Water Treatment Plant Year-end Report for 2021

Water demand

The total influent volume of water drawn from the Assiniboine River for treatment was approximately 15.6% higher in 2021 than in 2020, and 31.7% higher than 2019. 2021 had an influent volume of 9,331,668 m3 compared to 8,047,701 m3 in 2020.

The total treated volume of water pumped to the distribution system from the water treatment plant was approximately 8,519,485 m3 in 2021, compared to 7,758,072 m3 in 2020.

The volume of water used internally for the treatment process in 2021 was 164,105 m3.

This water is used in the process production for mixing chemicals, dilution of chemicals for pumping purposes, and flushing pipes after sludge removal from process systems.

Raw Water Quality

The raw water quality for 2021 has had much lower turbidity and slightly higher hardness than 2020. This is usually consistent when a rivers' flow is continually low over an extended period of time. The average raw water hardness for the winter months; January, February, March, October, November, and December 2021, was 417 ppm. The raw water hardness average for the other six months was 356 ppm. The treated water average hardness was 213 ppm and 185 ppm for the respective periods. The 2020 yearly average hardness for Raw Water was 394 ppm and Treated Water was 193 ppm.

Overall raw water turbidity was a non-issue this past year. The WTP experienced only a few small peaks in turbidity that were very short lived. The Actiflow clarifier was able to reduce the high levels of turbidity to minimize the impact on the downstream treatment process. The plant effluent turbidity rose slightly in the spring as usual. This is due to organics, and water chemistry changes as the near freezing water warms up.

Minimal operator overtime and shift changes were required during the spring runoff to service equipment to ensure water production continued. Fall freeze up was one of the best on record and did not cause too many disruptions at the plant.

Distribution System Water Quality

Distribution testing for 2021 was done on a weekly basis for Total Coliforms and Escherichia Coli. All Drinking Water Regulation treatment parameters were met.

On March 8, 2019, Health Canada set new regulatory guideline for lead in potable water.

The new Canadian Drinking Water Quality Guideline maximum acceptable concentration (MAC) for total lead was lowered from 0.010 mg/L, set in 1992, to 0.005mg/L. This is based on a sample of water taken at the consumer's tap.

Metals sampling and testing was conducted on a quarterly basis for the assessment of lead concentrations found in some household service lines. The samples were sent to an independent lab and all results were forwarded, by the lab, to the Manitoba Conservation and Climate, Office of Drinking Water Officer for our area. The practice of running cold water for 2 to 3 minutes, following extended periods of non-use, and before consuming, is recommended for all homes with lead services.

In 2021 Manitoba Health has mandated the City to do lead testing in forty residences per year.

More information may be obtained from the City's web page.

Water Quality Monitoring and Analyses

Each year, an annual water system report is to be completed by the City and submitted to Manitoba Conservation & Climate, Office of Drinking Water by March 31st. The Office of Drinking Water and the City of Portage la Prairie will continue implementing testing changes at the Water Treatment Plant to enhance the water quality and will continue to work jointly with the local Drinking Water Officer.

The attached graphs for the Hardness show the Raw Water was lower than the seasonal trend from April to June. Slightly higher than normal hardness levels were prevalent during the year, with the fall Raw hardness rising considerably higher than normal. The plant operators, however, did an efficient job dealing with the high fall hardness. The effluent hardness in the fall only rose slightly.

As shown in the turbidity graph below and as mentioned, the WTP Raw water was less turbid than usual this past year and had very few peaks in turbidity. These small variations did not seriously affect the plant performance.

The graph for the effluent pH shows some peaks above 8.5 due to over-feed of sodium hydroxide. The raw water pH tends to follow seasonal trends for highs and lows and the effluent pH is adjusted with Sodium Hydroxide to maintain positive Langlier Index to prevent metal corrosion and metals from leaching into the water from too low of a pH.

Fluoride graphs shows some variation in feed early in 2021 and a consistent feed for the remainder of the year. In the start of the year a new feed pump was installed, and it was being adjusted to optimize its feed rate. The fluoride test results are from the morning sample and represent the reading in the effluent water at that time, and not as a daily average. A concentration of 0.70 mg/l has been deemed optimum by Health Canada.

Chlorine was on manual feed for much of 2021 due to a delay in the repair of the automatic controller. The feed unit was put on manual while the feed controller was sent out to be repaired. The effluent chlorine levels are higher as it enters the distribution system. Weekly

sampling of the distribution areas for chlorine residual was done and samples sent to an independent lab for analyses and reporting to the Drinking Water Officer and Water Plant Management. All samples were shown to be free of Total Coliform and Escherichia Coli. Water treatment staff are working to lessen the variance in the chlorine residual in the water entering the distribution system.

In 2021, the Tri-halomethane (THM) regulation requirements were met in the city limits. In the regional water systems where the water age increases, THM results are higher. THM's and other disinfection byproducts develop when chlorine reacts with organics in the water, organics can also cause taste and odour issues. Taste and odours are removed in part by the granular activated carbon filters. While these filters still seem to be reducing tastes and odour, they are showing higher levels of embedded total organic carbon (TOC) that could react with chlorine to form THM'S. The effective removal of THM-forming compounds is limited. The expected life rating of the GAC media life is well below the original anticipated three years, but the replacement of the GAC media annually, or more frequently, would be cost prohibitive. Monitoring of the raw and treated water will continue to detect problems within the raw water that would cause this. Further studies with chemical treatment alternatives have continue in 2021 to help find a solution for the elevated THM's.

