

# CASE STUDY: NITRIFICATION CONTROL PLAN

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**WESTERNBERKS**  
**WATER**



# WESTERN BERKS WATER AUTHORITY

- ▶ WBWA is a bulk wholesaler of high-quality drinking water to numerous municipalities in Berks County.
- ▶ WBWA currently supplies drinking water to 5 public water systems.
- ▶ WBWA conducts all routine monthly, quarterly, and annual testing for each of the 5 PWS that it serves.
- ▶ WBWA maintains water quality data, and files all reports for each of its consecutive systems.

# CONSECUTIVE SYSTEMS

- ▶ The three consecutive systems that we are talking about today range in population from 4,101 to 12,900. These systems are required to collect 6 to 15 coliform samples per month.
- ▶ The consecutive water systems own and operate their distribution systems. WBWA has no control over how these systems are maintained or operated.
- ▶ None of the consecutive systems served have existing facilities to boost chloramine or do any other form of treatment once WBWA water has entered into their system.

# SAMPLE SITE SELECTION PROCESS

# DISTRIBUTION SAMPLE SITE SELECTION

- ▶ Our RTCR sites were our first choice, those sites include areas of high water age, dead ends, low use as specified by that plan.
- ▶ We also added our main storage tank facility
- ▶ In general our 13 sites we chose give us well rounded data from
  - young/new infrastructure
  - old infrastructure
  - residential areas
  - industrial & commercial areas

