Status of Benton Harbor Water System

February 2022

Ernie Sarkipato, EGLE-DWEHD

2021 Significant Deficiency (Air Vents)

- Finished Water Reservoirs: Air Vents (work by Peerless)

Before photographs of reservoir vents approximately 10” – 12” above grade.


PEERLESS

2021 Significant Deficiency (Air Vents)

2021 Significant Deficiency (Hatches)

BEFORE

AFTER

2021 Significant Deficiency (Hatches)

- BEFORE

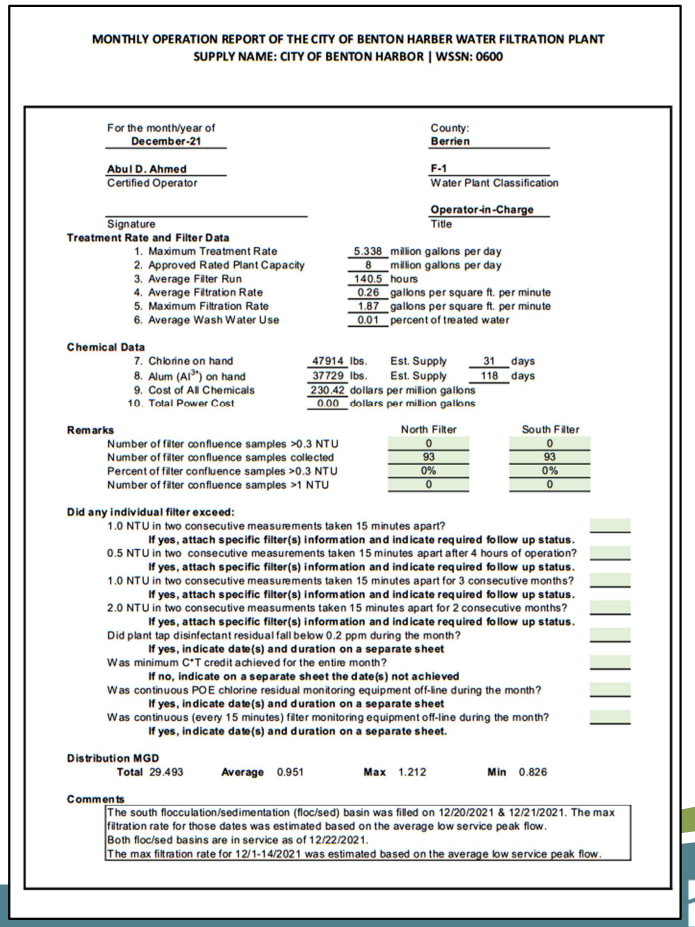
AFTER

PEERLESS

2021 Significant Deficiency (MOR issues)

- Draft Template from F&V
- Approved by EGLE
  - No pre-filling front page
  - Accurate calculations
  - NSF Max Dose added
  - CT added

1st submittal by 2/10/2022



MONTHLY OPERATION REPORT OF THE CITY OF BENTON HARBER WATER FILTRATION PLANT
SUPPLY NAME: CITY OF BENTON HARBOR | WSSN: 0600

For the month/year of: **December-21** | County: **Berrien**

Abul D. Ahmed (Certified Operator) | **F-1** (Water Plant Classification)

Signature | **Operator-in-Charge** (Title)

Treatment Rate and Filter Data

1. Maximum Treatment Rate	5.338	million gallons per day
2. Approved Rated Plant Capacity	8	million gallons per day
3. Average Filter Run	140.5	hours
4. Average Filtration Rate	0.26	gallons per square ft. per minute
5. Maximum Filtration Rate	1.87	gallons per square ft. per minute
6. Average Wash Water Use	0.01	percent of treated water

Chemical Data

7. Chlorine on hand	47914 lbs.	Est. Supply	31	days
8. Alum (Al^{3+}) on hand	37729 lbs.	Est. Supply	118	days
9. Cost of All Chemicals	230.42	dollars per million gallons		
10. Total Power Cost	0.00	dollars per million gallons		

Remarks

	North Filter	South Filter
Number of filter confluence samples >0.3 NTU	0	0
Number of filter confluence samples collected	93	93
Percent of filter confluence samples >0.3 NTU	0%	0%
Number of filter confluence samples >1 NTU	0	0

Did any individual filter exceed:

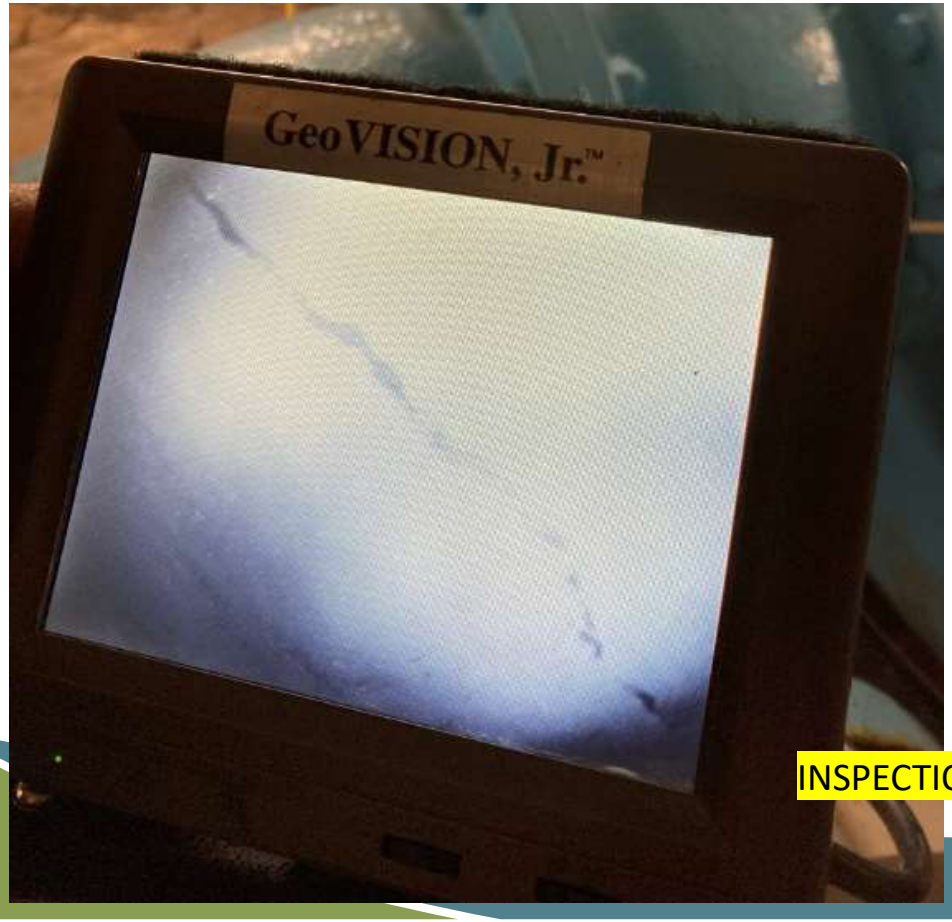
1.0 NTU in two consecutive measurements taken 15 minutes apart?
If yes, attach specific filter(s) information and indicate required follow up status.
0.5 NTU in two consecutive measurements taken 15 minutes apart after 4 hours of operation?
If yes, attach specific filter(s) information and indicate required follow up status.
1.0 NTU in two consecutive measurements taken 15 minutes apart for 3 consecutive months?
If yes, attach specific filter(s) information and indicate required follow up status.
2.0 NTU in two consecutive measurments taken 15 minutes apart for 2 consecutive months?
If yes, attach specific filter(s) information and indicate required follow up status.
Did plant tap disinfectant residual fall below 0.2 ppm during the month?
If yes, indicate date(s) and duration on a separate sheet
Was minimum C*T credit achieved for the entire month?
If no, indicate on a separate sheet the date(s) not achieved
Was continuous POE chlorine residual monitoring equipment off-line during the month?
If yes, indicate date(s) and duration on a separate sheet
Was continuous (every 15 minutes) filter monitoring equipment off-line during the month?
If yes, indicate date(s) and duration on a separate sheet.

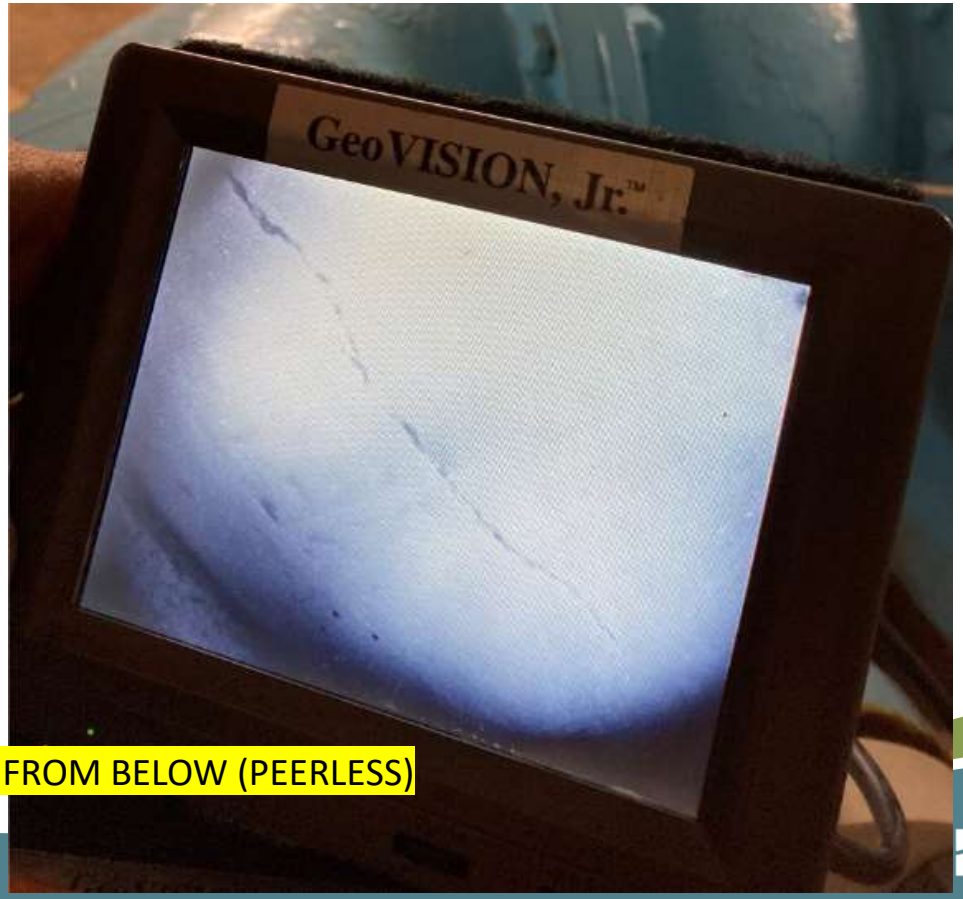
Distribution MGD
Total 29.493 **Average** 0.951 **Max** 1.212 **Min** 0.826

Comments
The south flocculation/sedimentation (floc/sed) basin was filled on 12/20/2021 & 12/21/2021. The max filtration rate for those dates was estimated based on the average low service peak flow.
Both floc/sed basins are in service as of 12/22/2021.
The max filtration rate for 12/1-14/2021 was estimated based on the average low service peak flow.

