

# Water quality update for the Millville Elementary School

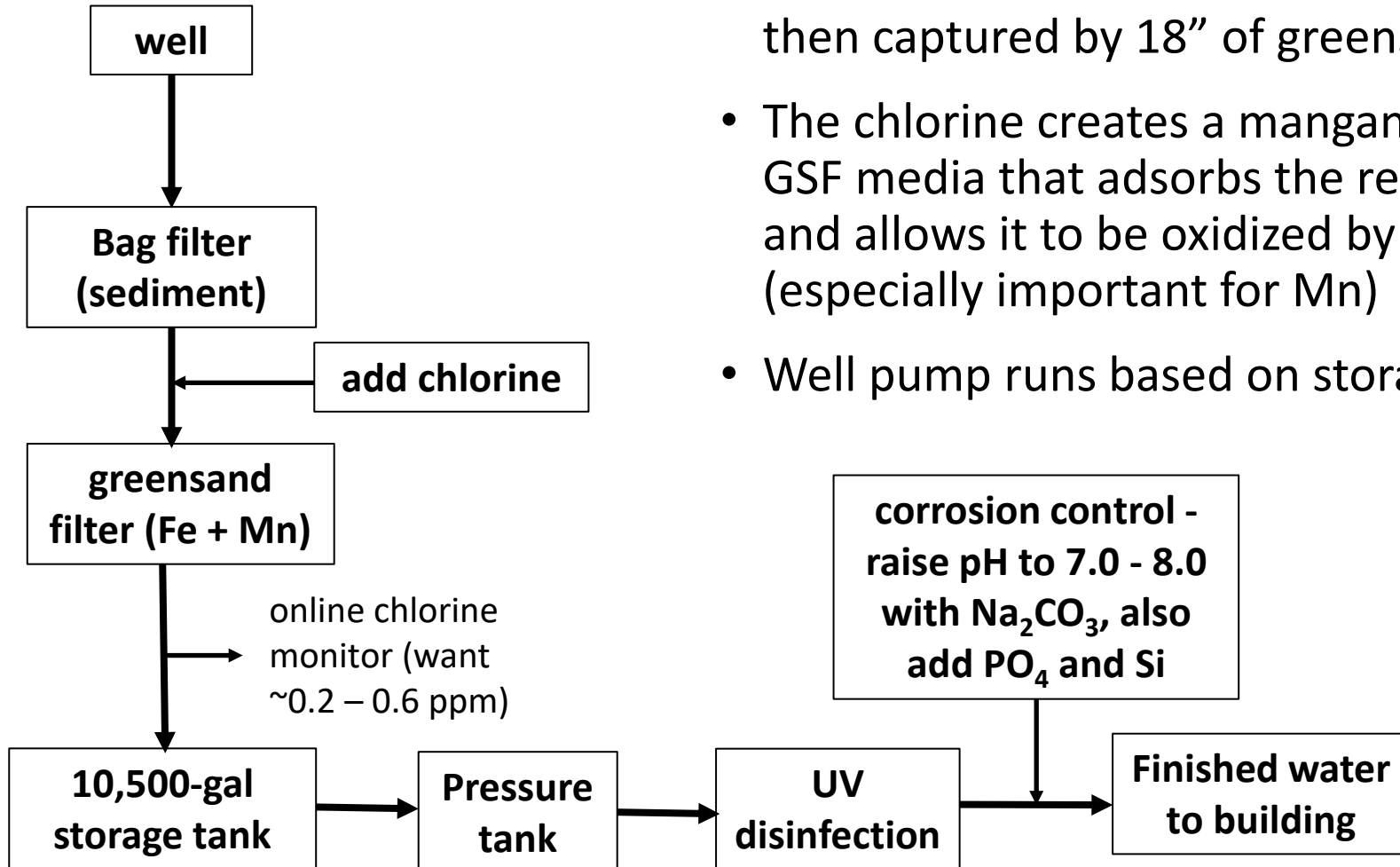
Presented to the Town of Millville Board of Selectmen