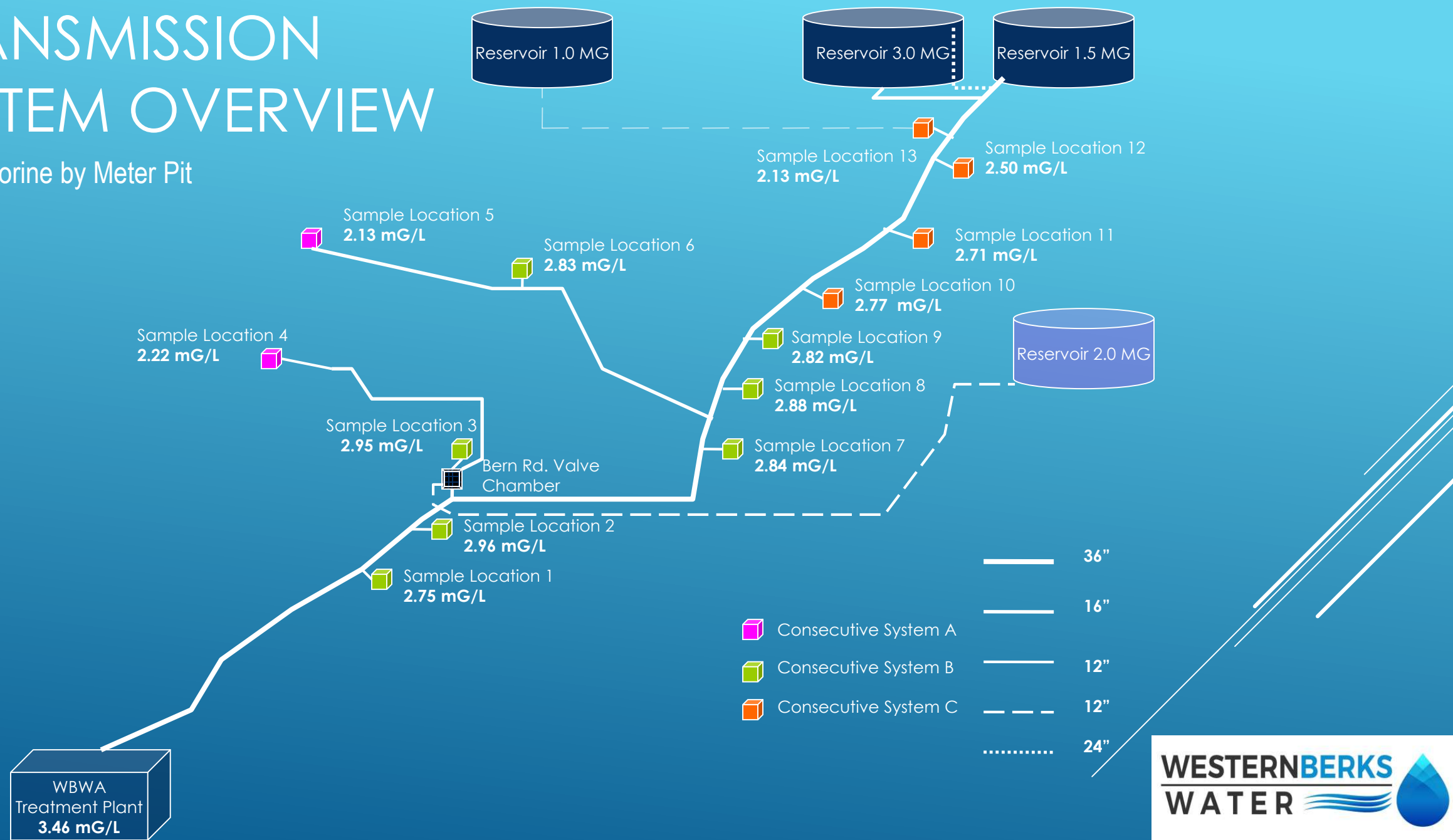
# PLANT SAMPLE SITES

- ▶ **Source Site Sampling:** We measure our source water for free ammonia, nitrite and nitrate.
- ▶ **Entry Point Sampling:** The system entry point is included in the nitrification control plan. In addition to the routine analysis, we conducted a hold study to insure the stability of the Monochloramine residual entering the distribution system.