2021 Significant Deficiency (Suction Well)

2021 Significant Deficiency (Suction Well)





INSPECTION FROM BELOW (PEERLESS)

2021 Significant Deficiency (Suction Well)

2021 Significant Deficiency (Fluoride-NSF)

The Public Health and Safety Organization

NSF Product and Service Listings

These NSF Official Listings are current as of **Tuesday, November 16, 2021** at 12:15 a.m. Eastern Time. Please contact NSF to confirm the status of any Listing, report errors, or make suggestions.

Alert: NSF is concerned about fraudulent downloading and manipulation of website text. Always confirm this information by clicking on the below link for the most accurate information:
http://info.nsf.org/Certified/PwsChemicals/Listings.asp?Company=09090&Standard=060&

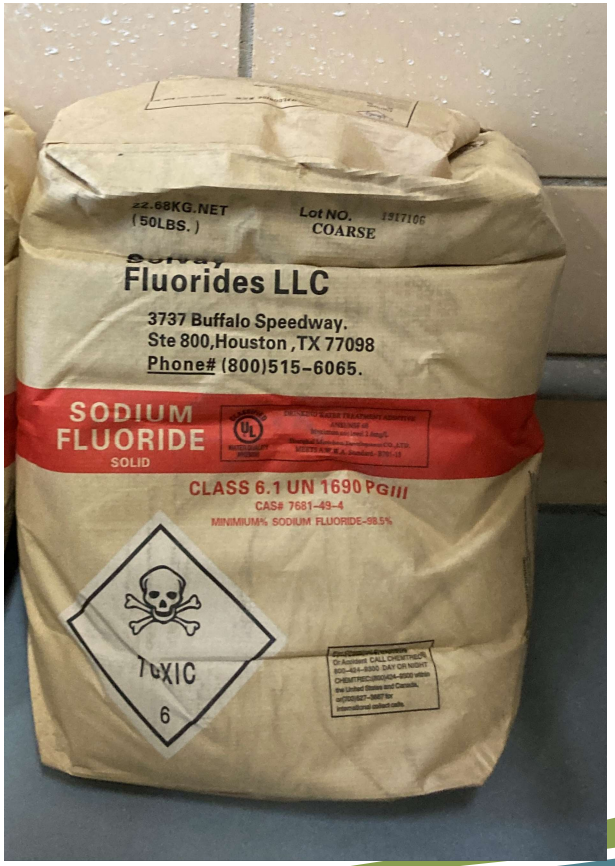
NSF/ANSI/CAN 60
Drinking Water Treatment Chemicals - Health Effects

Solvay Fluorides, LLC.
3737 Buffalo Speedway
Suite 800
Houston, TX 77098
United States
800-325-3332
713-525-6500

Facility : Distribution Center - Fremont, CA

Sodium Fluoride

Trade Designation	*Product Function*	*Max Use*
Sodium Fluoride	Fluoridation	2.2 mg/L



DATE	Peak HS Flow GPM	Minumum Reservoir Depth Feet	In Use %	Minimum Chlorine Residual mg/L	pH	Temperature °C	CT	CTR	M/R	Inactivation log
1	2000	12.7	100%	1.53	8.0	9.0	726.7	30.7	23.7	11.8
2	2000	12.7	100%	1.55	8.0	9.0	736.2	30.7	23.9	12.0
3	2000	12.8	100%	1.67	8.2	9.0	799.5	33.2	24.1	12.0
4	2000	13.0	100%	1.64	7.8	8.5	797.4	30.0	26.6	13.3
5	2000	12.7	100%	1.61	7.8	8.5	764.7	29.9	25.6	12.8
6	2000	11.3	100%	1.64	7.7	9.0	693.1	28.0	24.8	12.4
7	2000	12.7	100%	1.68	7.7	9.0	798.0	28.1	28.4	14.2
8	2000	12.8	100%	1.53	8.0	9.0	732.4	30.7	23.9	11.9
9	2000	12.4	100%	1.43	7.6	9.0	663.2	26.5	25.1	12.5
10	2000	12.7	100%	1.35	8.0	8.0	641.2	32.3	19.9	9.9
11	2000	13.0	100%	1.46	8.1	9.0	709.9	31.5	22.5	11.3
12	2000	12.8	100%	1.35	8.1	9.0	646.3	31.1	20.8	10.4
13	2000	12.7	100%	1.33	7.5	7.0	631.7	28.8	21.9	11.0
14	2000	12.2	100%	1.49	7.4	7.0	679.9	28.8	23.6	11.8
15	1787	9.0	100%	1.33	7.7	7.5	501.0	30.1	16.7	8.3
16	1777	8.7	100%	1.16	7.5	7.0	424.8	28.4	14.9	7.5
17	1779	9.4	100%	1.15	7.4	8.0	454.5	25.8	17.6	8.8
18	1751	8.6	100%	1.18	7.9	9.0	433.5	28.5	15.2	7.6
19	1778	9.3	100%	1.33	7.8	9.0	520.4	28.1	18.5	9.3
20	1703	8.3	100%	1.36	8.0	8.0	495.8	32.3	15.3	7.7
21	1798	8.5	100%	1.33	7.9	8.0	470.3	31.1	15.1	7.6
22	1775	8.5	100%	1.26	7.4	7.5	451.3	26.8	16.8	8.4
23	1802	8.4	100%	1.25	7.3	8.0	435.8	24.9	17.5	8.7
24	1790	8.9	100%	1.59	7.6	8.0	591.3	28.8	20.5	10.3
25	1827	8.9	100%	1.26	7.9	7.5	459.1	32.0	14.4	7.2
26	1805	9.2	100%	1.18	7.9	7.0	449.9	32.8	13.7	6.9
27	1788	8.8	100%	1.15	8.0	8.0	423.4	31.5	13.4	6.7
28	1856	9.0	100%	1.13	7.5	8.3	409.9	25.9	15.8	7.9
29	1820	8.5	100%	1.22	8.0	9.0	426.2	29.7	14.4	7.2
30	1843	8.6	100%	1.16	8.0	8.0	404.9	31.6	12.8	6.4
31	1795	8.2	100%	1.09	8.0	8.0	372.5	31.3	11.9	6.0

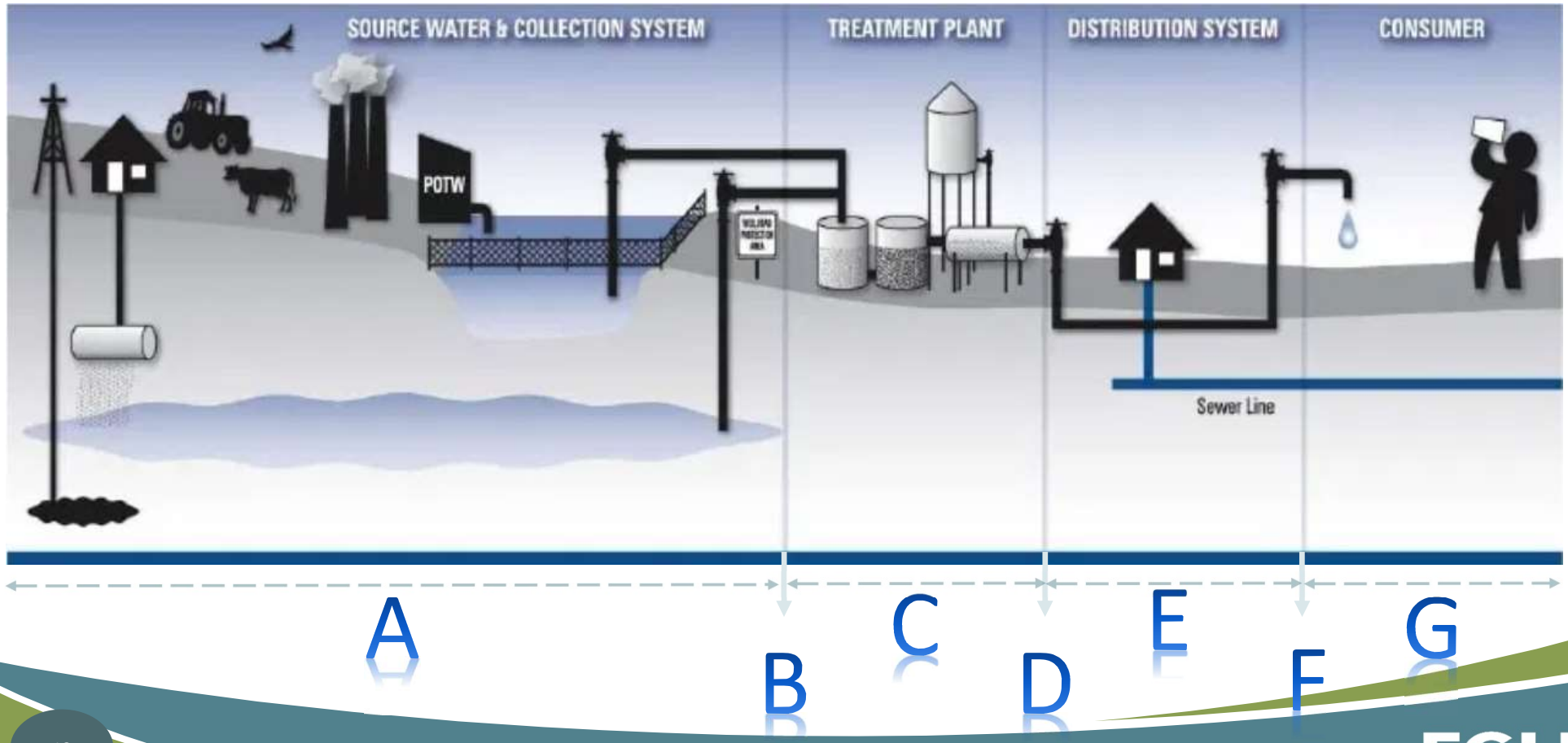
AVG	1886.2581	10.5	100%			8.3	572.4	29.7	19.3	9.7
MAX	2000	13	100%			9.0	799.5	33.2	28.4	14.2
MIN	1703	8.2	100%			7.0	372.5	24.9	11.9	6.0

WORST CASE SCENARIO:	Peak Flow, Minimum Clearwell Depth, Minimum Tap Chlorine Residual
DATE:	12/31/2021
ACTUAL C*T:	372.5
REQUIRED C*T:	31.3

Note: began recording peak HS flow rate and minimum reservoir depth from SCADA 12/15/2021. Previous data is from lab bench sheets.