McKay Reservoir flow control upgrades. Two new motors and variable frequency drives were added with modification to the Supervisory Control and Data Acquisition Program. Allowing for better control on the overall water distribution system. Maintaining a constant pressure in the system and directional flow control of the system. Also reducing water main breaks in low flow situations such as over the Christmas holidays.

The Water Treatment Functional Design Upgrades is being coordinated by AECOM Engineering, Manitoba Water Service Board, and the City of Portage la Prairie Water Treatment Plant Staff.

Certain Phase 2 A upgrades were not completed in 2019 and were carried over into 2020/2021 which include: Lime Batching Alterations and the Makeup water System for chemical batch tanks.

Phase Two (B) upgrades completed in 2021 include the following: New Backup Generator, Air -Scouring System for Pre-Treatment process and New Ozonation System.

Phase Three of the water plant upgrades included a 15,000,000 litres per day Water Treatment Plant Expansion.

Major Maintenance in 2021

Complete new ozone generation system.

Water plant air compressor replacement.

Replacement of McKay reservoir pressure control valve.

Various valve and flowmeter replacements.

Five turbidimeters replaced with new modern units.

Two chlorine analyzers replaced with new modern units.

Blowdown sludge pump repair.

New air-cooled water chiller for heat loop.

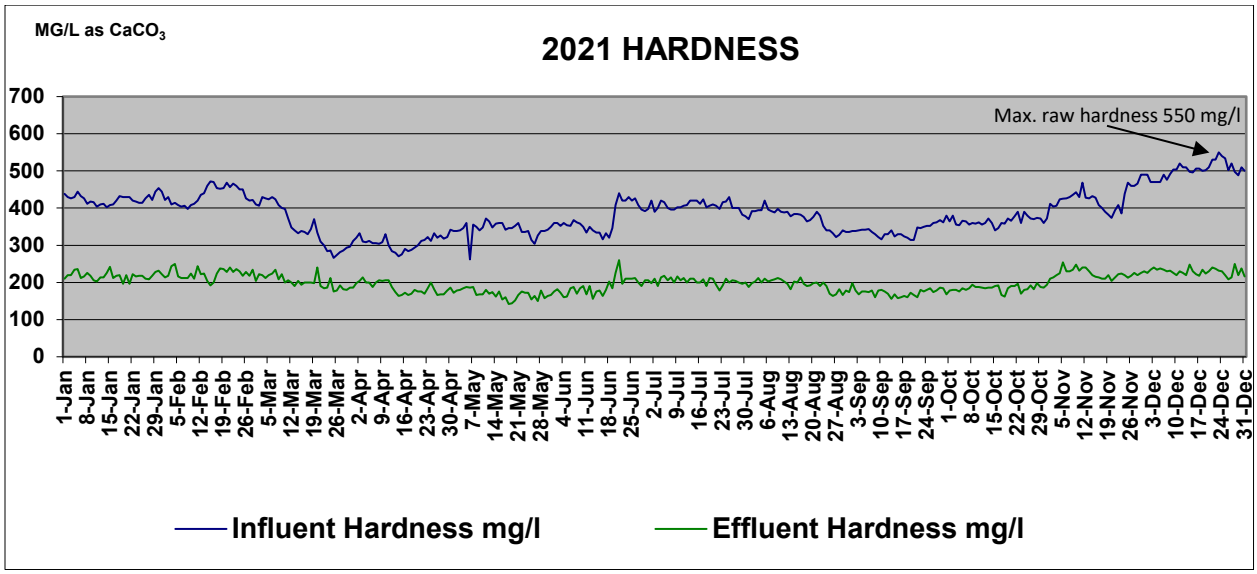
Ongoing Water Quality Studies will result in optimizing the treatment process to treat the raw water to continue to have a safe, reliable product for our consumers.

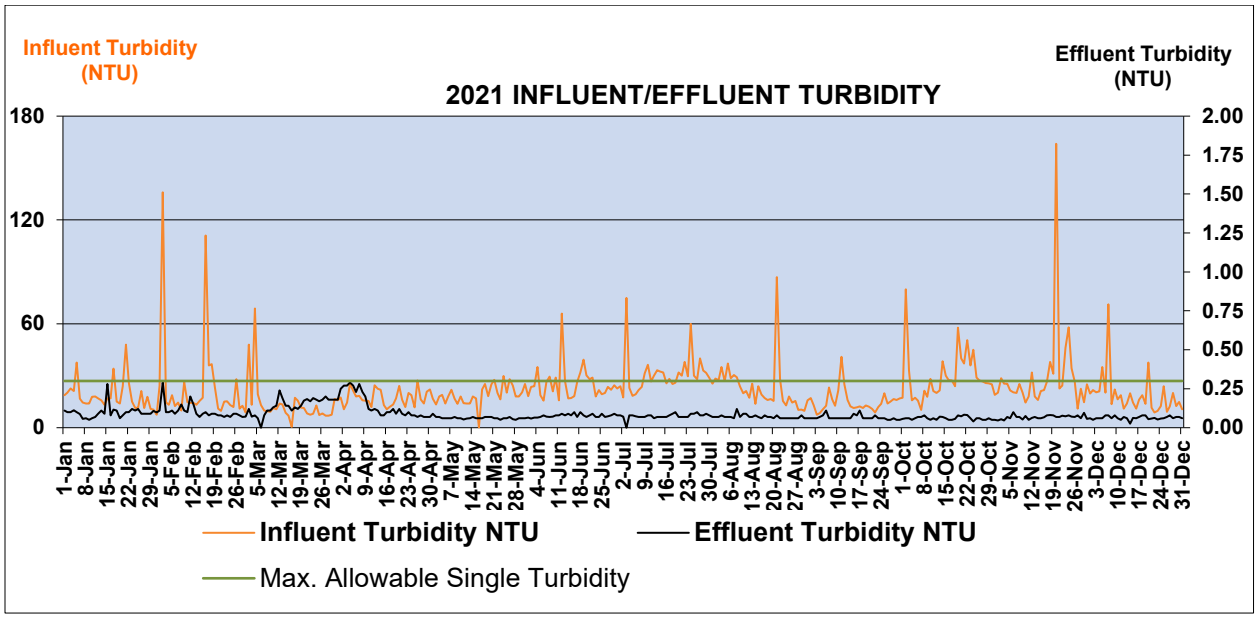
The plant was kept in operation during maintenance work and plant shutdowns were done in a manner to keep the consumers supplied with water.