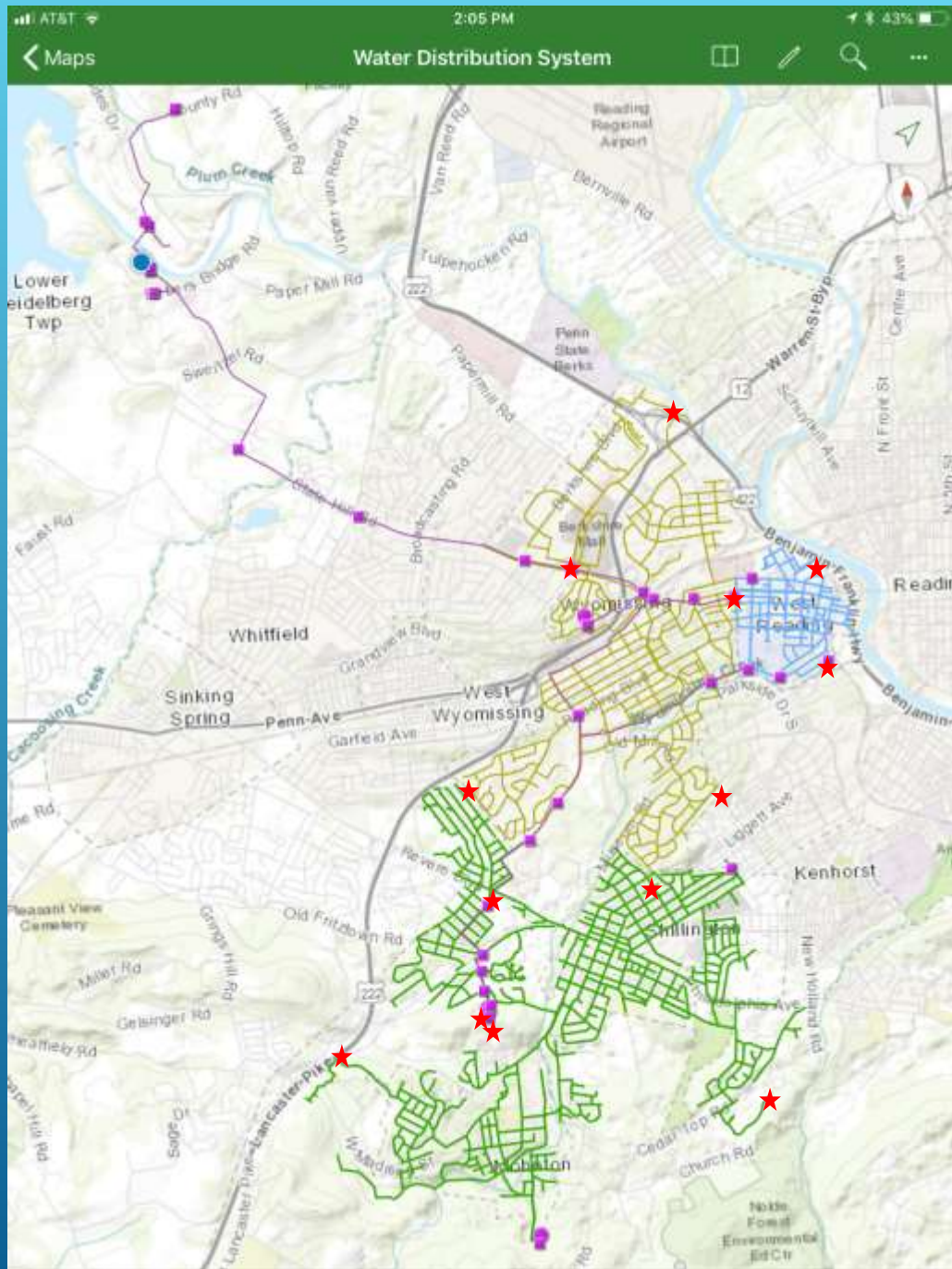
# SAMPLE SITE MAPS

# TRANSMISSION SYSTEM OVERVIEW

Total Chlorine by Meter Pit







# SYSTEM OVERVIEW

Source & Entry Point  
Sample Site



WBWA Transmission



Consecutive System A



Consecutive System B



Consecutive System C



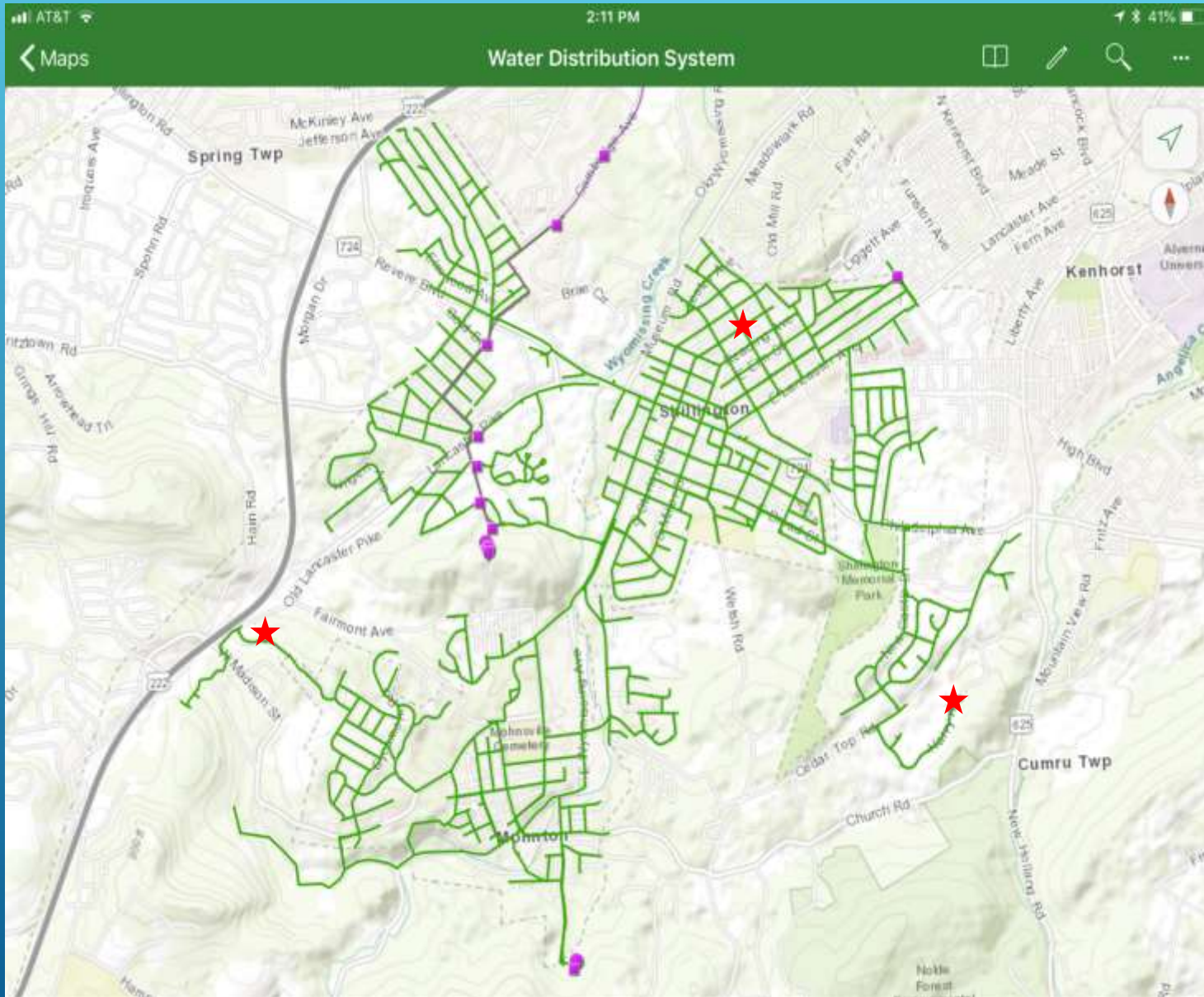
Nitrification Sample Site



# CONSECUTIVE SYSTEM "C" OVERVIEW

High Risk Sample Sites ★

We have selected three sites with High water age and historically low Chlorine levels.