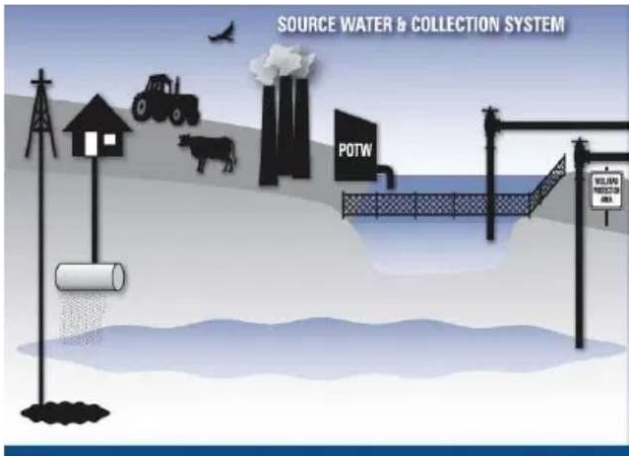
https://www.epa.gov/sites/default/files/2015-10/documents/guide_swppocket_2002_updated.pdf

Multiple Barriers to Contamination

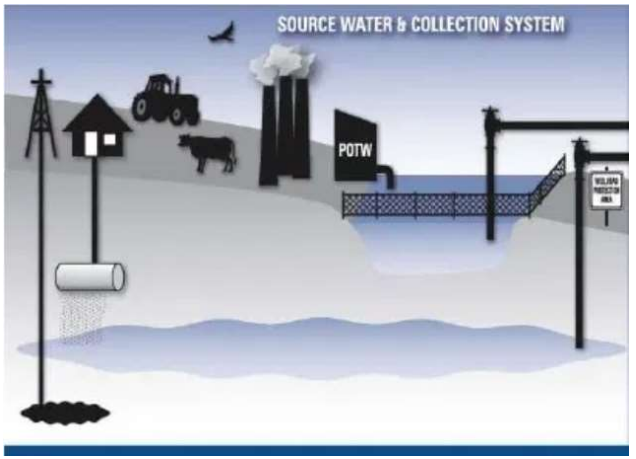


A. Source Water Protection

- No SWIPP in place to study sourcewater
- Stability in Lake Michigan demonstrated
- Riverine Influence from St. Joseph River
- **2018 survey finding**: Raw water intake cleaning and repairs needed
  - Correction: completed early 2021
- Note, lack of redundant intakes



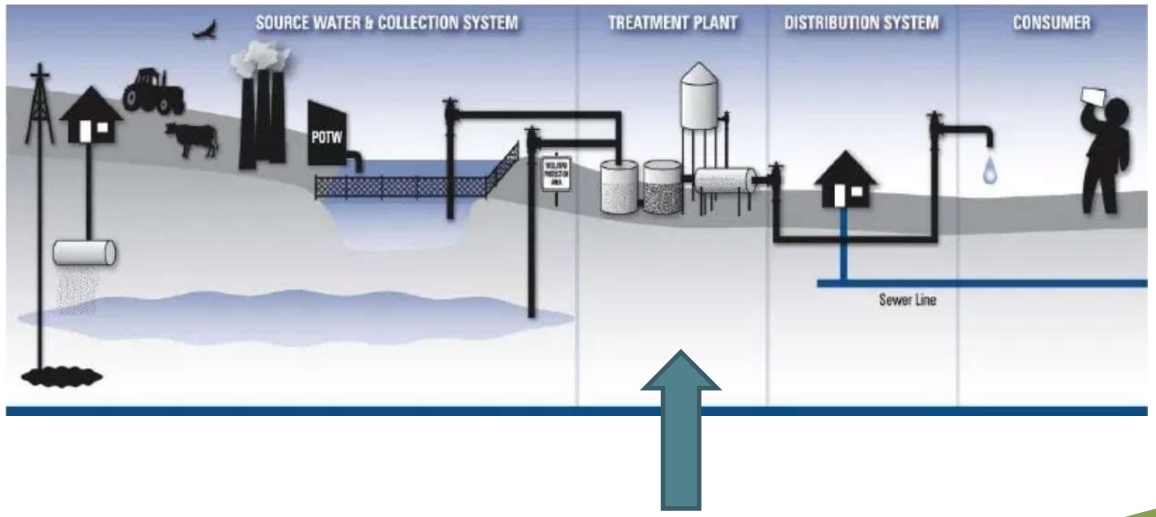
B. Source Water Sampling



- EGLE sampling for Lake Michigan:
  - Algal Toxins
  - PFAS
- Daily Bacteriological Sampling
- LT2 Sampling
- Isolated elevation of TOC (fall->winter->early spring)
  - Resulted in non-compliance
  - SUVA alternate compliance criteria (non-humic organics)

C. Treatment Process

a. Rapid Mix
b. Coagulant Addition
c. Flocculation
d. Sedimentation
e. Filtration
f. Disinfection



Rapid Mix

- **2018: significant deficiency** for no active rapid mix
- **Correction**: New Alum feed system and rapid mixing were accepted for record on September 26, 2019.

Coagulation

- **Repeated alum underfeed** incidences

  -Sept 2019 **-Nov 4, 2020** -May 2021

- Treatment technique violations
- Filter & Boil Water Advisories
- Cryptosporidium sampling (Nov 2020)

September 2019

- Alum pump failure, caught around 2 hours.
- WTP shut-down, dumped from Sedimentation to Lagoon
- “caught the problem in the basins”
- Max CFE for the day was 0.14 NTU
- Operator instructed to report these incidences

November 2020 Incident

- 11/4/2020 – operator noted high turbidity after a few hours of start-up
- Neglected to start Alum feed
- Max CFE turbidity: 0.23 NTU

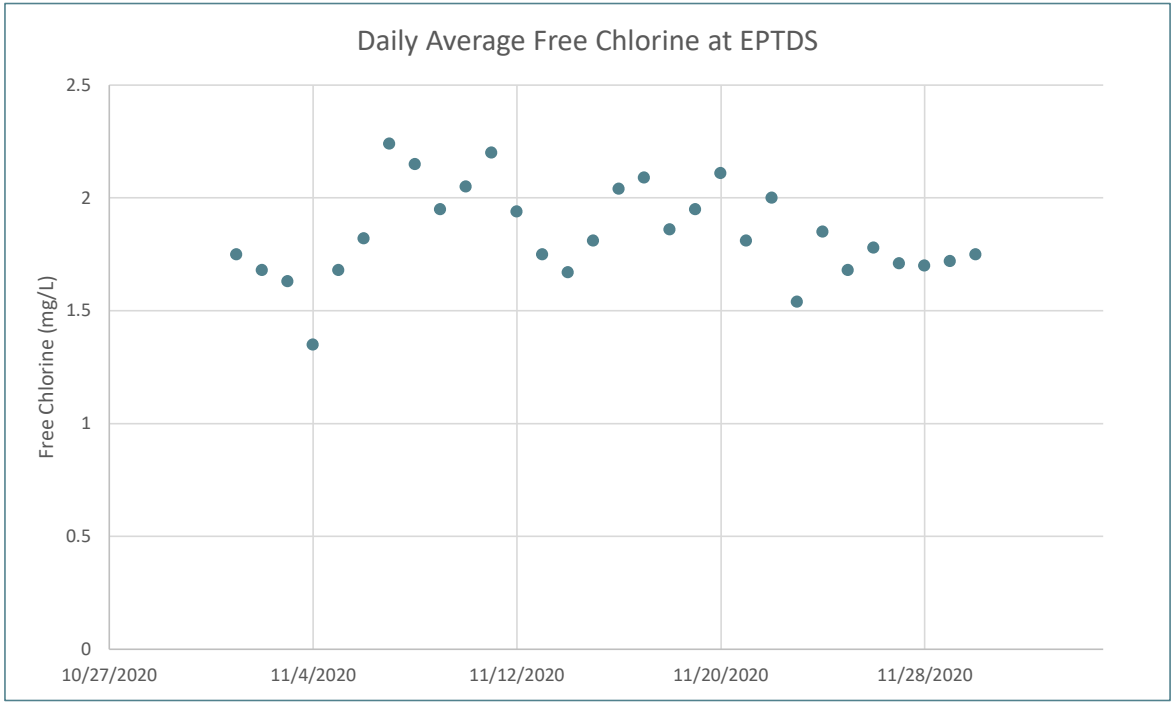
November 2020 Incident

3 of 3

DateTime	Filter5Turbidity	Filter6Turbidity	Filter7Turbidity	Filter8Turbidity	Filter9Turbidity	Filter10Turbidity	Filter11Turbidity	Filter12Turbidity	
11/4/20 7:01:12 AM	0.033750001	0.026562503	0.035312504	0.028125001	0.030937502	0.042812504	0.104062505	0.020312501	
11/4/20 7:16:12 AM	0.033437502	0.026250001	0.029687501	0.027187502	0.030937502	0.042812504	0.103125006	0.020312501	
11/4/20 7:31:12 AM	0.033437502	0.026562503	0.029687501	0.027812501	0.030937502	0.042500004	0.101875007	0.020312501	
11/4/20 7:46:12 AM	0.033437502	0.026250001	0.030000001	0.027812501	0.030937502	0.039062504	0.101875007	0.020625001	
11/4/20 8:01:12 AM	0.033437502	0.026250001	0.030312503	0.028125001	0.030937502	0.039375003	0.100312509	0.020000001	
11/4/20 8:16:12 AM	0.033437502	0.025937501	0.030625002	0.030000001	0.030937502	0.040625002	0.09937501	0.021250002	
11/4/20 8:31:12 AM	0.033437502	0.026250001	0.032187503	0.034687504	0.030937502	0.045312501	0.09937501	0.020312501	
11/4/20 8:46:12 AM	0.033437502	0.026250001	0.035625003	0.045312501	0.030937502	0.056875005	0.09843751	0.021875001	
11/4/20 9:01:12 AM	0.033437502	0.026250001	0.041875005	0.065937504	0.030937502	0.080312505	0.136875004	0.021875001	
11/4/20 9:16:12 AM	0.033750001	0.027500002	0.050625004	0.101875007	0.030937502	0.109062508	0.412500024	0.022500001	
11/4/20 9:31:12 AM	0.033437502	0.027812501	0.068437502	0.18187502	0.030625002	0.110000007	0.844375074	0.020000001	Caught Operator's attention and he started backwash
11/4/20 9:46:12 AM	0.033437502	0.026562503	0.064687505	0.056562506	0.030625002	0.109687507	1.595000148	0.020625001	
11/4/20 10:01:12 AM	0.033437502	0.028437503	0.066250004	0.045625005	0.030937502	0.109375007	0.612500072	0.019687502	
11/4/20 10:16:12 AM	0.051562503	0.029062502	1.046250105	0.048125003	0.030625002	0.109687507	0.478125036	0.020000001	
11/4/20 10:31:12 AM	5.00531292	0.092187509	2.8681252	0.695625067	0.030625002	0.112500004	1.282812595	0.019375002	
11/4/20 10:46:12 AM	1.068750024	5.002812862	2.137500048	0.423125029	0.030625002	0.124375008	0.400000036	0.0190625	Proceeded to dump Took Plant off Line.
11/4/20 11:01:12 AM	0.890000045	4.445937634	0.857187569	0.36937502	0.030312503	0.115625009	0.386250019	0.020312501	
11/4/20 11:16:12 AM	0.868750036	2.933125257	0.763437569	0.651875019	0.030312503	0.405312538	2.558750153	0.020312501	
11/4/20 11:31:12 AM	0.868125081	2.385625124	0.745000064	0.487812549	0.030312503	0.83593756	2.185312748	0.019687502	
11/5/20 4:16:12 AM	0.550312519	1.116875052	0.283750027	0.383750021	0.030312503	0.163125008	0.332500011	0.154375017	
11/5/20 4:31:12 AM	0.611875057	1.115000129	0.28343752	0.383437514	0.030312503	0.16187501	0.335625023	0.146562517	
11/5/20 4:46:12 AM	0.575937569	1.115312576	0.283125013	0.379062533	0.030000001	0.163437515	0.342500031	0.134687513	
11/5/20 5:01:12 AM	0.571875036	1.110312581	0.282187521	0.376875013	0.030000001	0.162187517	0.340937525	0.144062504	
11/5/20 5:16:12 AM	0.556562543	1.104687572	0.284687519	0.374375015	0.030000001	0.16125001	0.340312511	0.115937509	
11/5/20 5:31:12 AM	0.510312557	1.108750105	0.284062535	0.36937502	0.030000001	0.159375012	0.336250037	0.146875009	
11/5/20 5:46:12 AM	0.610625029	1.11156261	0.284375012	0.367812514	0.030000001	0.160937518	0.344687521	0.133437514	
11/5/20 6:01:12 AM	0.633750021	1.110937595	0.284375012	0.360625029	0.030000001	0.158750013	0.345000029	0.132812515	
11/5/20 6:16:12 AM	0.595625043	1.099375129	0.284687519	0.352812529	0.030000001	0.157187507	0.345625013	0.138750017	Ran Filter to waste Sequence again before actual Start up treatment
11/5/20 6:31:12 AM	0.60375005	1.1059376	0.285000026	0.353125036	0.030000001	0.155625015	0.342812538	0.117500007	
11/5/20 6:46:12 AM	0.593125045	1.101562619	0.285312533	0.360625029	0.030000001	0.155937508	0.342500031	0.100312509	
11/5/20 7:01:12 AM	0.622812569	1.104687572	1.816250086	0.348125011	0.029687501	0.161562517	0.42187503	0.121562511	
11/5/20 7:16:12 AM	0.592187524	4.063125134	0.145000011	0.39843753	0.030000001	0.157187507	0.175937518	0.165000007	
11/5/20 7:31:12 AM	0.552187562	2.112812757	0.195000008	0.330000013	0.030000001	0.089062504	0.270625025	0.123437509	

November 2020 Response

- Increase chlorination at water plant



November 2020 Response

- **MDHHS** sampling **11/6/20**
- **Correction**: New Alum feed system and rapid mixing were accepted for record on September 26, 2019.