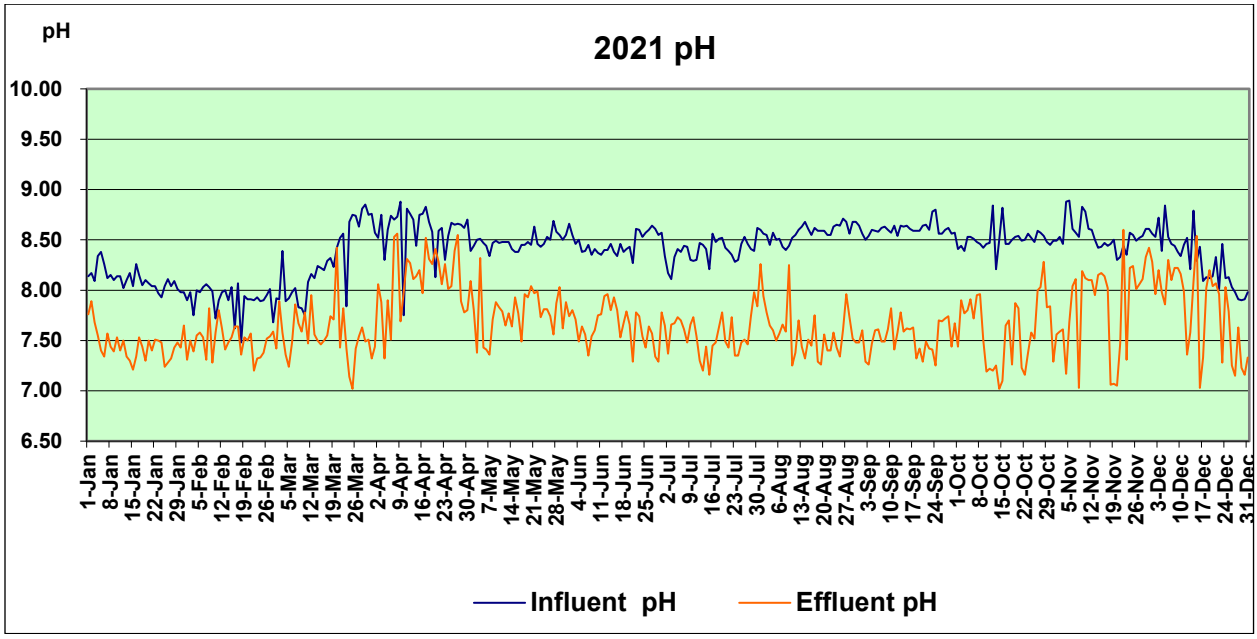
Operating staff will continue to abide by all Government operational requirements and work with the local Drinking Water Officer to ensure the best quality of water for all persons.

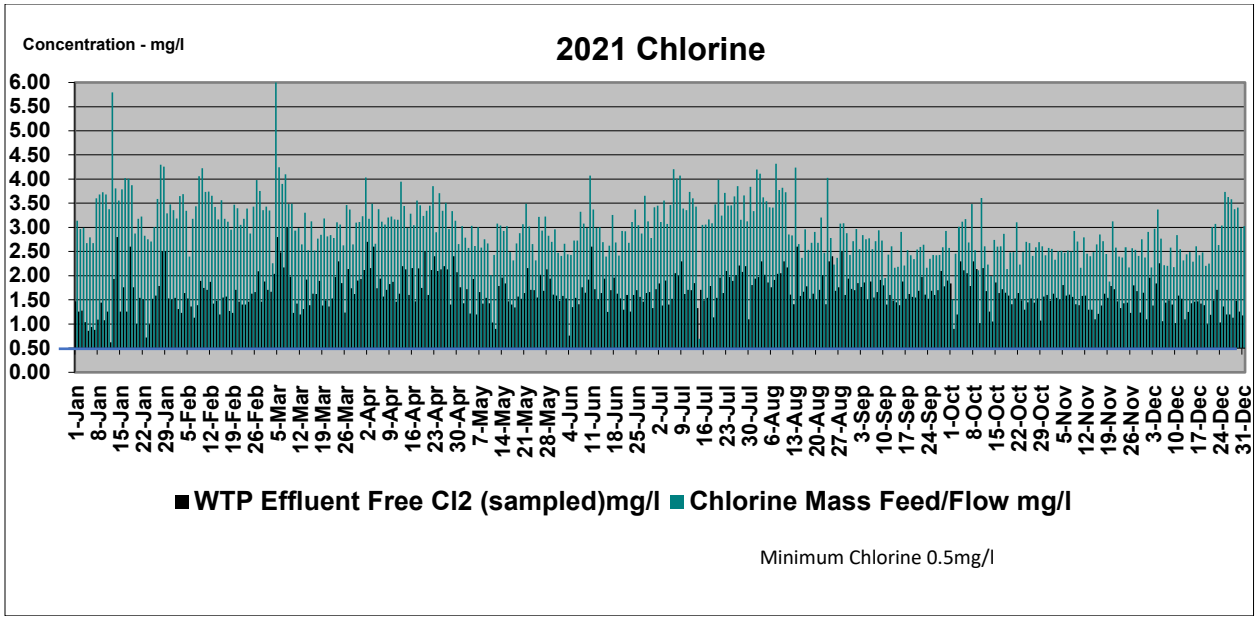
City of Portage la Prairie Water Treatment Plant - 2021 Annual Data Summary