# WATER QUALITY PARAMETERS & SAMPLING SCHEDULES

# SAMPLE ANALYSIS

- ▶ Western Berks has selected six water quality parameters to test for all field samples. These six parameters were selected based on the equipment that we own and the time that we want to spend at each location. Our plan indicates that we will sample each location once per month, if necessary we plan to collect weekly data.

- ▶ Total Chlorine
- ▶ pH
- ▶ Nitrite
- ▶ Monochloramine
- ▶ Free Ammonia
- ▶ Temperature

# DATABASE

Nitrification Control Plan											
Date: 07/11/18											
<b>State Hill and Woodland</b>			<b>West Reading Fire House</b>			<b>Harry Ave</b>			<b>Country Meadows</b>		
Total Cl2			Total Cl2			Total Cl2			Total Cl2		
pH			pH			pH			pH		
Nitrite			Nitrite			Nitrite			Nitrite		
Mono Cl2			Mono Cl2			Mono Cl2			Mono Cl2		
Free NH3			Free NH3			Free NH3			Free NH3		
Temp			Temp			Temp			Temp		
<b>Gold St</b>			<b>West Reading Borough Garage</b>			<b>Waverly St</b>			<b>Farr Road</b>		
Total Cl2			Total Cl2			Total Cl2			Total Cl2		
pH			pH			pH			pH		
Nitrite			Nitrite			Nitrite			Nitrite		
Mono Cl2			Mono Cl2			Mono Cl2			Mono Cl2		
Free NH3			Free NH3			Free NH3			Free NH3		
Temp			Temp			Temp			Temp		
<b>Cherry St</b>			<b>Grings Hill Meter Pit</b>			<b>Sturbridge Ct</b>					
Total Cl2			Total Cl2			Total Cl2					
pH			pH			pH					
Nitrite			Nitrite			Nitrite					
Mono Cl2			Mono Cl2			Mono Cl2					
Free NH3			Free NH3			Free NH3					
Temp			Temp			Temp					
<b>Sugarloaf 1.5 MG</b>			<b>Sugarload 3.0 MG</b>								
Total Cl2			Total Cl2								
pH			pH								
Nitrite			Nitrite								
Mono Cl2			Mono Cl2								
Free NH3			Free NH3								
Temp			Temp								