Location	Crypto	Giardia
Raw	ND	ND
Plant tap	ND	ND
B&Z	ND	ND
Blue Water Thermal	ND	ND
Water Tower (LeRoys)	ND	ND

Method 1623, Eurofins, South Bend, IN

November 2020 Response

Bacteriological Sampling

Date	Location	TC Detected?	Free Chlorine
11/8/2020	Britain (Glass store)	No	1.46
11/8/2020	202 S Fair	No	2.03
11/8/2020	295 Colfax	No	1.65
11/8/2020	S Fair	No	1.76
11/8/2020	Fair & Main	No	1.76
11/9/2020	Britain (Glass store)	No	1.05
11/9/2020	Colfax & Britain	No	1.15
11/9/2020	Empire & Colfax	No	1.08
11/9/2020	S Fair	No	1.15
11/9/2020	Fair & Main	No	1.38
11/11/2020	Milton & Cross	No	1.24
11/11/2020	Emery & Columbus	No	1.22
11/11/2020	Cross & Lavette	No	1.16

EGLE

City of Benton Harbor Boil Water Advisory
Frequently Asked Questions

1 Is this just another advisory about lead in the water?

This advisory is different. Due to a failure in the water treatment process, there is a possibility disease-causing bacteria entered the tap water. Contamination from bacteria is the primary health risk.

2 What is wrong with the water?

Like many communities in Michigan, Benton Harbor uses Lake Michigan water as its drinking water source. This water must go through an extensive treatment process before it is safe to drink. When there is a failure in the treatment process, the safety of the water cannot be confirmed. When the safety of the water cannot be confirmed, an advisory to the public is needed to inform you of the increased risk.

3 Will the water make me sick?

Without first boiling the water, there is an increased risk of getting sick because of the recent treatment failure. The risk is greater for people with weak immune systems, the young, or the elderly. Additional steps are included to reduce lead (see questions 5, 6 and 7).

4 What should I do if I think the water made me sick?

You should consult your doctor.

5 What can I do as a resident to ensure my tap water is safe for consumption?

If you had a lead filter, continue to use that but also boil the filtered water to kill any bacteria. If you don't have a lead filter, you should run the water for five minutes and then boil the water to kill any bacteria. Water should be heated to a boil and kept at a rolling boil for 1 minute to kill any bacteria. Allow the water to cool before using.

6 Should I continue using my filter?

Yes, the filter will continue to remove lead in the water. However, water should also be boiled after being filtered, according to the boil water advisory. Residents should not run hot water though the filter as a shortcut to boiling. Running hot water through the filter can damage it and cause it to not function properly.

7 Should I replace my filter cartridge after the boil water advisory?

Yes. The filters in place should have a cartridge inside, which may be fouled if exposed to large amounts of bacteria. The best time to change the cartridge is after the precautionary boil water notice is ended. The Berrien County Health Department can be contacted at 1-800-815-5485 for cartridge replacement.

8 Can the water be used for washing and showering?

Yes. The potential health risk occurs only when drinking the water (see question #4). There is no risk associated with skin contact. Hand washing is especially important during the pandemic.

9 Can we use water for laundry?

Yes, the city water supply can be safely used to wash clothing either with a machine or by hand.

10 What action has the city taken since discovering the problem?

The city has fixed the treatment issue and is now adding extra chlorine to the water to kill any bacteria. The city is also flushing water through some hydrants to make sure chlorine reaches locations throughout the city.

11 Should I drink bottled water?

The steps of filtering and boiling are recommended to reduce the risk from this event. Bottled water is also a good way to avoid the risks of lead and bacteria.

12 Can the water be tested to see if it is contaminated?

The city will be testing the water supply for bacteria and chlorine residuals, as well as other contaminants in the coming days. The city is also looking for volunteers to conduct testing for lead. Contact the City of Benton Harbor at 269-927-8400 to volunteer for lead testing.

13 Will the water have a different taste, odor, or color?

In response to the emergency, the city has increased the chlorine level to kill bacteria. Residents might smell or taste chlorine. This is not harmful and is an indication that the city's flushing efforts are effective. Also, the city's flushing efforts may cause discolored water. If you observe colored water, continue running your tap until it clears up.

14 When did this problem happen?

The interruption in treatment was discovered Wednesday morning November 4th. The city notified the State of Michigan about the incident Thursday afternoon November 5th. Preparations for the public advisory were initiated immediately after.

15 How long will this advisory be in place?

The advisory will remain in place until the following is confirmed by state and local officials:

- The water of questionable quality has been flushed out of the distribution system.
- No bacteria are detected in the distribution system.
- Proper disinfection residuals are measured throughout the distribution system

It is estimated this will take 3 to 7 days.

EGLE MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
https://bhcity.us

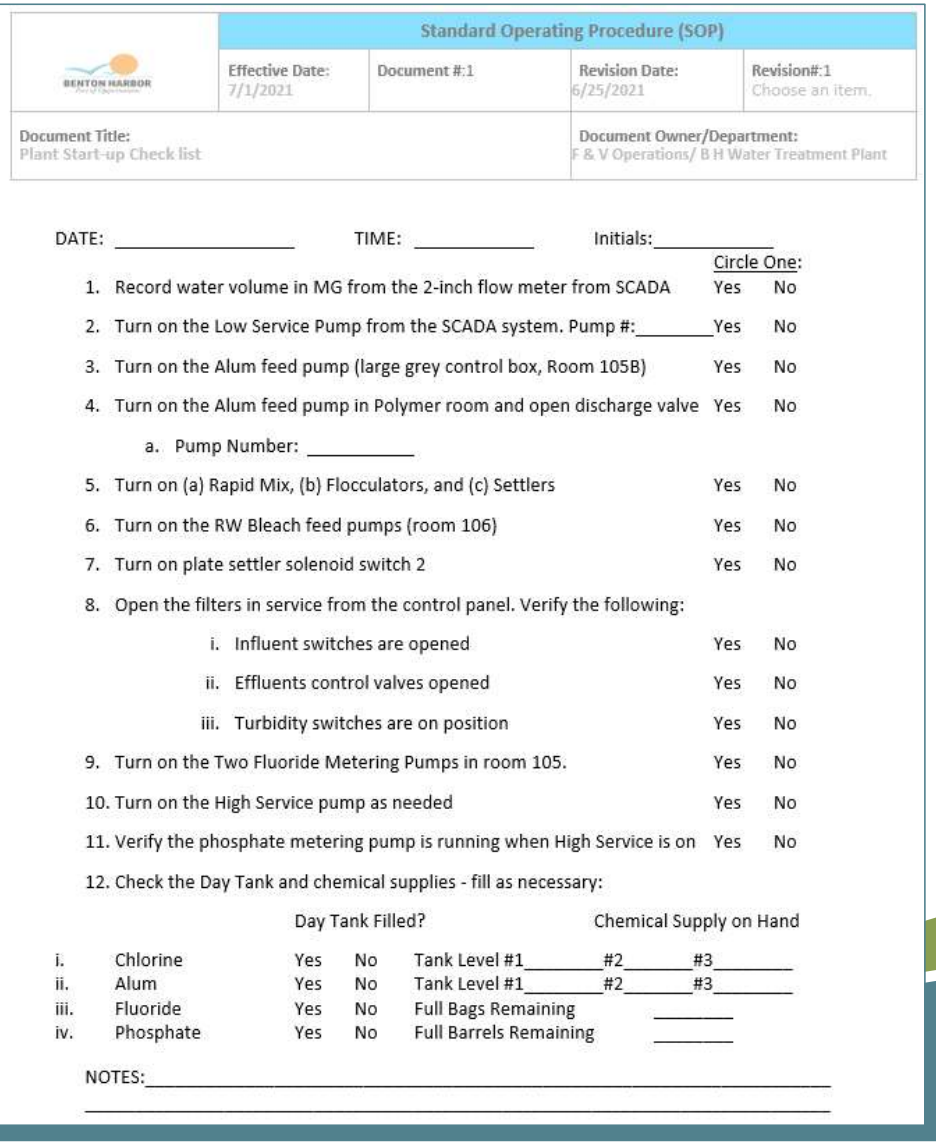
May 18, 2021 Incident and Response

- 45 minutes operation without alum feed (@ startup)
- No turbidity spikes
- Precautionary boil issued
- Bacteriological Testing

Date	Location	TC Detected?	Free Chlorine
5/19/2021	City Hall	No	0.98
5/19/2021	Wolf Marine	No	1.86
5/19/2021	470 W. Main	No	1.46
5/19/2021	Sunny Spot	No	0.75
5/19/2021	B&Z	No	1.03
5/20/2021	City Hall	No	2.08
5/20/2021	Wolf Marine	No	1.65
5/20/2021	470 W. Main	No	1.57
5/20/2021	Sunny Spot	No	0.48
5/20/2021	B&Z	No	1.36

May 18, 2021 Response

- Created SOP and checklist for plant startup



BENTON HARBOR	Standard Operating Procedure (SOP)			
	Effective Date: 7/1/2021	Document #:1	Revision Date: 6/25/2021	Revision#:1 Choose an item.
Document Title: Plant Start-up Check list			Document Owner/Department: F & V Operations/ B H Water Treatment Plant	

DATE: _____ TIME: _____ Initials:_____

		Circle One:	
1.	Record water volume in MG from the 2-inch flow meter from SCADA	Yes	No
2.	Turn on the Low Service Pump from the SCADA system. Pump #:_____	Yes	No
3.	Turn on the Alum feed pump (large grey control box, Room 105B)	Yes	No
4.	Turn on the Alum feed pump in Polymer room and open discharge valve	Yes	No
	a. Pump Number: _____		
5.	Turn on (a) Rapid Mix, (b) Flocculators, and (c) Settlers	Yes	No
6.	Turn on the RW Bleach feed pumps (room 106)	Yes	No
7.	Turn on plate settler solenoid switch 2	Yes	No
8.	Open the filters in service from the control panel. Verify the following:		
	i. Influent switches are opened	Yes	No
	ii. Effluents control valves opened	Yes	No
	iii. Turbidity switches are on position	Yes	No
9.	Turn on the Two Fluoride Metering Pumps in room 105.	Yes	No
10.	Turn on the High Service pump as needed	Yes	No
11.	Verify the phosphate metering pump is running when High Service is on	Yes	No

