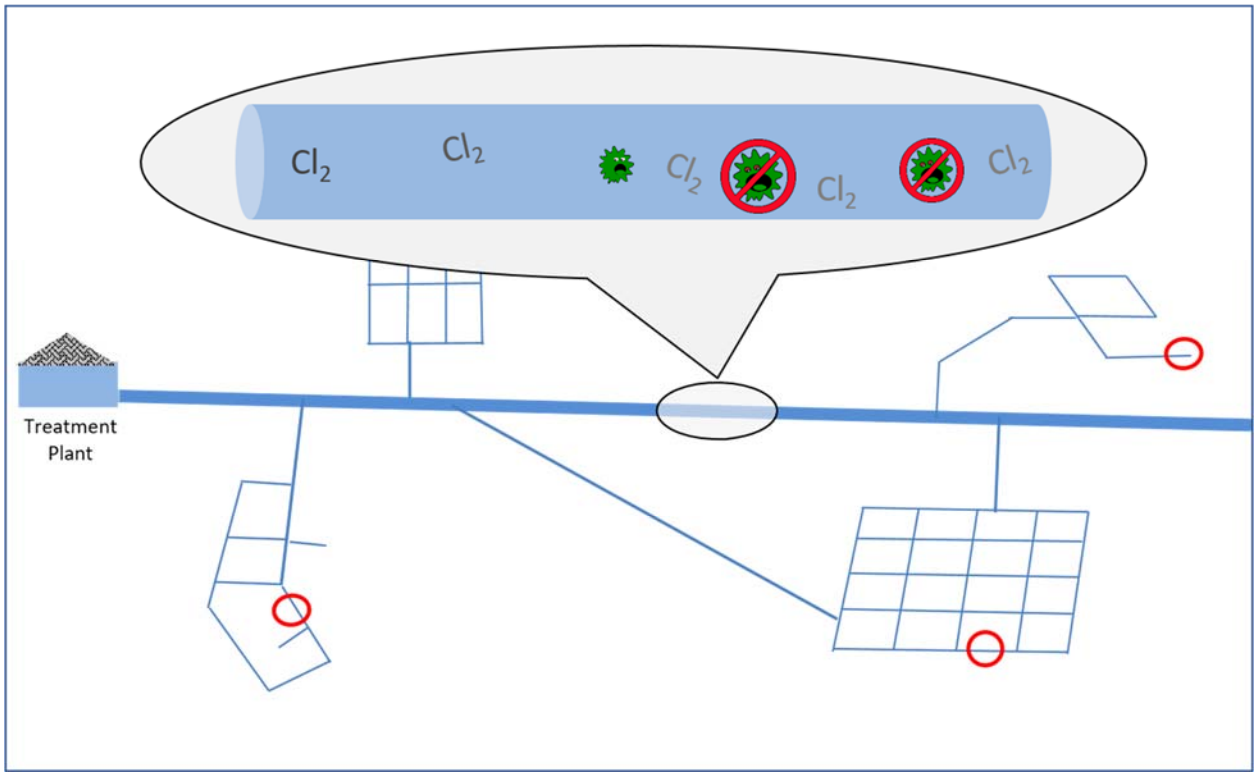
Disinfection Requirements Rule

Operator Training



Bureau of Safe Drinking Water

2019

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Disinfection Requirements Rule (DRR)

Operator Training

Contents

Appendices

Lesson 1: DRR Background

Introduction

Objectives:

After this lesson, you will be able to:

- Explain why the disinfectant residual requirements are changing
- Describe the basis for the Disinfection Requirements Rule
- Identify the rule basics

Who is affected by the DRR?

The DRR applies to:

- All **Community Water Systems**
- All **Non-Transient Noncommunity Water Systems** using chlorine disinfectant
- **Transient Noncommunity Water Systems** with:
  - Filtration of a surface water source
  - Filtration of a GUDI (Groundwater Under the Influence of Surface Water) source
  - 4-Log disinfection of a groundwater source

Background: Distribution Disinfectant Residual

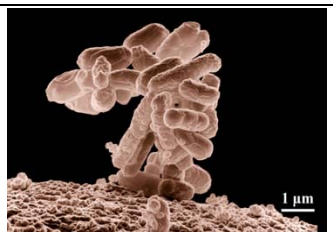
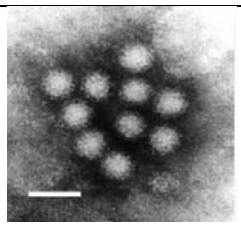
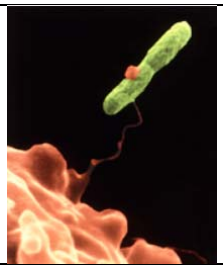
Beginning April 29, 2019, the minimum required distribution residual level will increase from 0.02 to 0.2 mg/L (free or total chlorine depending on the type of disinfectant used).

