WESTERN BERKS WATER AUTHORITY

- WBWA is a bulk wholesaler of high-quality drinking water to numerous municipalities in Berks County.
- WBWA is the primary source of drinking water for 5 PWS and the standby emergency connection for 2 large PWS in the area.
- WBWA conducts all routine monthly, quarterly, and annual testing for each of the 5 PWS that it serves. This allows WBWA to see all the water quality data for each of its consecutive systems, and make adjustments at the treatment plant and to make informed recommendations about distribution system management.
The three consecutive systems that I have selected to present today range in population from 4,101 to 12,900. These systems are required to collect 5 to 10 coliform samples per month.

Like many small and medium systems, the employees for the PWSs served wear many hats and do not have dedicated full-time staff to focus on their individual water systems. These systems look to WBWA for guidance on water quality issues and concerns as they arise.

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.
The Disinfection Requirements Rule published April 28, 2018

The requirements of the DRR fall into two categories: provisions that are effective immediately and provisions that have delayed implementation dates.

- **Minimum disinfectant residual concentration in distribution from 0.02 to 0.2 mg/L.**
- Reporting individual chlorine results vs. average system results
- Minimum disinfectant residual concentration at entry point from 0.2 to 0.20 mg/L.
- Calculate and **REPORT** Giardia log (%) inactivation at least once/daily during the hour of expected peak flow.
- Develop DRR sampling plan—this plan will require distribution chlorine sampling to be conducted 52 weeks/year
- **Method 334.0**—Operators (and their equipment) conducting compliance sampling for free or total chlorine need to be certified and compliant with the method.
- Develop and implement a nitrification control plan.
NITRIFICATION PLAN BACKGROUND

By April 29, 2019 all chloraminated public water systems must develop and implement a nitrification control plan. The plan must conform to industry standards (such as AWWA’s M56 Manual on Nitrification) and contain a system-specific monitoring plan and a response plan with expected water quality ranges and action levels. The plan must be updated as necessary, retained on site, and made available to DEP upon request.
Disinfection Requirements Rule (DRR) was published as a final regulation on April 28, 2018. (Follow-up Letter Dated May 11, 2018)

- All chloraminated water system

Develop and implement a nitrification control plan that conforms to industry standards and contain a system-specific monitoring plan and a response plan.

- Source Water, Entry Point, Distribution system and Storage facilities

- By April 29, 2019

- Consultants? DEP templates? D.I.Y.?
1 HOW—HOW DO WE DO THIS?

- The mandate that all chloraminated public water systems develop and implement a nitrification control plan was a concern. Primarily because it was something that we had not been focusing on and really didn’t have a strong understanding of what was going on in our consecutive systems.

- **Consultant**—Our first attempt was to contact a consultant. We wanted them to develop a Nitrification Control Plan and help our utility implement it. This is an uncommon request and the firm, although highly qualified, had never done one. The cost of the plan was too high.

- **DEP**—We reached out the DEP Operator Outreach to see what they recommended for our utility. We were told that there was no template for the Nitrification Control Plan and they were not going to tell us how to develop a plan because they had not received any information or training on how to best develop a Nitrification Control Plan. Our best bet was AWWA Manual M56 Nitrification Prevention and Control in Drinking Water, 2nd Edition

- **D.I.Y.**—We decided to go out on our own, purchase the AWWA manual M56 and develop our own plan. Hopefully the information that we cover today will help you and your system create your own Nitrification Control Plan.
DRR’S IMPACT TO WBWA’S CONSECUTIVE SYSTEMS
CONSECUTIVE SYSTEM “A”

- Population 4,101 to 4,900 (5 required monthly samples)
- Last 36 SDWA-S reports:
  - 0.66 mG/L minimum
  - 2.14 mG/L maximum
  - 1.41 mG/L average
- Under old regulations: 0 samples under 0.02, 0 Total Coliform, 0 E. coli.
- Under new regulations: 11 Tier II violations with public notification
CONSECUTIVE SYSTEM “B”

- Population 7,601 to 8,500 (9 required monthly samples)
- Last 36 SDWA-S reports:
  - 1.49 mG/L minimum
  - 2.55 mG/L maximum
  - 2.03mG/L average
- Under current regulations: 0 samples under 0.02, 0 Total Coliform, 0 E.coli.
- Under proposed regulations: 8 Tier II violations with public notification
CONSECUTIVE SYSTEM “C”