12. Check the Day Tank and chemical supplies - fill as necessary:

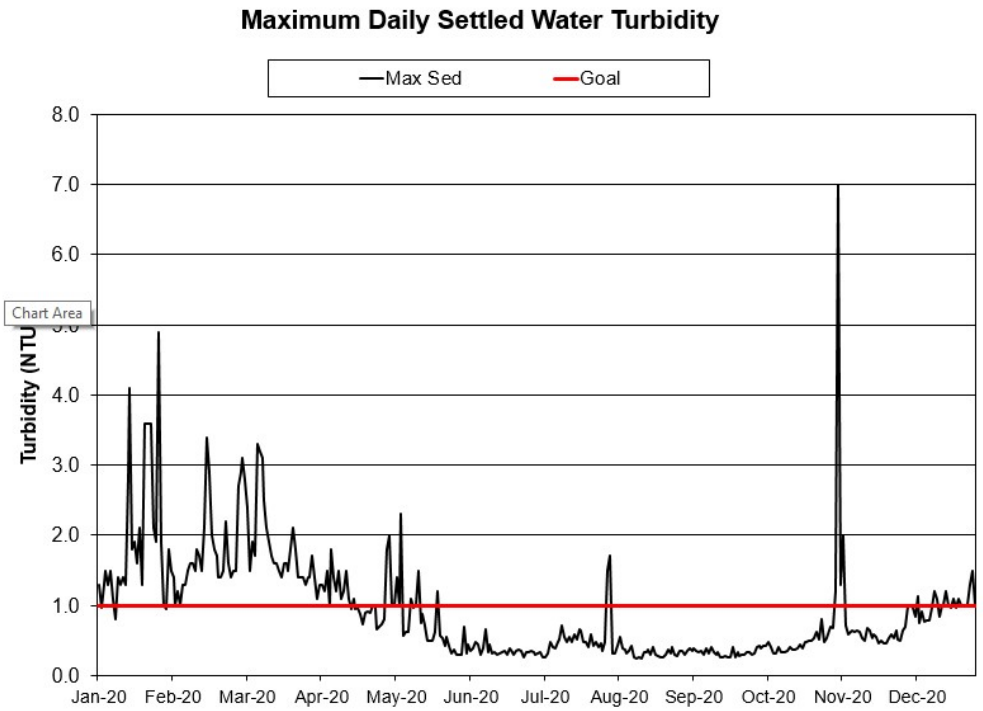
		Day Tank Filled?		Chemical Supply on Hand
i.	Chlorine	Yes	No	Tank Level #1_____#2_____#3_____
ii.	Alum	Yes	No	Tank Level #1_____#2_____#3_____
iii.	Fluoride	Yes	No	Full Bags Remaining _____
iv.	Phosphate	Yes	No	Full Barrels Remaining _____

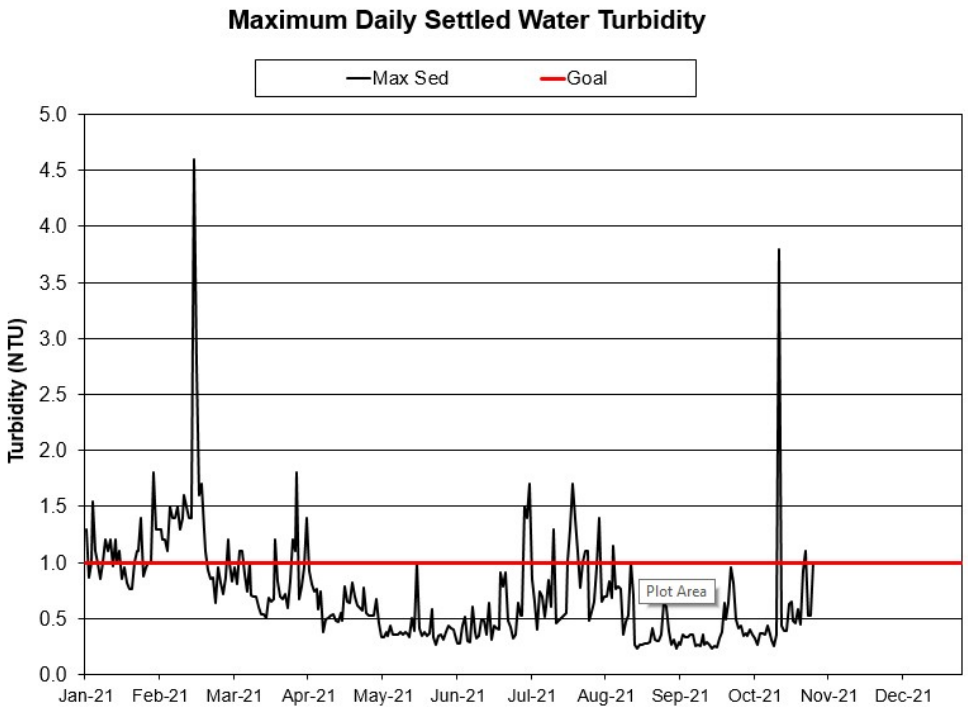
NOTES:_____
_____

Flocculation & Sedimentation

- No lapse in mixing or sedimentation functionality
- Long *down-time* due to sludge wasting valve stuck (south)
  - **Correction**: Sludge was removed and repairs made (south), operational as of January 2022.

Settled Water Turbidity





Filtration

- EPA Order 108 (a) to repair flow meters by 11/9/2021 (7 days)
  - Flow meters on filters were repaired/calibrated
- EPA Order 112 (b) to initiate repairs to filters identified as necessary
  - Waste valve for Filters 9/10 on order, repairs await.

Filters 1 – 4: abandoned in place

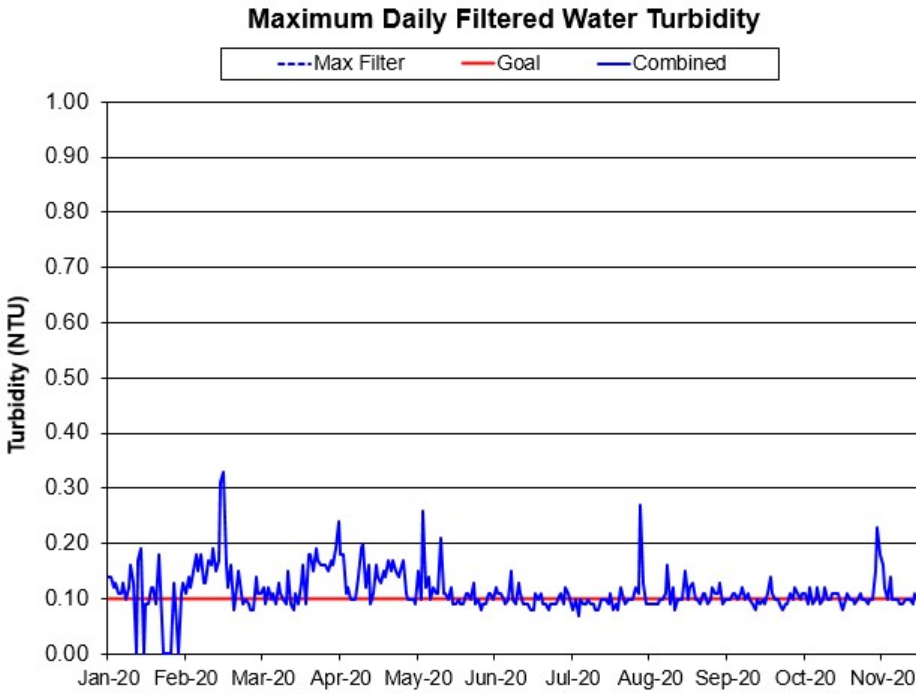
Filters 5 – 8, 11 & 12: in operation

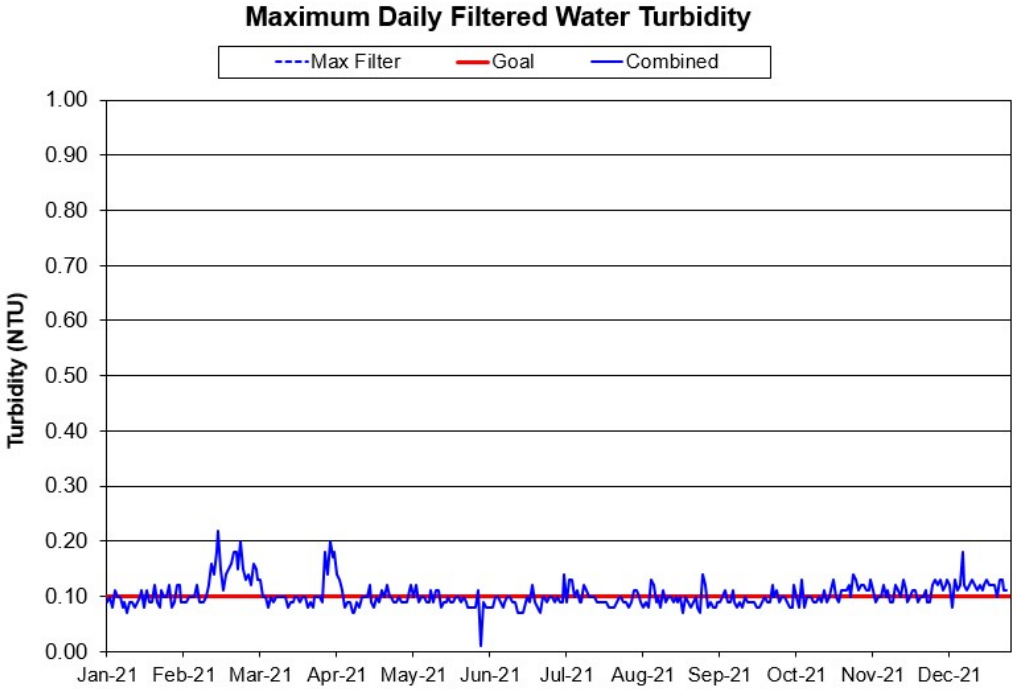
Filters 9 & 10: awaiting repairs

Filter Backwashing, Filter-to-waste

- **2018 Compliance Communication:** Filters with FTW capability (9, 10, 11, 12) weren't being used
- **2019 Survey Finding**: Implement SOP for FTW
  - Could have been utilized during high turbidity event February 2018
  - **Correction**: Developed SOP for operators to backwash, and either use FTW or do an extended/slow wash if no FTW
    - **Update**: suspect operators are not following