The distribution system presents many challenges:

- Finished water can undergo substantial changes due to physical, chemical, and biological reactions in the distribution system.
- To make matters worse, as distribution systems age, deterioration can occur allowing organic matter and microbial contamination. For example:
  - Corrosion
  - Erosion of pipe materials
  - Eventual water main breaks
  - Other areas of intrusion create pathways of contamination

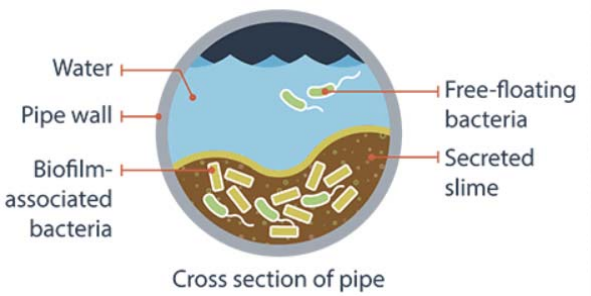
Many different microbes can survive in the distribution system:

- Bacteria
- Viruses
- Protozoa
- Amoeba

		
Cluster of *E. Coli* Electron micrograph from Eric Erbe, digital colorization by Christopher Pooley, both of USDA, ARS, EMU	**Norwalk Virus** Photo taken by EPA; Transmission electron micrograph of viruses; white bar = 50 nm	**A *Legionella pneumophilia* bacterium caught by an amoeba** Electron micrograph from CDC/ Dr. Barry S. Fields

Some microbes produce **biofilms** in the distribution system:

- Biofilms can trap other material, organisms and contaminants
- Under various circumstances, biofilms can release trapped contaminants (slow release mechanism)



There are several factors that that influence pathogen survival and growth in the distribution system, including:

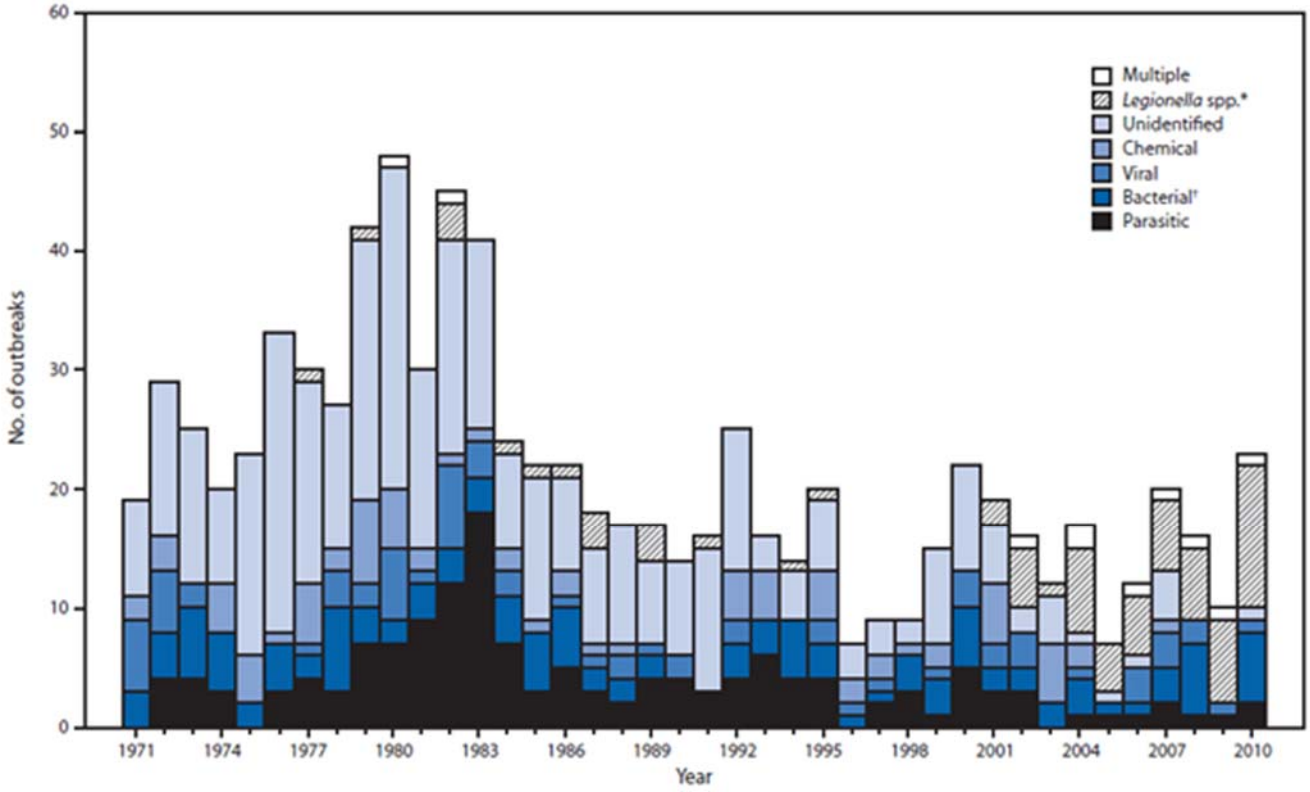
- Water chemistry (temperature, pH, etc.)
- Presence of nutrients
- System hydraulics
- Sediment accumulation
- **Presence (or absence) of disinfectant residual**