December 4, 2023



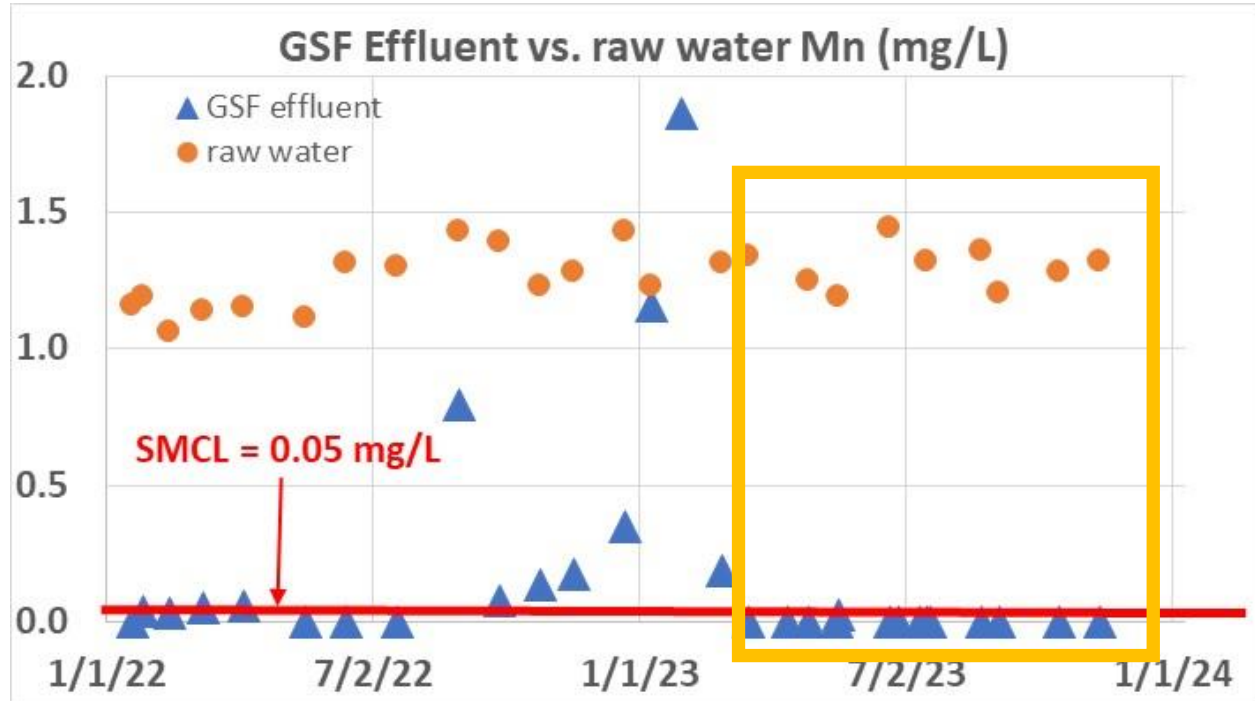
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# Millville Water Treatment System