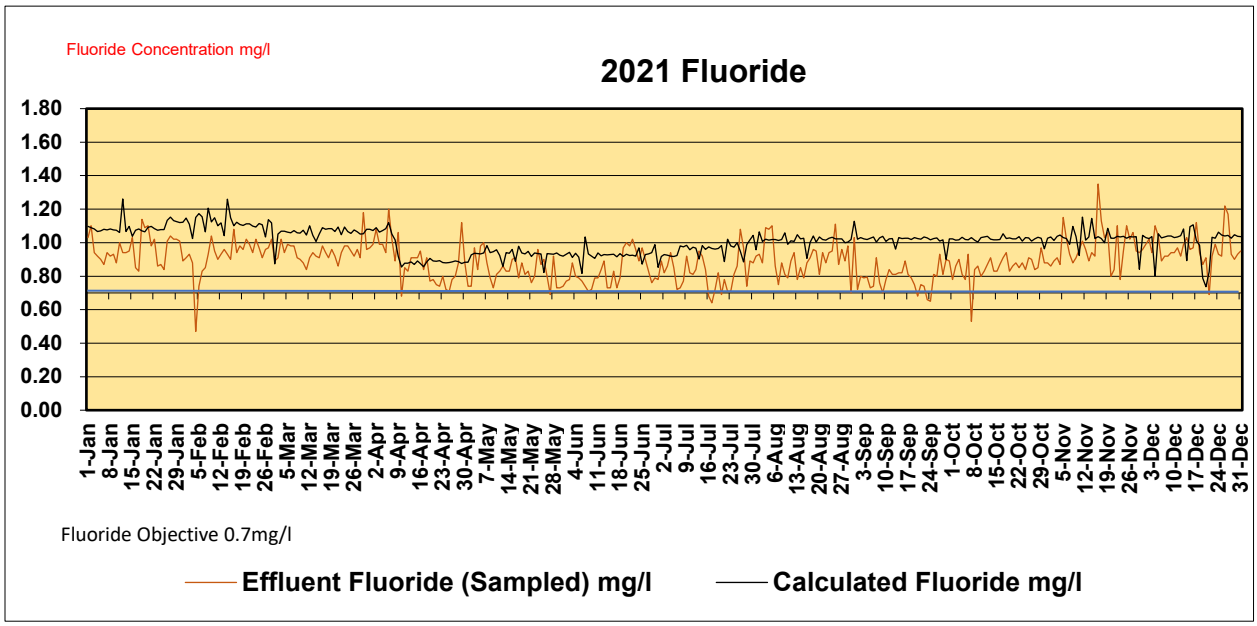
	Influent Hardness ppm	Effluent Hardness ppm	Influent Turbidity NTU	Effluent Turbidity NTU	Influent pH	Effluent pH	WTP Effluent Free Cl_2 (sampled)mg/l	W.T.P. Effluent Fluoride (Sampled) mg/l	WTP Reservoir Influent Flow m3	Reservoir Effluent less process water m3
TOTAL ANNUAL									9,208,051	8,519,485
AVERAGE	**387**	**199**	**22.12**	**0.09**	**8.40**	**7.66**	**1.65**	**0.89**	**25,228**	**23,341**
PEAK DAY	550	260	164.00	0.29	8.89	8.60	3.00	1.35	34,920	31,026
90th PERCENTILE	468	230	33.74	0.12	8.68	8.12	2.14	1.02		
MEDIAN	384	200	18.50	0.07	8.46	7.61	1.61	0.90		
WINTER AVG	417	213								
SUMMER AVG	357	186								

