	1.26	1.19	2.33	1.46	1.15	2.27	1.42	1.42	1.74	1.54
Sep	1.30	1.71	1.50	1.39	1.92	1.66	1.22	2.02	1.41	1.31	2.34	1.58	1.36	2.20	1.52	1.26	1.50	1.38
Oct	1.18	1.65	1.55	1.45	2.10	1.81	1.32	2.03	1.50	1.47	2.30	1.76	1.42	2.18	1.63	1.26	1.38	1.33
Nov	1.31	2.05	1.68	1.17	2.36	1.96	1.51	2.10	1.67	1.59	2.38	1.86	1.68	2.25	1.89	1.14	1.80	1.58
Dec	--	--	--	1.50	2.13	2.02	1.64	2.06	1.70	1.82	2.33	2.04	1.74	2.19	1.95	1.57	1.72	1.65
Monthly Min/Max/ Avg	1.18	2.05	1.63	1.17	2.36	1.85	1.02	2.16	1.57	1.19	2.38	1.76	1.13	2.29	1.72	1.14	2.34	1.63

NOTES: '--' Indication Analyzer Offline