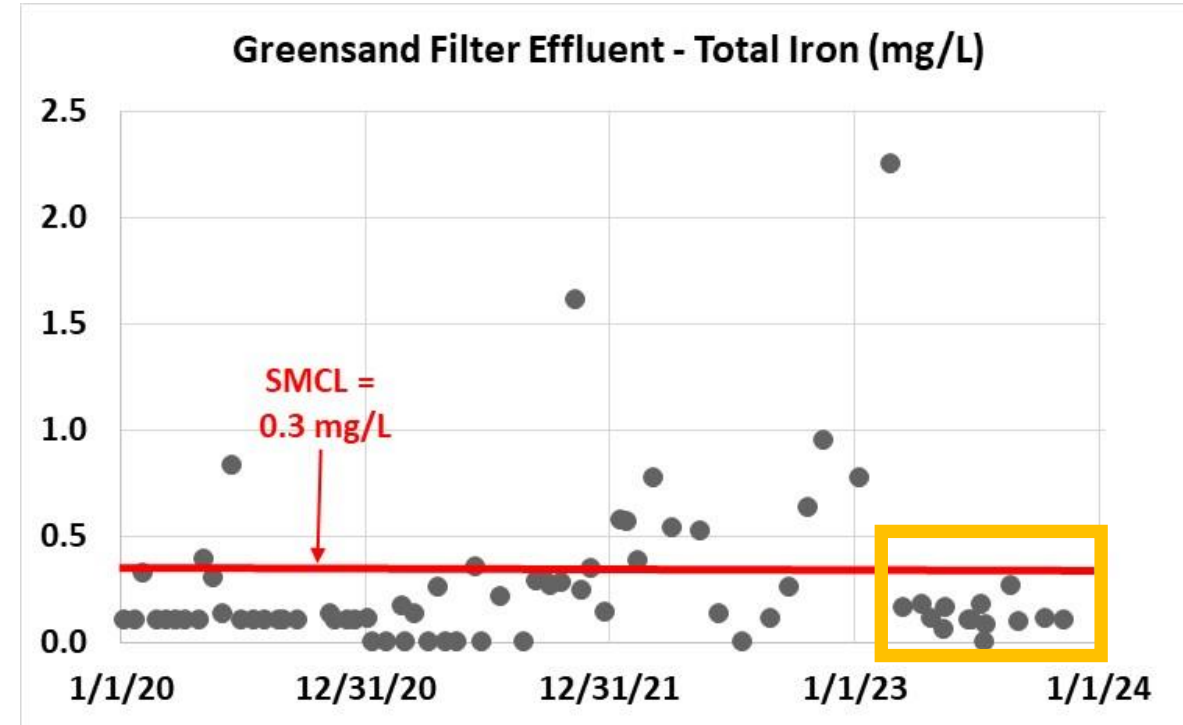


- Chlorine oxidizes most dissolved Fe + some Mn which is then captured by 18" of greensand filter (GSF) media
- The chlorine creates a manganese dioxide coating on the GSF media that adsorbs the remaining dissolved Fe/Mn and allows it to be oxidized by chlorine over time (especially important for Mn)
- Well pump runs based on storage tank levels (at ~6 gpm)
- Chlorine in GSF effluent is monitored continuously. Normally desire a chlorine residual of 0.5 to 1.0 ppm, but lower levels are used at MES to minimize DBPs
- Want [Mn] ≤ 0.015 ppm

# Manganese and iron

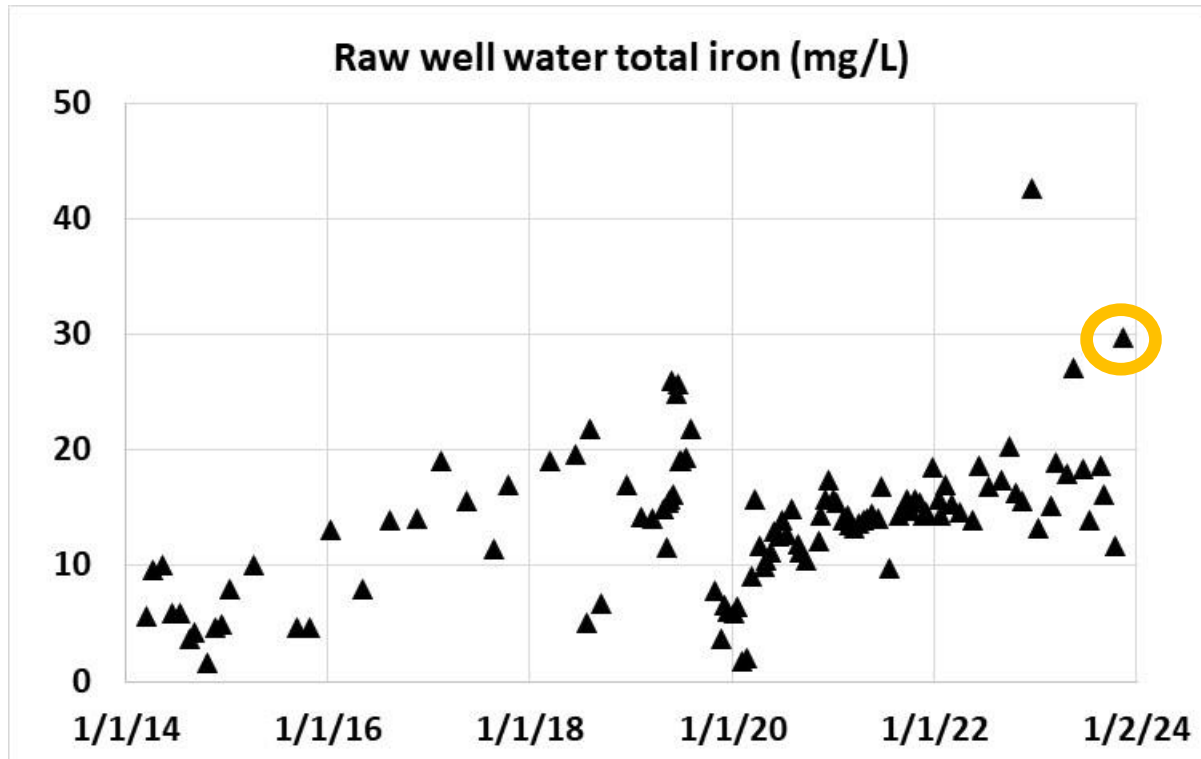


❖ 13 of 14 samples for Mn since Mar. 2023 have been non-detect (< 0.02 mg/L), including all since June