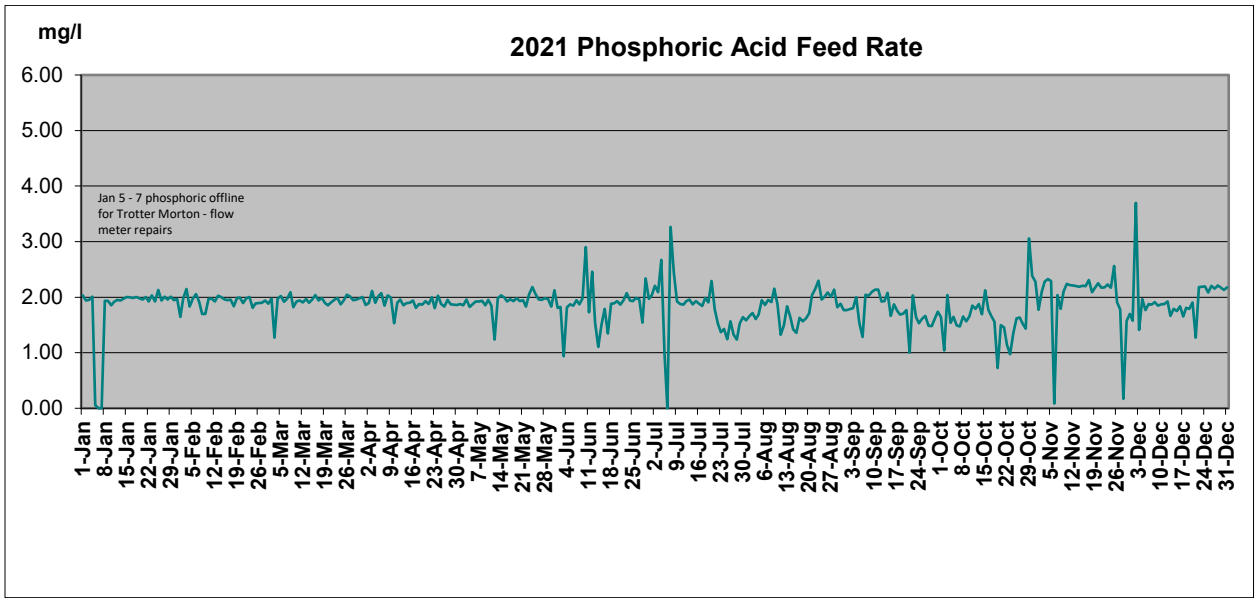

MG/L as $CaCO_3$
2021 HARDNESS
Max. raw hardness 550 mg/l
700
600
500
400
300
200
100
0
1-Jan 8-Jan 15-Jan 22-Jan 29-Jan 5-Feb 12-Feb 19-Feb 26-Feb 5-Mar 12-Mar 19-Mar 26-Mar 2-Apr 9-Apr 16-Apr 23-Apr 30-Apr 7-May 14-May 21-May 28-May 4-Jun 11-Jun 18-Jun 25-Jun 2-Jul 9-Jul 16-Jul 23-Jul 30-Jul 6-Aug 13-Aug 20-Aug 27-Aug 3-Sep 10-Sep 17-Sep 24-Sep 1-Oct 8-Oct 15-Oct 22-Oct 29-Oct 5-Nov 12-Nov 19-Nov 26-Nov 3-Dec 10-Dec 17-Dec 24-Dec 31-Dec
Influent Hardness mg/l
Effluent Hardness mg/l