Filtered Turbidities – 2020 & 2021



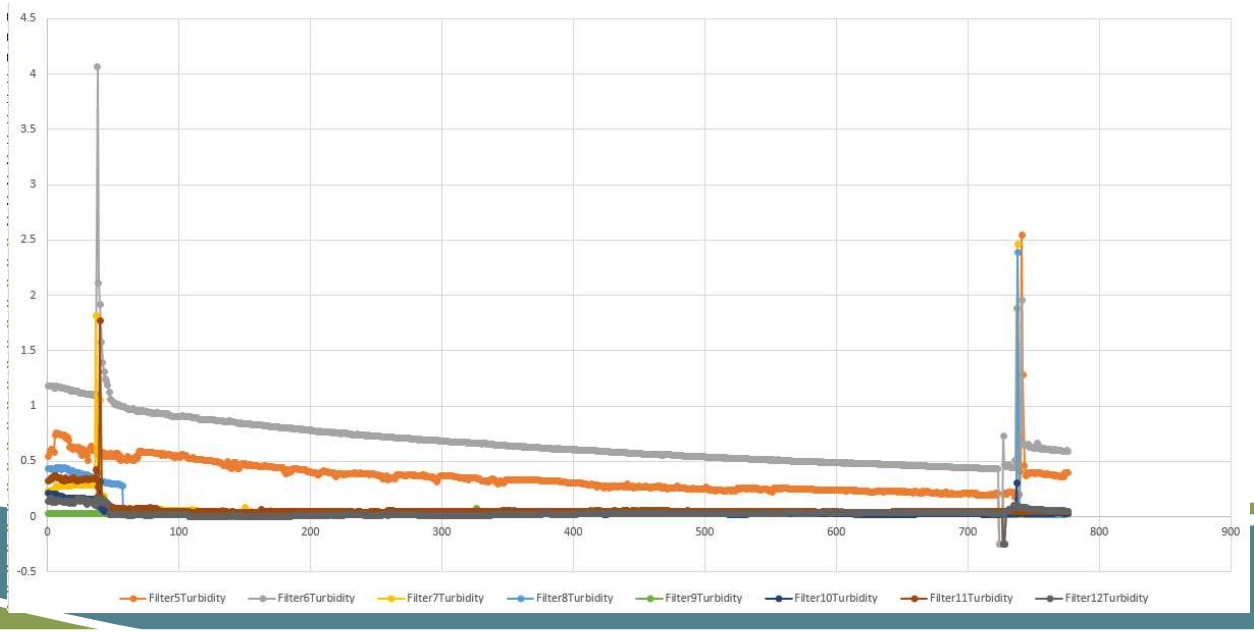


Turbidity Measurements

- **2021: Significant Deficiency** for no calibration of turbidimeters
  - **Correction:** SOP for calibration and maintenance of all turbidimeters developed and implemented late 2021

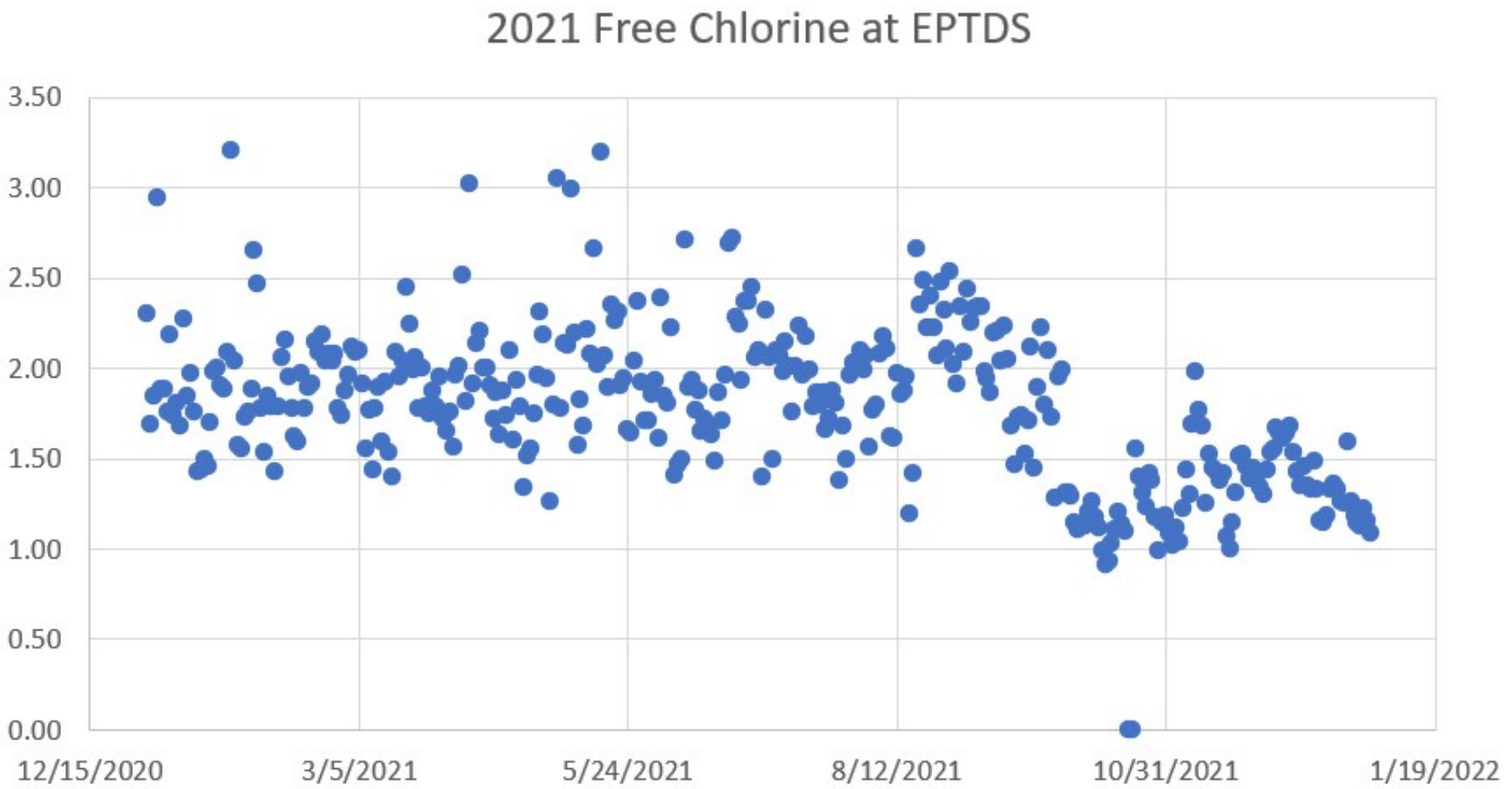
Turbidity Records and SCADA

- **10/5/2020: Violation Notice** for lack of filter turbidity records
  - **Correction: SCADA** work done to retain 15-minute data indefinitely



Disinfectant Residual Monitoring

- **2018: significant deficiency** for non-working chlorine analyzer at EPTDS.
  - **Correction**: installed new analyzer, resolved 8/12/2019
- **9/9/20: VN** for non-working analyzer
  - **Correction:** back online 9/21/20
- **9/21/2021: significant deficiency** for same (new location)
  - **Correction**: back online 9/23/2021
  - Installed redundant analyzer recently

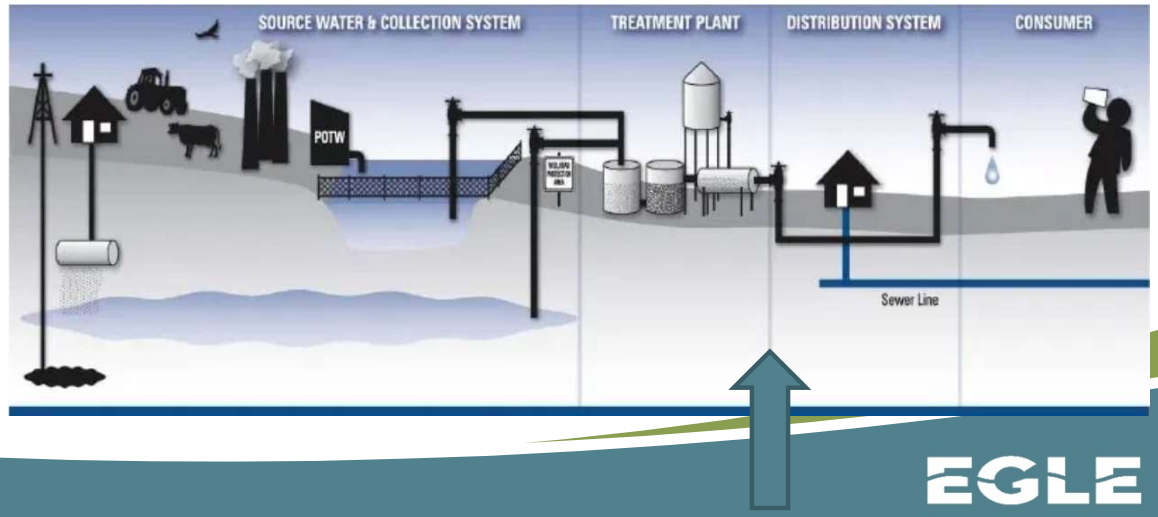

2021 Free Chlorine at EPTDS
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
12/15/2020
3/5/2021
5/24/2021
8/12/2021
10/31/2021
1/19/2022

Disinfection

- Required to attain inactivation of 0.5-log (giardia) and 4-log (virus) for conventional treatment
- Due to large volume, estimates of CT ratio vary between 7 – 20
- **2021: EGLE requested** daily CT calculations be added to MOR (*in process*)
- **EPA Order (110 a – e)** requires the City complete a 12-month long Disinfection Profiling and Benchmarking Report (*in process*)

D. Finished Water Sampling

- **2021 Monitoring**: full metals, cyanide, Nitrate, PFAS, SOC, VOC
  - No detections, except PFAS (PFOS=2 ppt, PFOA=2ppt)
  - Daily total coliform testing



E. Distribution System: Continuous Pressure

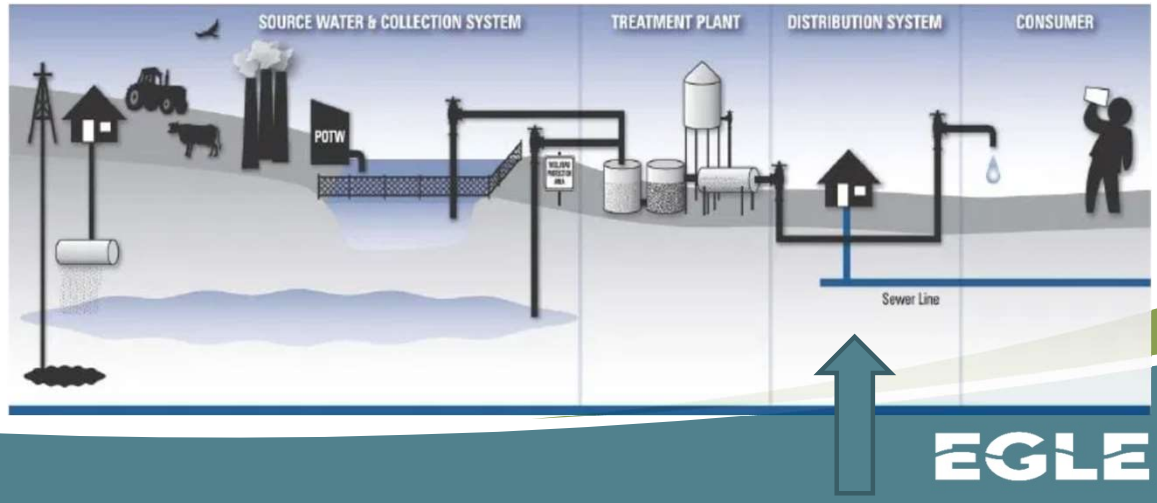
- One depressurization event in October 2021 (complete)
  - **Response:**
    - EGLE onsite to observe repair and plant startup
    - Flushing: 20 hydrants, 15 minutes each
    - Bacteriological Sampling, chlorine residuals
  - **Corrections**:
    - VFD on high service pumps
    - Better SCADA alarming
- Focus on coordinate public messaging during emergency