- Population 8,501 to 12,900 (10 required monthly samples)
- Last 36 SDWA-S reports:
  - 0.54 mG/L minimum
  - 2.43 mG/L maximum
  - 1.11 mG/L average
- Under old regulations: 0 samples under 0.02, 1 Total Coliform (All check samples clean), 0 E. coli.
- Under new DRR regulations: 50 Tier II violations with public notification
WHAT NEEDS TO HAPPEN TO SUCCESSFULLY DEVELOP A PLAN?

1. Sample site selection,
2. Sample site map,
3. Water quality parameters,
4. Sample schedules,
5. Site-specific goals, baselines, and trigger levels,
6. Corrective Actions
SAMPLE SITE SELECTION PROCESS
Source Sites: Every PWS must be able to measure its source water. Source water can contain free ammonia, nitrite and nitrate. A system with different sources may encounter different levels at each source.

Entry Point: The system entry point should be included in the nitrification control plan. In addition to the routine analysis, a hold study should be conducted to insure the stability of the Monochloramine residual entering the distribution system.
**DISTRIBUTION SAMPLE SITE SELECTION**

- **The Good, The Bad and the Ugly:** Sample sites must be representative of the entire distribution system. You need to select sites that represent the range of water age, treatment, and sources in your system.

- **Existing sample sites for RTCR and DBP can be used as Nitrification sample locations.**

- **Average Water Condition Sites:** Sample locations within your distribution system that represent average conditions. Select enough of these sites so that the data can be used to compare other site data.

- **High Risk Condition Sites:** Sample locations with the highest risk of having a nitrification event. These sites include:
  - Dead end,
  - Under-used areas,
  - Maximum water age,
  - Older sections of water main that contain iron pipe and
  - Storage tanks.
SAMPLE SITE MAPS
TRANSMISSION SYSTEM OVERVIEW

Total Chlorine by Meter Pit

WBWA Treatment Plant 3.46 mg/L

Reservoir 1.0 MG

Sample Location 1
2.75 mg/L

Sample Location 2
2.96 mg/L

Bern Rd. Valve Chamber

Sample Location 3
2.95 mg/L

Sample Location 4
2.22 mg/L

Sample Location 5
2.13 mg/L

Sample Location 6
2.83 mg/L

Reservoir 1.5 MG

Sample Location 7
2.84 mg/L

Sample Location 8
2.88 mg/L

Sample Location 9
2.82 mg/L

Sample Location 10
2.77 mg/L

Reservoir 2.0 MG

Sample Location 11
2.71 mg/L

Sample Location 12
2.50 mg/L

Sample Location 13
2.13 mg/L

Consecutive System A
12"

Consecutive System B
12"

Consecutive System C
36"

16"

24"
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
Western Berks has selected seven water quality parameters to test for all field samples. These seven parameters were selected based on the equipment that we own and the time that we want to spend at each location.

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

We have recently started to use a new device to help detect anything living in the water.
The nitrite and nitrate baselines are the concentrations in the source water.

The nitrite and nitrate in the distribution system should always be the same as the source water. **The only thing that can change them is nitrification, cross connection, or source water changes.**
FREQUENCY

- Initially, the frequency of sampling should be at least weekly for the first six months. This is done to create a baseline of data.
- After your initial six month and your data begins to accumulate, sampling events can be spaced out to a once a month.
- WBWA will employ a hybrid approach that will move sample events to monthly sampling through the winter and spring and then transition back to weekly sampling events through the summer and fall.
SITE-SPECIFIC GOALS, BASELINES, AND TRIGGER LEVELS
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.
CORRECTIVE ACTIONS

- Optimize your Chloramination process
- Reduce water age
  - Rotate reservoirs out of service
- Hard flush or mechanically pig your distribution system
- Check system valves to make sure that they are set correctly
- Replace aging infrastructure
- Conduct Free Chlorine Burn
- Add chlorine booster systems
- Loop main
- pH adjustment
- **MONITOR FOR NITRIFICATION REGULARLY**
QUESTIONS

► Thank You!