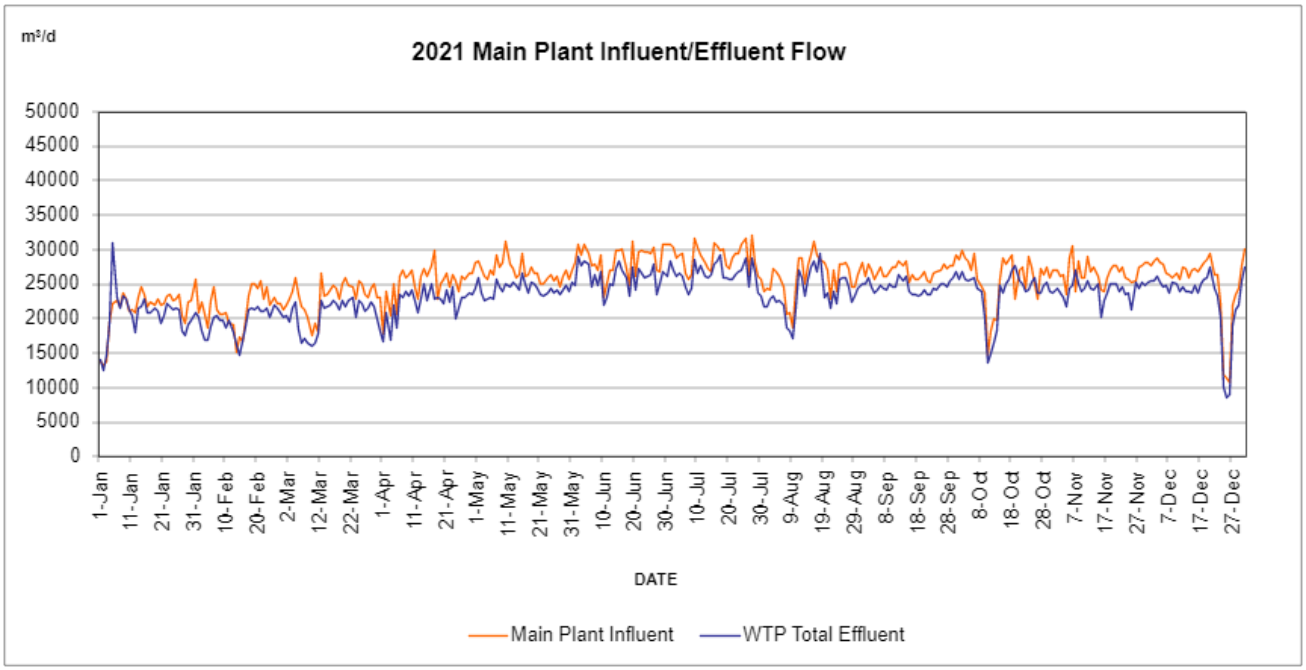

Influent Turbidity (NTU)
Effluent Turbidity (NTU)
2021 INFLUENT/EFFLUENT TURBIDITY
180
120
60
0
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
1-Jan 8-Jan 15-Jan 22-Jan 29-Jan 5-Feb 12-Feb 19-Feb 26-Feb 5-Mar 12-Mar 19-Mar 26-Mar 2-Apr 9-Apr 16-Apr 23-Apr 30-Apr 7-May 14-May 21-May 28-May 4-Jun 11-Jun 18-Jun 25-Jun 2-Jul 9-Jul 16-Jul 23-Jul 30-Jul 6-Aug 13-Aug 20-Aug 27-Aug 3-Sep 10-Sep 17-Sep 24-Sep 1-Oct 8-Oct 15-Oct 22-Oct 29-Oct 5-Nov 12-Nov 19-Nov 26-Nov 3-Dec 10-Dec 17-Dec 24-Dec 31-Dec
Influent Turbidity NTU
Effluent Turbidity NTU
Max. Allowable Single Turbidity

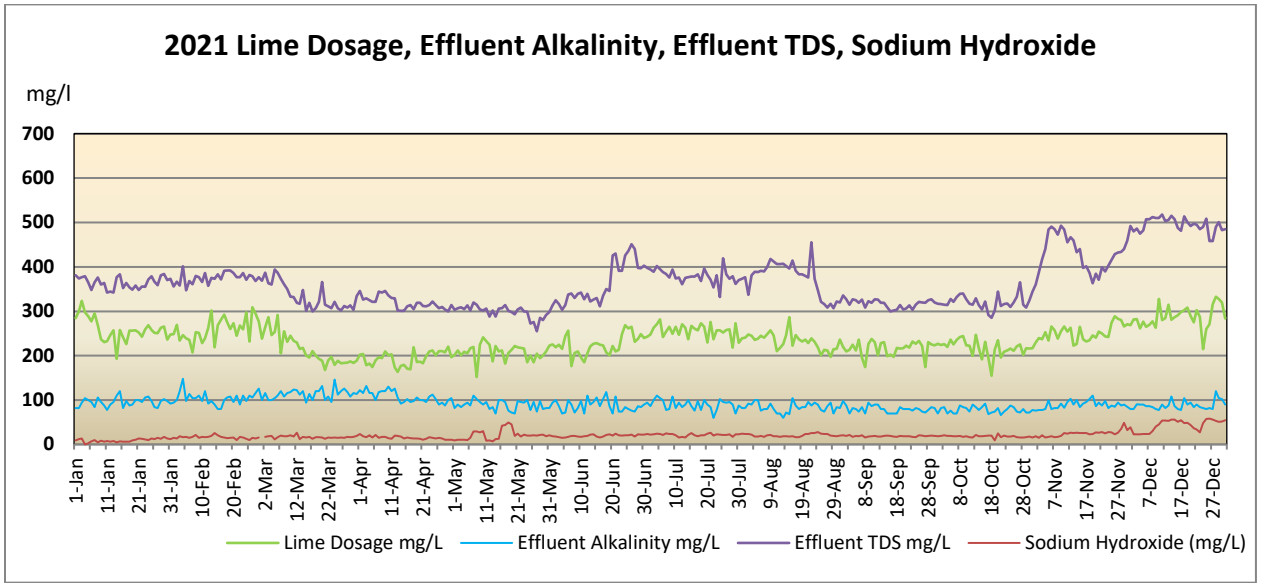

pH
2021 pH
10.00
9.50
9.00
8.50
8.00
7.50
7.00
6.50
1-Jan
8-Jan
15-Jan
22-Jan
29-Jan
5-Feb
12-Feb
19-Feb
26-Feb
5-Mar
12-Mar
19-Mar
26-Mar
2-Apr
9-Apr
16-Apr
23-Apr
30-Apr
7-May
14-May
21-May
28-May
4-Jun
11-Jun
18-Jun
25-Jun
2-Jul
9-Jul
16-Jul
23-Jul
30-Jul
6-Aug
13-Aug
20-Aug
27-Aug
3-Sep
10-Sep
17-Sep
24-Sep
1-Oct
8-Oct
15-Oct
22-Oct
29-Oct
5-Nov
12-Nov
19-Nov
26-Nov
3-Dec
10-Dec
17-Dec
24-Dec
31-Dec
Influent pH
Effluent pH