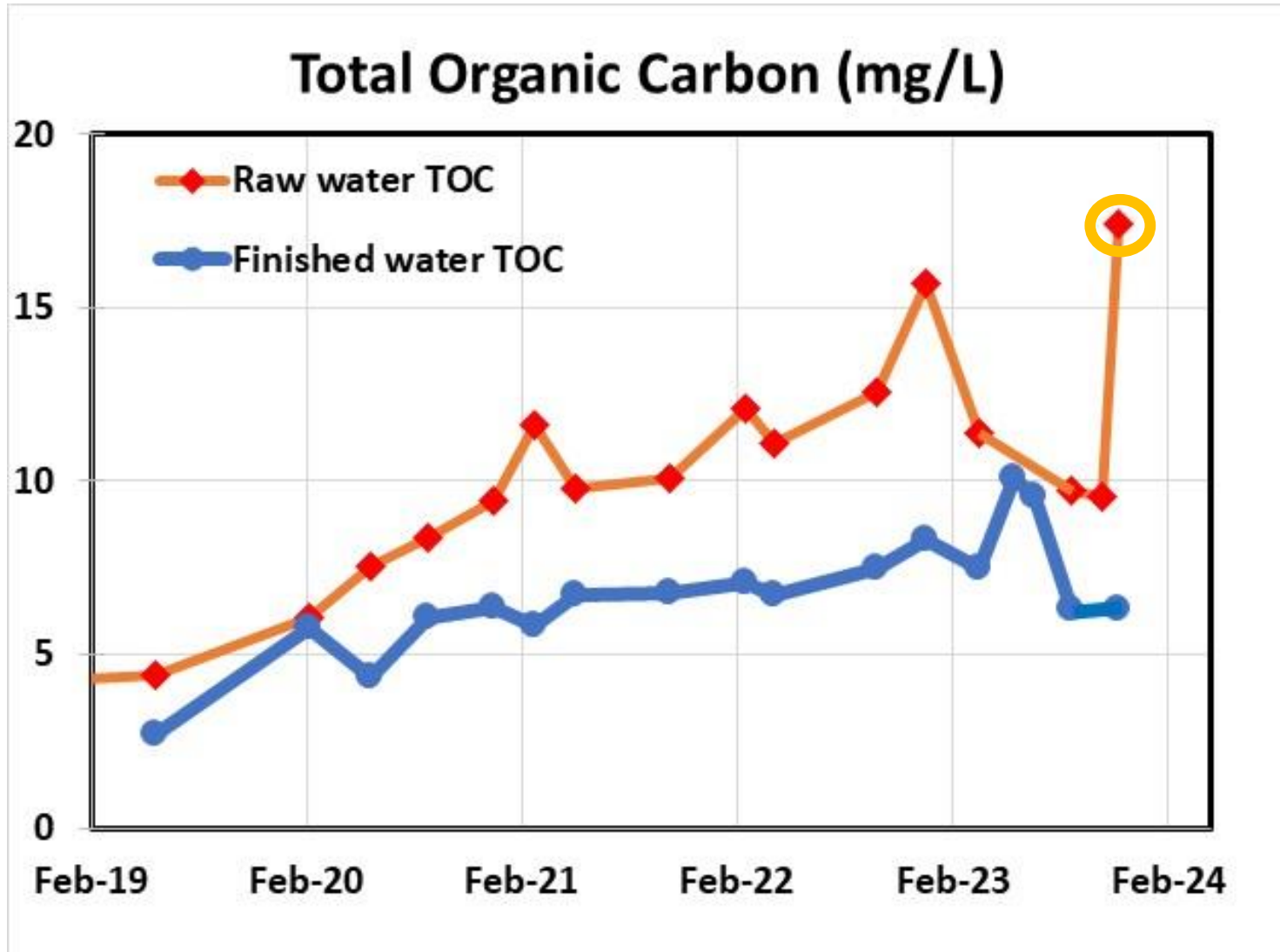
❖ All 14 iron samples since March 2023 have been below the SMCL of 0.3 mg/L