EGLE

E. Distribution System Maintenance

Water Tower

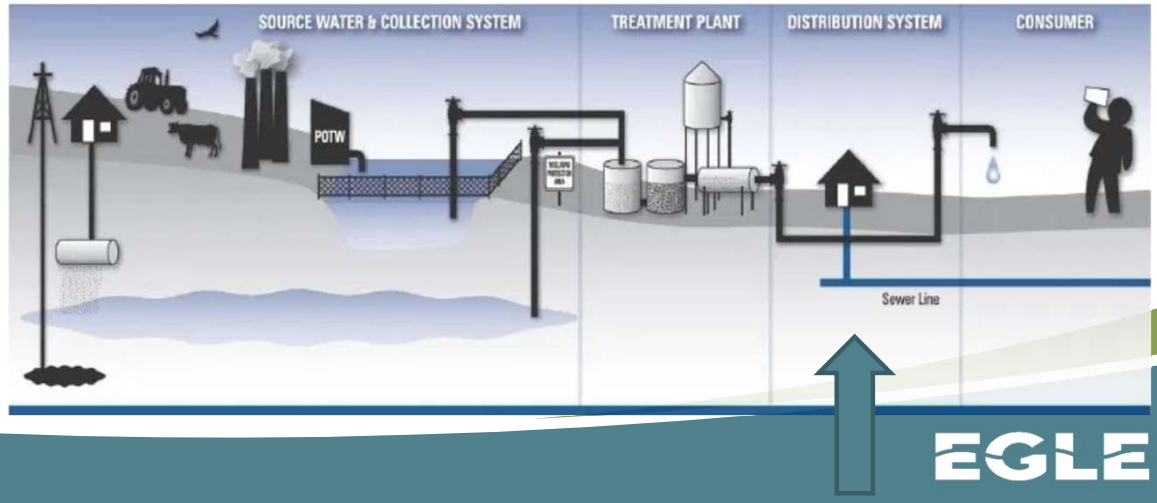
- **2018: Deficiency** for lack of water tower maintenance/repairs.
  - **Correction**: upgrades completed 2021



E. Distribution System Maintenance

Valves and Hydrants

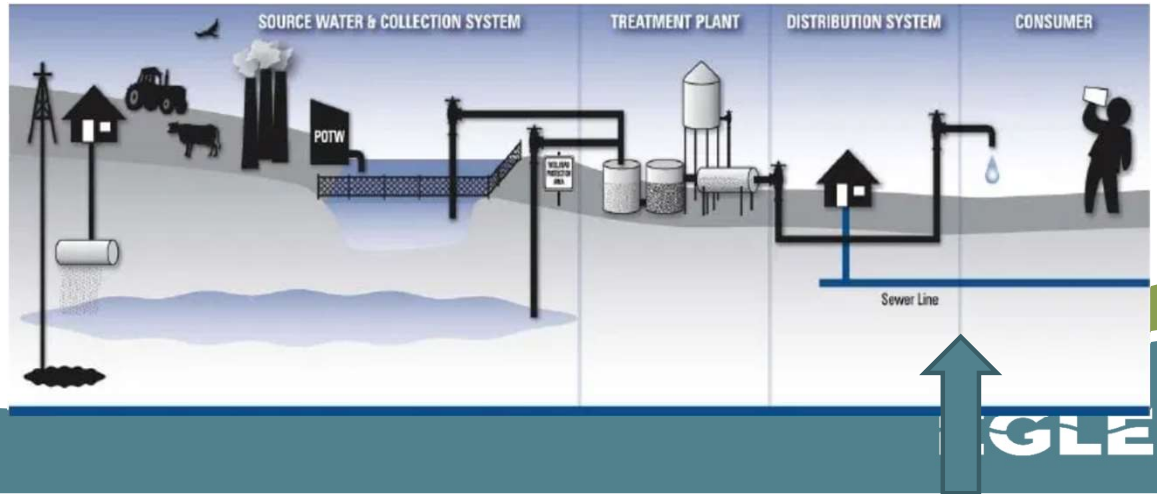
- **2018: Significant Deficiencies** for lack of valve and hydrant maintenance/repairs/records
  - **Correction**: *partially* addressed through contract with Wachts water, 2021
  - Work needed to upgrade
  - aging infrastructure