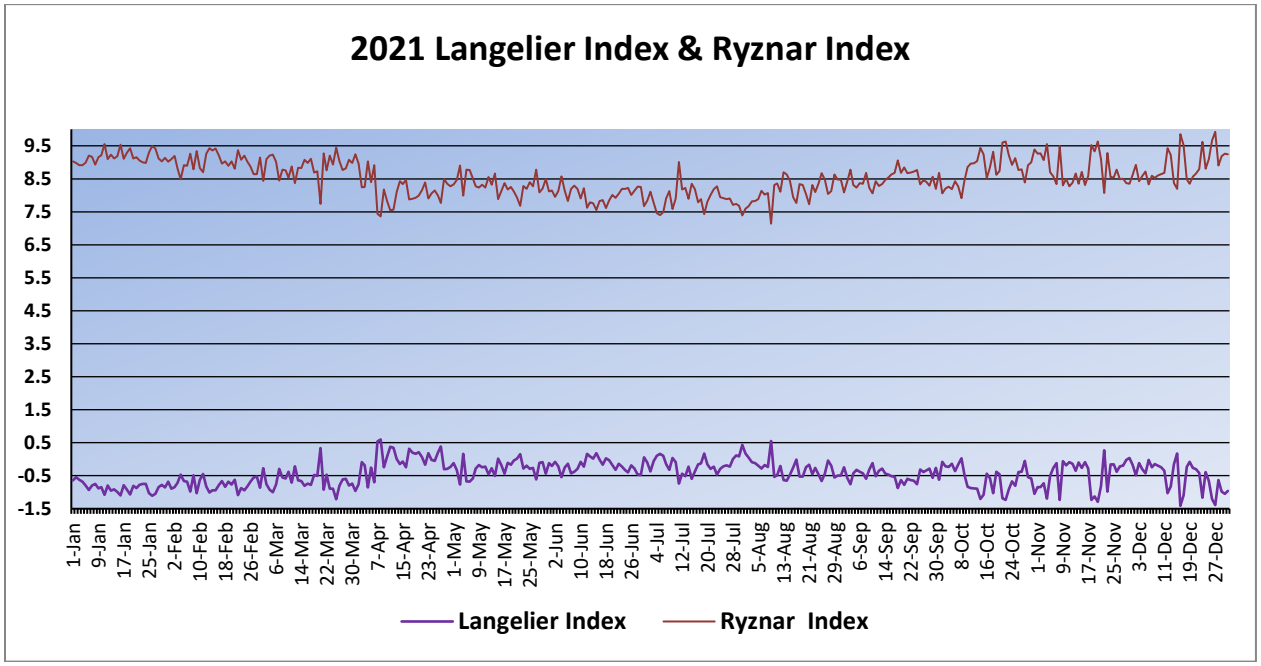

Concentration - mg/l
2021 Chlorine
6.00
5.50
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
1-Jan
8-Jan
15-Jan
22-Jan
29-Jan
5-Feb
12-Feb
19-Feb
26-Feb
5-Mar
12-Mar
19-Mar
26-Mar
2-Apr
9-Apr
16-Apr
23-Apr
30-Apr
7-May
14-May
21-May
28-May
4-Jun
11-Jun
18-Jun
25-Jun
2-Jul
9-Jul
16-Jul
23-Jul
30-Jul
6-Aug
13-Aug
20-Aug
27-Aug
3-Sep
10-Sep
17-Sep
24-Sep
1-Oct
8-Oct
15-Oct
22-Oct
29-Oct
5-Nov
12-Nov
19-Nov
26-Nov
3-Dec
10-Dec
17-Dec
24-Dec
31-Dec
WTP Effluent Free Cl2 (sampled)mg/l
Chlorine Mass Feed/Flow mg/l
Minimum Chlorine 0.5mg/l