# Iron in raw well water



| Total iron (mg/L)               |                |                           |
|---------------------------------|----------------|---------------------------|
| Date                            | Raw well water | Greensand Filter Effluent |
| 8/24/23                         | 18.7           | 0.26                      |
| 9/5/23                          | 16.2           | 0.10                      |
| 10/16/23                        | 11.7           | 0.11                      |
| 11/13/23                        | 29.8*          | 0.10                      |
| * 2nd highest value in 10 years |                |                           |

# Total Organic Carbon (TOC)



- ❖ *11/13/23 raw water TOC result was highest in years at 17.4 mg/L (maybe the highest ever?)*
- ❖ *TOC is measure of natural organic matter, a precursor to DBPs*

# Haloacetic acids (HAAs)

| 2023 | HAA5 (ppb) |       |
|------|------------|-------|
|      | DBP-1      | DBP-2 |
| Jan  | 23         |       |
| Feb  | 249        |       |
| Mar  | 110        | 115   |
| Apr  | 126        |       |
| May  | 46         | 44    |
| Jun  | 140        |       |
| Jul  | 22         |       |
| Aug  | 31         | 43    |
| Sep  | 18         |       |
| Oct  | 41         |       |
| Nov  | 42         | 42    |

- ❖ *HAA5 violations in recent years resulted in Public Notices*
- ❖ *Compliance sample results in July – November all good for HAA5*
- ❖ *MCL= 60 ppb, based on Locational Running Annual Average (LRAA)*
- ❖ *Site DBP-1 is the bathroom next to room 111, and DBP-2 is Room 322*
- ❖ *Additional experimental data being collected, some with higher results; conclusions to be provided later*

# Haloacetic acids (HAAs)

|                       | HAA5 (ppb; MCL = 60 ppb for LRAA) |        |          |         |          |
|-----------------------|-----------------------------------|--------|----------|---------|----------|
| Site                  | 8/24/23                           | 9/5/23 | 10/25/23 | 11/1/23 | 11/13/23 |
| GSF #1 effluent       | 49                                | 123    |          | 79      | 67       |
| GSF #2 effluent       |                                   |        | 38       |         | 64       |
| storage tank effluent | 49                                |        | 30       | 29      | 30       |
| DBP-1 (near Rm. 111)  | 31                                | 18     | 41       |         | 42       |
| DBP-2 (Rm. 322)       | 43                                |        |          |         | 52       |

- ❖ *Storage tank effluent < GSF effluent*
- ❖ *Storage tank effluent  $\cong$  DBP1 and DBP2*

# Total Trihalomethanes (TTHMs)

| 2023 | TTHM (ppb) |       |
|------|------------|-------|
|      | DBP-1      | DBP-2 |
| Jan  | 14         |       |
| Feb  | 158        |       |
| Mar  | 115        | 113   |
| Apr  | 109        |       |
| May  | 95         | 93    |
| Jun  | 76         |       |
| Jul  | 161        |       |
| Aug  | 97         | 91    |
| Sep  | 113        |       |
| Oct  | 57         |       |
| Nov  | 56         | 60    |

- ❖ *Compliance sample results were better in October and November*
- ❖ *MCL= 80 ppb, based on Locational Running Annual Average (LRAA)*
- ❖ *Site DBP-1 is the bathroom next to Room 111, and DBP-2 is Room 322*

# Total Trihalomethanes (TTHMs)

|                       | TTHM (ppb; MCL = 80 ppb for LRAA) |        |          |         |          |
|-----------------------|-----------------------------------|--------|----------|---------|----------|
| Site                  | 8/24/23                           | 9/5/23 | 10/25/23 | 11/1/23 | 11/13/23 |
| GSF #1 effluent       | 35                                | 55     |          | 48      | 31       |
| GSF #2 effluent       |                                   |        | 27       |         | 40       |
| storage tank effluent | 84                                |        | 49       | 56      | 57       |
| DBP-1 (near Rm. 111)  | 97                                | 113    | 57       |         | 56       |
| DBP-2 (Rm. 322)       | 91                                |        |          |         | 60       |

- ❖ *Storage tank effluent > GSF effluent*
- ❖ *Storage tank effluent  $\cong$  DBP1 and DBP2*