# TOOLS WE USE

- ▶ Hach SL1000
- ▶ Hach DR 900

Total cl<sub>2</sub>

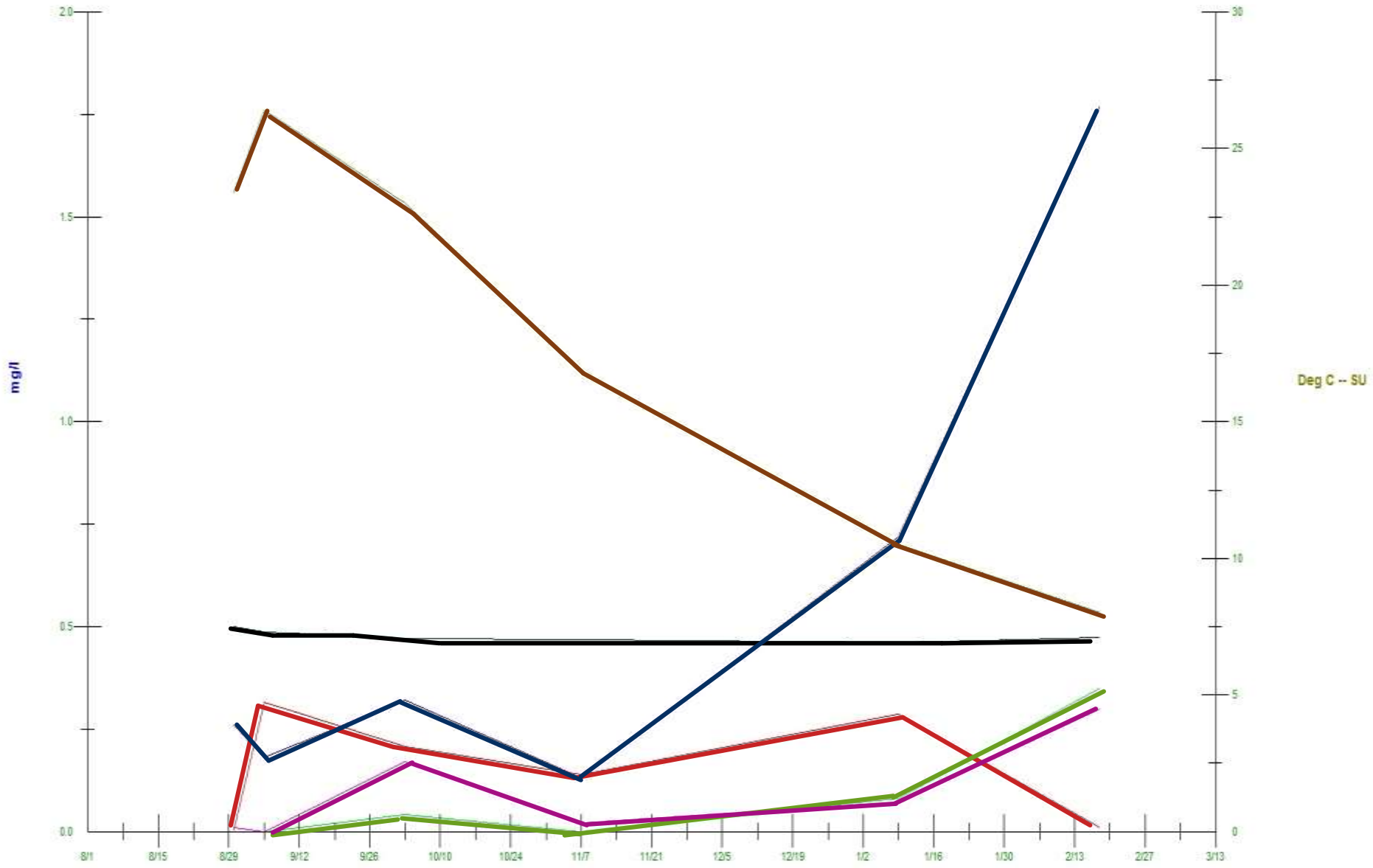
Nitrite

Mono Chloramine

Free Ammonia

PH & Temperature

Data Over Time



Date ( 8/1/2018 to 2/28/2019 )

WMS (Western Berks Water Authority)

KEY

- Total Cl<sub>2</sub>
- Temp C<sup>0</sup>
- pH
- Mono
- Free NH<sub>3</sub>
- Nitrite



# GOALS, BASELINES, AND TRIGGER LEVELS

- ▶ WBWA is still in the process of collecting baseline data
- ▶ There is currently no secondary treatment in WBWA's transmission system or any of the consecutive systems
- ▶ The only tool currently available is to flush



# GOALS/BASELINES

- ▶ Nitrification is controlled by defining what “normal” is and looking for trends that are “abnormal.” Therefore, initial data must be analyzed to define normal levels,
- ▶ Goals and Baselines are the normal, good levels at each point in the sample plan.
  - ▶ **GOALS** are set for total chlorine, Monochloramine, and free ammonia to make sure that disinfection treatment is operated correctly.
  - ▶ **BASELINES** are set for nitrite and nitrate because they come from source water and are not under a system’s control. Initial results will be used to set goals and baselines.
- ▶ Ongoing, routine sampling will be used to detect potential nitrification and take appropriate action.

# TRIGGER LEVELS

- ▶ **“ALERT” TRIGGER**—Somewhat out of the norm, indicating that nitrification may have started. Some action to get back to normal is needed, but it is probably a routine type of action like flushing.
- ▶ **“ALARM” TRIGGER**—When it becomes difficult to maintain a compliant total chlorine residual, and there is a strong possibility that nitrification is the culprit. If routine actions don’t get the system back to normal, more intense action will be needed.

# PLANNED CORRECTIVE ACTIONS

- ▶ Optimize our Chloramination process
- ▶ Reduce water age
  - ▶ Rotate reservoirs out of service
- ▶ Work with our consecutive systems to implement a progressive flushing program
- ▶ Replace aging infrastructure
- ▶ Add chlorine booster systems
- ▶ Loop main
- ▶ pH adjustment
- ▶ **MONITOR FOR NITRIFICATION REGULARLY**

# QUESTIONS

▶ **Thank You!**