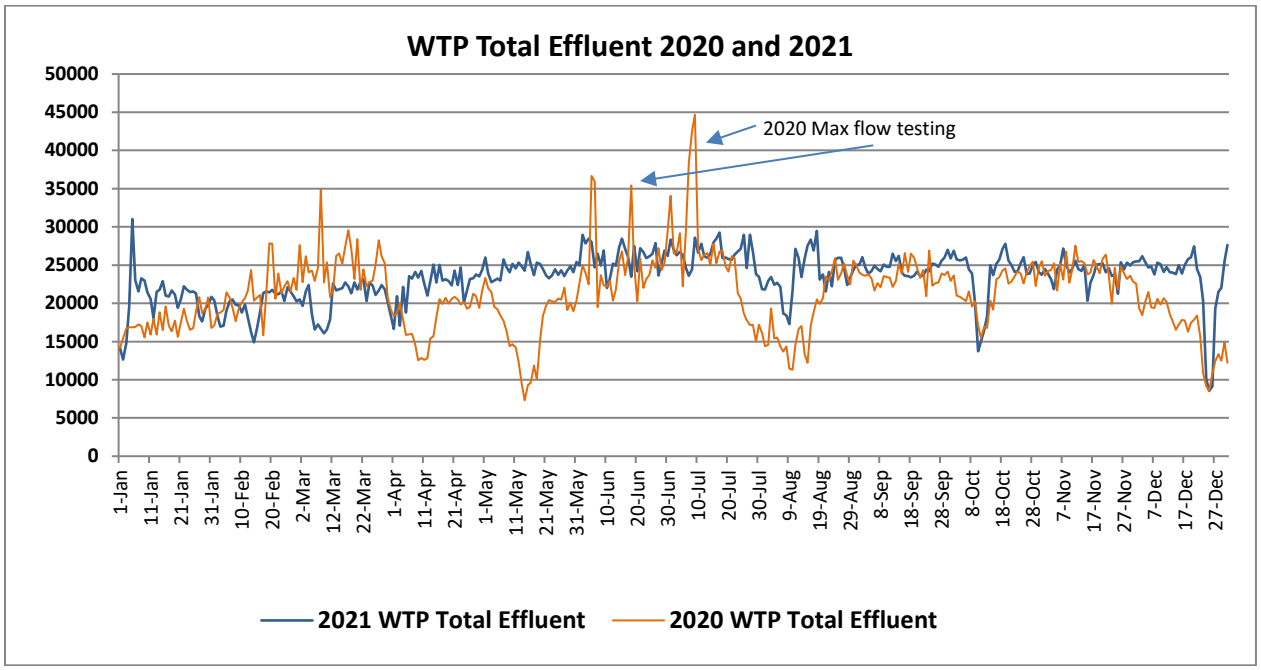

Fluoride Concentration mg/l
2021 Fluoride
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
1-Jan 8-Jan 15-Jan 22-Jan 29-Jan 5-Feb 12-Feb 19-Feb 26-Feb 5-Mar 12-Mar 19-Mar 26-Mar 2-Apr 9-Apr 16-Apr 23-Apr 30-Apr 7-May 14-May 21-May 28-May 4-Jun 11-Jun 18-Jun 25-Jun 2-Jul 9-Jul 16-Jul 23-Jul 30-Jul 6-Aug 13-Aug 20-Aug 27-Aug 3-Sep 10-Sep 17-Sep 24-Sep 1-Oct 8-Oct 15-Oct 22-Oct 29-Oct 5-Nov 12-Nov 19-Nov 26-Nov 3-Dec 10-Dec 17-Dec 24-Dec 31-Dec
Fluoride Objective 0.7mg/l
Effluent Fluoride (Sampled) mg/l
Calculated Fluoride mg/l


mg/l
2021 Phosphoric Acid Feed Rate
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Jan 5 - 7 phosphoric offline for Trotter Morton - flow meter repairs
1-Jan 8-Jan 15-Jan 22-Jan 29-Jan 5-Feb 12-Feb 19-Feb 26-Feb 5-Mar 12-Mar 19-Mar 26-Mar 2-Apr 9-Apr 16-Apr 23-Apr 30-Apr 7-May 14-May 21-May 28-May 4-Jun 11-Jun 18-Jun 25-Jun 2-Jul 9-Jul 16-Jul 23-Jul 30-Jul 6-Aug 13-Aug 20-Aug 27-Aug 3-Sep 10-Sep 17-Sep 24-Sep 1-Oct 8-Oct 15-Oct 22-Oct 29-Oct 5-Nov 12-Nov 19-Nov 26-Nov 3-Dec 10-Dec 17-Dec 24-Dec 31-Dec


m³/d
2021 Main Plant Influent/Effluent Flow
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
1-Jan
11-Jan
21-Jan
31-Jan
10-Feb
20-Feb
2-Mar
12-Mar
22-Mar
1-Apr
11-Apr
21-Apr
1-May
11-May
21-May
31-May
10-Jun
20-Jun
30-Jun
10-Jul
20-Jul
30-Jul
9-Aug
19-Aug
29-Aug
8-Sep
18-Sep
28-Sep
8-Oct
18-Oct
28-Oct
7-Nov
17-Nov
27-Nov
7-Dec
17-Dec
27-Dec
DATE
Main Plant Influent
WTP Total Effluent


2021 Lime Dosage, Effluent Alkalinity, Effluent TDS, Sodium Hydroxide
mg/l
700
600
500
400
300
200
100
0
1-Jan
11-Jan
21-Jan
31-Jan
10-Feb
20-Feb
2-Mar
12-Mar
22-Mar
1-Apr
11-Apr
21-Apr
1-May
11-May
21-May
31-May
10-Jun
20-Jun
30-Jun
10-Jul
20-Jul
30-Jul
9-Aug
19-Aug
29-Aug
8-Sep
18-Sep
28-Sep
8-Oct
18-Oct
28-Oct
7-Nov
17-Nov
27-Nov
7-Dec
17-Dec
27-Dec
Lime Dosage mg/L
Effluent Alkalinity mg/L
Effluent TDS mg/L
Sodium Hydroxide (mg/L)


2021 Langelier Index & Ryznar Index
9.5
8.5
7.5
6.5
5.5
4.5
3.5
2.5
1.5
0.5
-0.5
-1.5
1-Jan
9-Jan
17-Jan
25-Jan
2-Feb
10-Feb
18-Feb
26-Feb
6-Mar
14-Mar
22-Mar
30-Mar
7-Apr
15-Apr
23-Apr
1-May
9-May
17-May
25-May
2-Jun
10-Jun
18-Jun
26-Jun
4-Jul
12-Jul
20-Jul
28-Jul
5-Aug
13-Aug
21-Aug
29-Aug
6-Sep
14-Sep
22-Sep
30-Sep
8-Oct
16-Oct
24-Oct
1-Nov
9-Nov
17-Nov
25-Nov
3-Dec
11-Dec
19-Dec
27-Dec
Langelier Index
Ryznar Index


WTP Total Effluent 2020 and 2021
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
2020 Max flow testing
1-Jan
11-Jan
21-Jan
31-Jan
10-Feb
20-Feb
2-Mar
12-Mar
22-Mar
1-Apr
11-Apr
21-Apr
1-May
11-May
21-May
31-May
10-Jun
20-Jun
30-Jun
10-Jul
20-Jul
30-Jul
9-Aug
19-Aug
29-Aug
8-Sep
18-Sep
28-Sep
8-Oct
18-Oct
28-Oct
7-Nov
17-Nov
27-Nov
7-Dec
17-Dec
27-Dec
2021 WTP Total Effluent
2020 WTP Total Effluent