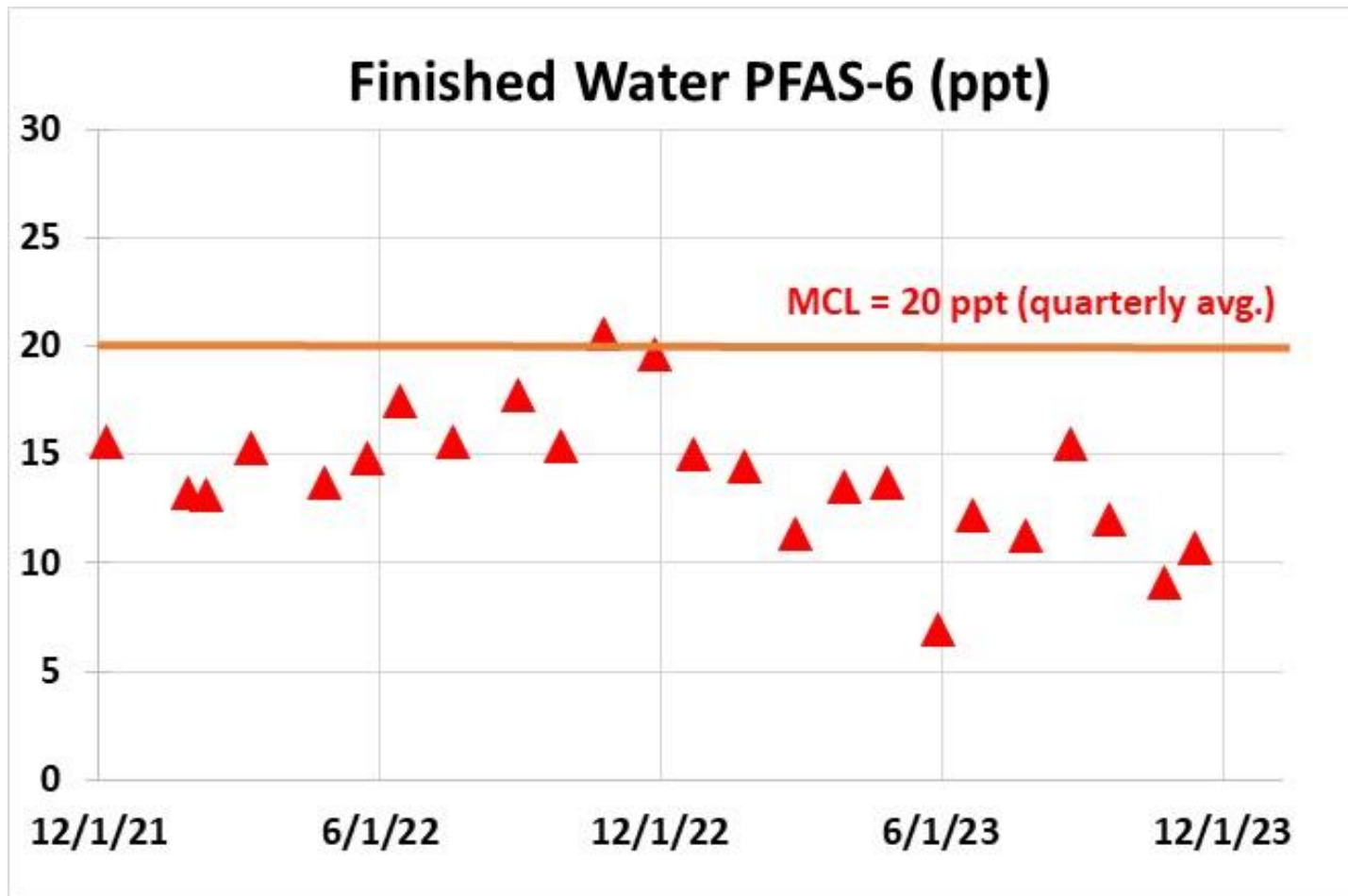
# Worst-case experimental data

|                       | 10/16/23              | 10:33 | 10:48 | 12:38 | 12:59 |
|-----------------------|-----------------------|-------|-------|-------|-------|
| <b>HAA5<br/>(ppb)</b> | GSF #1 effluent       |       |       | 53    |       |
|                       | GSF #2 effluent       | 202   | 90    |       |       |
|                       | storage tank effluent |       |       |       | 61    |
| <b>TTHM<br/>(ppb)</b> | GSF #1 effluent       |       |       | 42    |       |
|                       | GSF #2 effluent       | 131   | 72    |       |       |
|                       | storage tank effluent |       |       |       | 105   |

- ❖ When well pump shut off on 10/13/23 the filters had 2.3 ppm chlorine residual; then no flow for 3 days.
- ❖ 1<sup>st</sup> sample at 10:33 on 10/16/23 was taken 10 minutes after starting well pump/GSFs, so was water that had been sitting above the greensand media on the top of the GSF tank for previous 3 days.