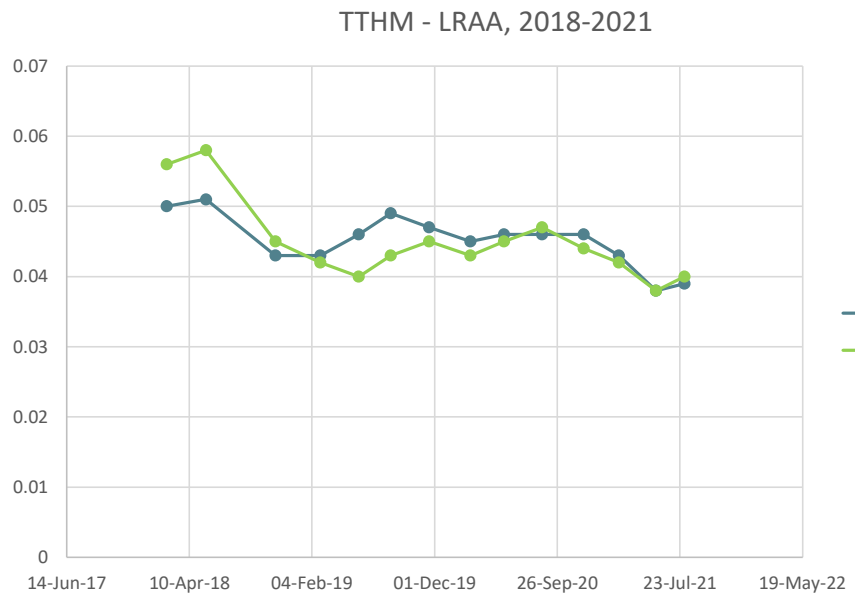
F. Distribution System Sampling

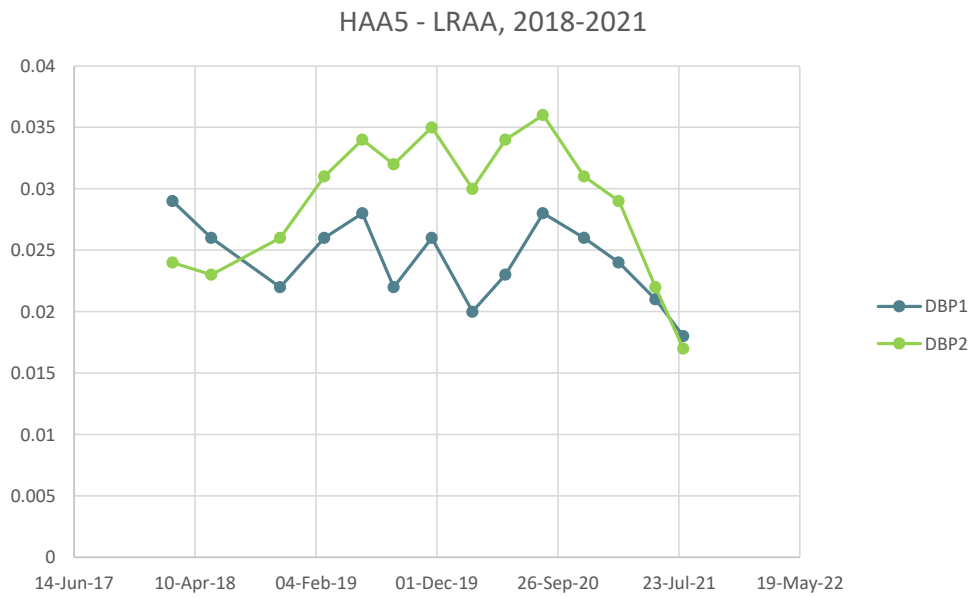
Disinfection Byproducts

Bacteriological/chlorine residuals



Disinfection Byproducts





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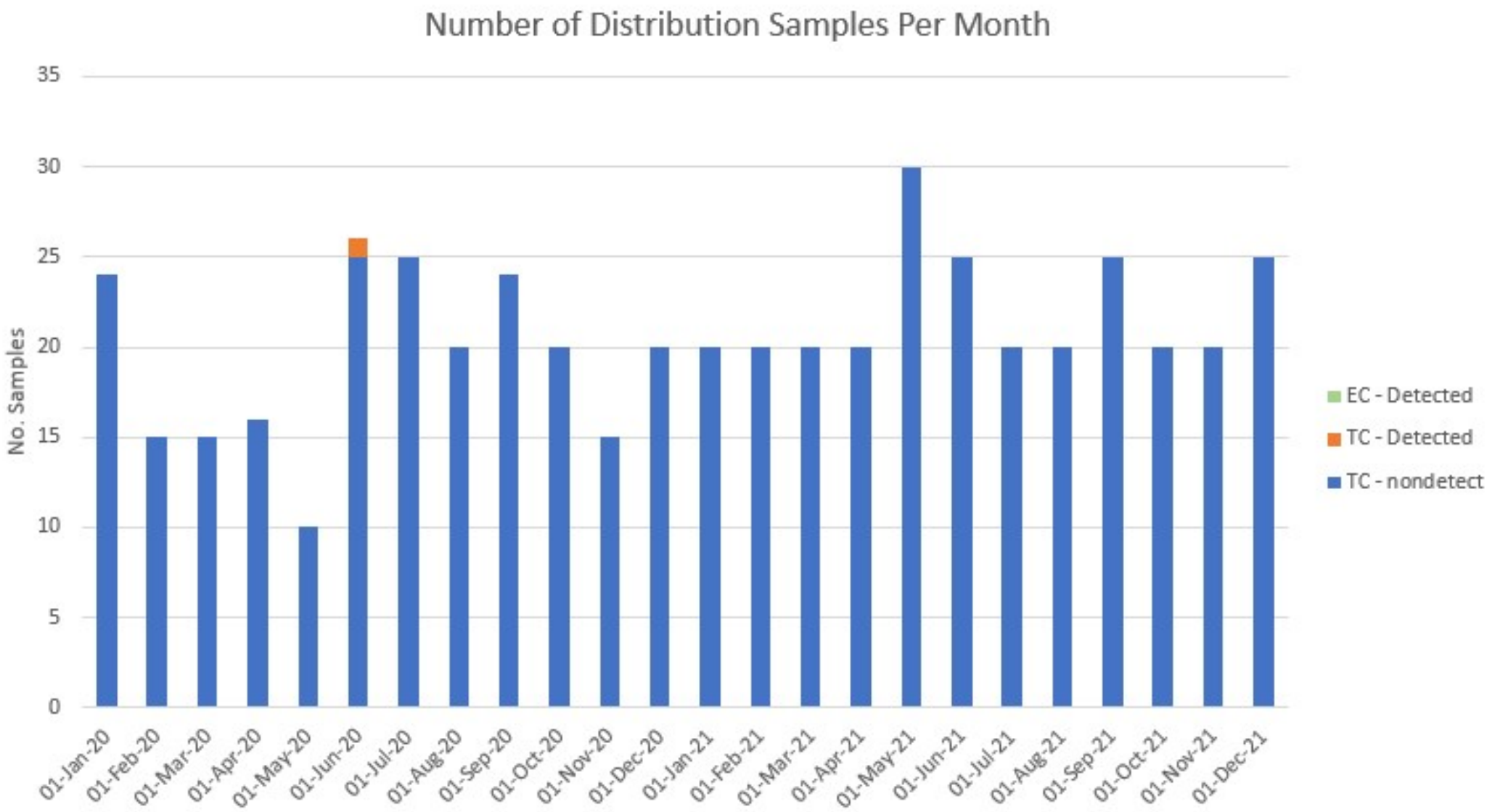
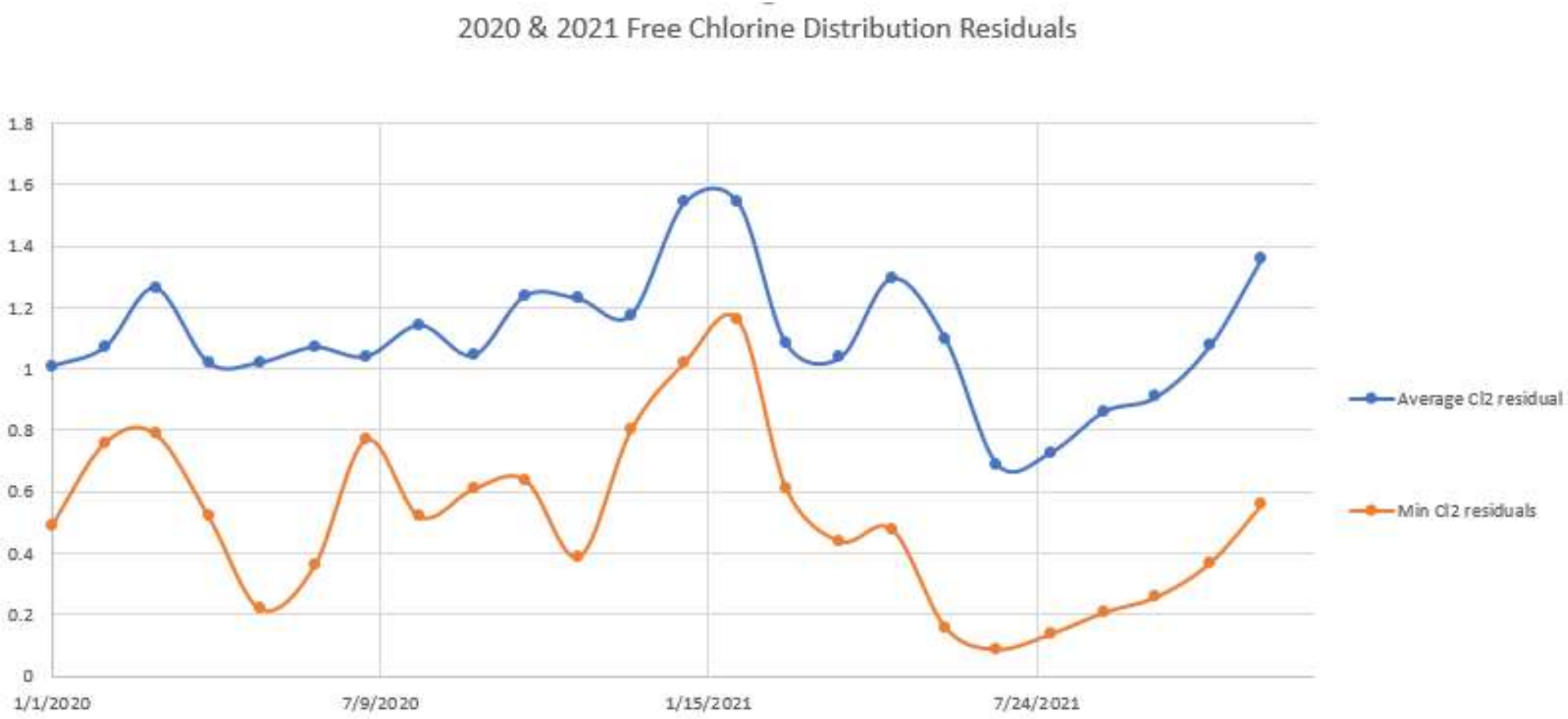
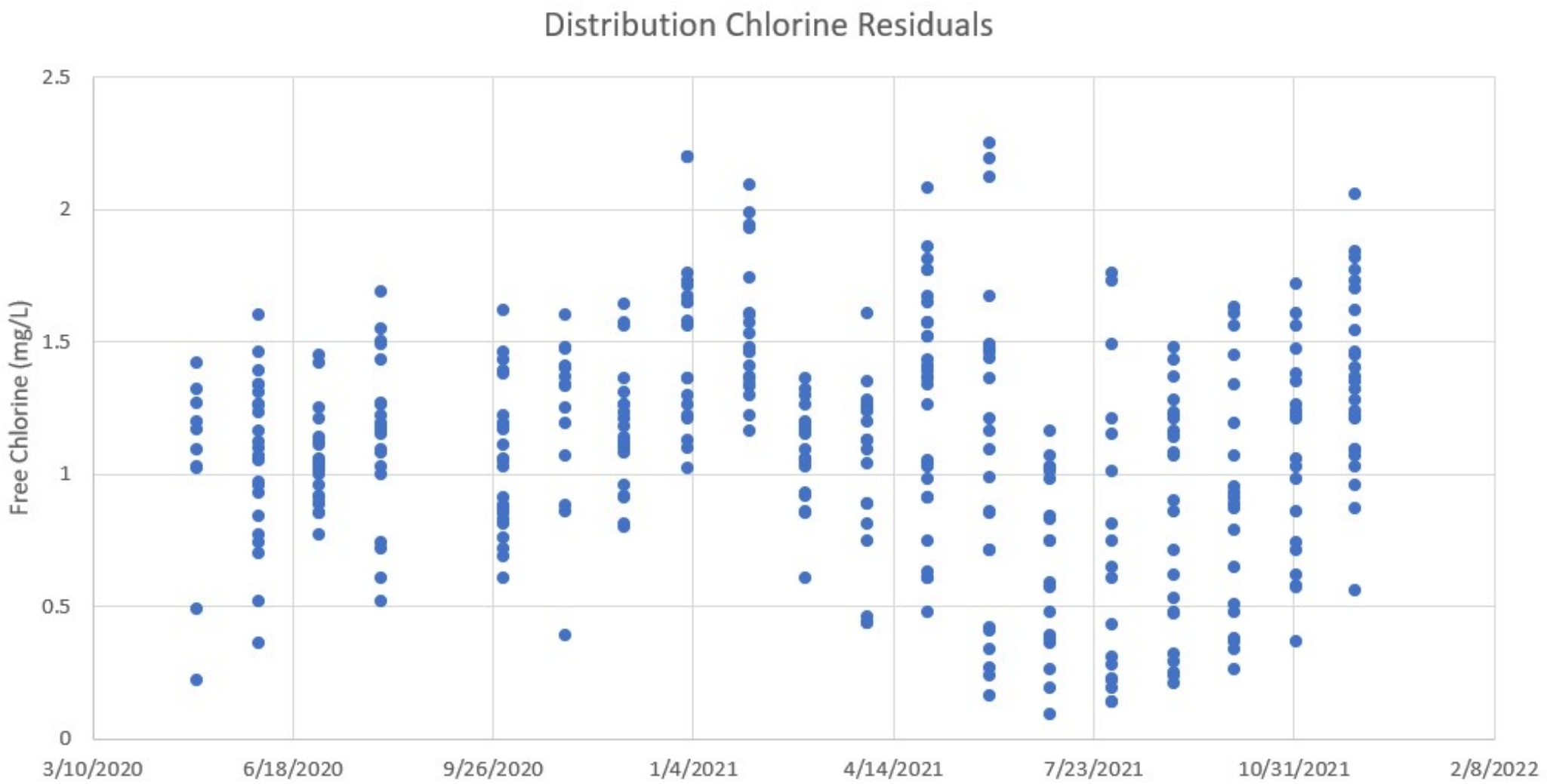

Number of Distribution Samples Per Month
No. Samples
35
30
25
20
15
10
5
0
01-Jan-20
01-Feb-20
01-Mar-20
01-Apr-20
01-May-20
01-Jun-20
01-Jul-20
01-Aug-20
01-Sep-20
01-Oct-20
01-Nov-20
01-Dec-20
01-Jan-21
01-Feb-21
01-Mar-21
01-Apr-21
01-May-21
01-Jun-21
01-Jul-21
01-Aug-21
01-Sep-21
01-Oct-21
01-Nov-21
01-Dec-21
EC - Detected
TC - Detected
TC - nondetect


2020 & 2021 Free Chlorine Distribution Residuals
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1/1/2020
7/9/2020
1/15/2021
7/24/2021
Average Cl2 residual
Min Cl2 residuals

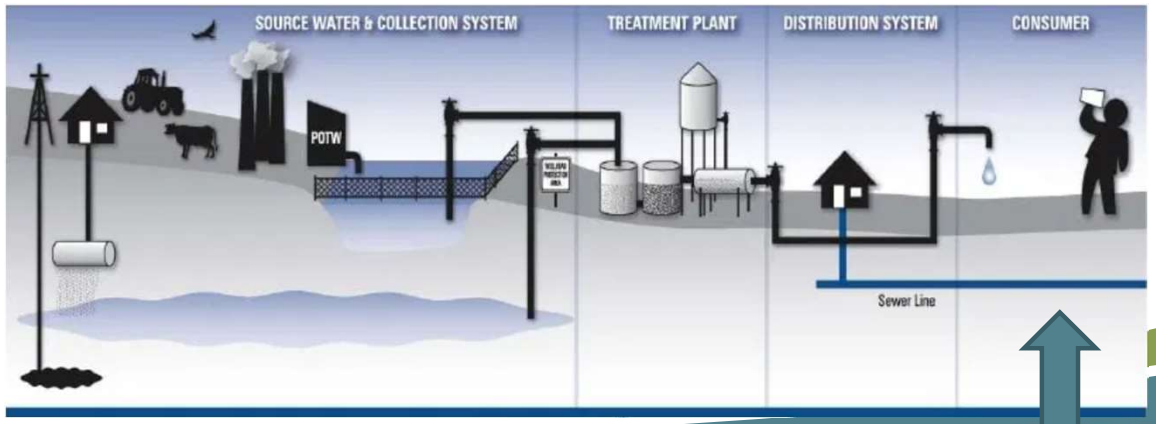

Distribution Chlorine Residuals
Free Chlorine (mg/L)
2.5
2
1.5
1
0.5
0
3/10/2020
6/18/2020
9/26/2020
1/4/2021
4/14/2021
7/23/2021
10/31/2021
2/8/2022

Event Response: Low Chlorine Residuals

- Home sampling investigation led by EPA
- Sporadic locations (8) with no/low chlorine
- EGLE requests spot flushing and chlorine sampling (11/19/21)
- Completed by F&V on 11/22/21 – 12/1/21 (5 dates)

G. Consumer Taps

- **2018: Significant Deficiency** for lack of ***cross connection*** *program* (no inspections, testing, records, education)
  - **Correction: No Action** (pending results of TMF Capacity study)



Area of Concern: Staffing and Oversight

- **2018 Significant Deficiency** for lack of managerial oversight.
  - **Correction**: contracted distribution oversight (FV Ops) in 2019
- **2020 License Revocation** of Operator in Charge by EGLE
  - **Correction**: secured additional contracted operations oversight for WTP as well as distribution
- Current contract for operations oversight lacking

Area of Concern: Financial Status

- **2018 Significant Deficiency** for lack of financial capacity
  - **Correction**: Implemented Rate Increases, Developed rate collection procedure
  - Ongoing, incorporated in TMF Capacity Study

Summary of Multiple Barriers

- Coordinated response to periodic failure of barriers
- Weekly and monthly review of technical operational data
- Long term concern with City's ability to remain in compliance