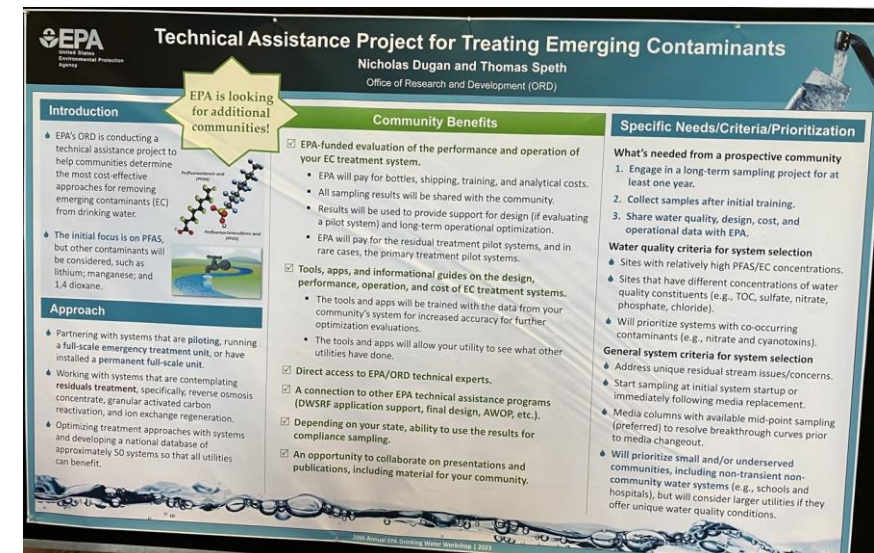
# PFAS-6



- ❖ PFAS = per- and polyfluoroalkyl substances
- ❖ 24 samples with no MCL exceedance
- ❖ Last 12 months averaged 12.2 ppt with maximum 15.0 ppt
- ❖ Most systems are not required to sample monthly
- ❖ PFAS-6 is by far the largest analytical expense for the water system
- ❖ Cost for PFAS-6 analysis is currently \$700/mth for one sample plus a field blank (\$8,400/yr)

# Present status at Millville

- Fe/Mn removal excellent
- HAA5 and TTHM levels good
- Water demand is very low
- Had one day of color in GSF effluent in Oct.; was promptly brought under control
- Changed greensand filter strategy in Oct. and stopped creating much demand; just let the system run as needed and not too much at once
- Considering alternatives for chlorine feed automation and/or remote control
- Thank you to Scott, Matt and Denise at MES for their help
- McClure Engineering expected to start soon for treatment plant assistance
- Millville missed the potential opportunity for USEPA Office of Research & Development to use MES water as a case study on PFAS treatment, which would have helped with DBP reduction also.



# MassDEP

- 2023 Quarter 3 had MCL violations and a Public Notice for excessive HAA5 + TTHM
- 2023 Quarter 4 results:
  - ✓ will have MCL violations and a Public Notice will be required for HAA5 + TTHM
  - ✓ will NOT exceed the OEL (Operational Evaluation Level) for either HAA5 or TTHM at site DBP2
  - ✓ will LIKELY NOT have an OEL exceedance for HAA5 at site DBP1
  - ✓ have a SMALL CHANCE to NOT have an OEL exceedance for TTHM at site DBP1 (need  $\leq 47$  ppb in December, while recent results were 56 ppb)
- MassDEP's + BMRSD's narratives about the water quality remain unfounded
  - Springfield's 7/7/23 Public Notice for a HAA5 violation: *"Customers may continue to use and consume the water as normal."*
  - EPA's Drinking Water Workshop: Small System Challenges and Solutions
- MassDEP informed me via phone that they won't allow Millville to use an operational approach for solving the DBP issue (*"already tried that and failed"*), and that a capital project would be required in an upcoming violation notice. They prefer a pipeline interconnection with a neighboring water system.

*That's All Folks!*