Maintenance of an adequate residual:

1. Prevent or limits regrowth of microorganisms in the distribution system
2. Inactivates microorganisms that may enter the system through:
   - cross-connections
   - main breaks
   - zero or negative pressure situations

We still have a problem:

Despite advances in water treatment and management, waterborne disease outbreaks continue to occur in the United States.



This graph was created by the Center for Disease Control and Prevention (CDC) and it shows water waterborne outbreaks in the US and what they are attributed to. You can see that Legionella is highly prevalent, which is a distribution system problem.

CDC also determined that the large proportion (78%) of illnesses observed in outbreaks involved distribution system deficiencies.

Pennsylvania follows a similar trend to the national numbers.

- Nearly all outbreaks since 2010 have been associated with distribution system deficiencies and Legionella
- In 2017, there were 90 *E. Coli* MCL violations at 79 different public water systems. *E. coli* violations are predominantly tied to distribution system issues.

The distribution system is the remaining component of public water systems yet to be adequately addressed in efforts eliminate waterborne disease outbreaks.

Establishing the New Distribution Residual Requirement

Pennsylvania sought to establish a residual requirement that is truly detectable and controls microbial growth.

First, the truly detectable residual level had to be established. It was determined that the previous 0.02 mg/L was not truly detectable. In other words, analyzers cannot accurately read that low.

What is a truly detectable residual?

To begin, DEP reviewed several studies to determine the true lower detection limit. Examples:

- Pressman and Wahman (2014 and 2015) reported that free chlorine and inorganic chloramines may react with dissolved organic nitrogen to form organic chloramines. Organic chloramines are problematic because they interfere with analytical methods and are poor disinfectants (that is, show little or no bactericidal activity). When total chlorine residuals are very low, between ''detectable'' and around 0.2 mg Cl_2/L, there may be little to no active disinfectant (that is, inorganic monochloramine) actually present.
- The Colorado Department of Public Health and Environment (CDPHE) conducted a study to determine the detection limit for free chlorine using hand-held DPD devices in a field setting. The study included analyzing data from over 450 samples that were collected from 15 public water systems from across the state. The study findings showed a detection limit of 0.09 mg/L (99% confidence) (CDPHE, 2014).

According to Hach Company© (Primer, 2015), a leading manufacturer of chlorine residual monitoring devices, the Method Limit (ML) used by the EPA to approve Hach's Free and Total Chlorine Residual Methods was 0.1 mg/L Cl. The Method Limit (ML), also known as the practical quantitation limit, is the lowest achievable quantifiable limit at a 95% confidence level. So, in other words, the lowest achievable quantifiable limit is 0.1 mg/L.

In addition, all chlorine residual test methods are subject to interferences from inorganic and organic constituents such as iron, manganese, other oxidants and disinfection byproducts, and organic chloramines. These interferences can cause false positive results (Hach Company©, 2013).

Based on these studies and reports, and the prevalence of iron, manganese and other constituents of concern in raw and finished waters in this Commonwealth, the Department believes that the true detectable residual is likely somewhere between 0.1—0.2 mg/L.

What is an adequate residual for the control of microbial growth?

DEP reviewed and considered:

- Numerous studies
- Industry standards
- Other states' disinfection residual requirements

Review of Studies:

Studies that were used to support the regulatory limit of 0.2 mg/L at the entry point include the following:

- LeChevallier, et al. (1996, 2007 and 2014) conducted an 18-month survey of 31 water systems in North America to determine the factors that contribute to the occurrence of coliform bacteria in drinking water. The study found that systems that maintained dead-end free chlorine levels of < 0.2 mg/L or monochloramine levels of < 0.5 mg/L had substantially more coliform occurrences than systems that maintained higher disinfectant residuals.
- Research also showed data from a utility in Utah that experienced occurrences of total coliform bacteria and *E. coli* when free chlorine residuals in its distribution system averaged only 0.1 mg/L. Coliform occurrences were controlled by increasing the free chlorine concentration > 0.2 mg/L. The study concluded that the occurrence of coliform bacteria within a distribution system is dependent upon a complex interaction of chemical, physical, operational and engineering parameters.
- The CDPHE conducted a study to review total coliform and *E. coli* occurrence data. The study showed a relationship between chlorine residuals and occurrence. There was a higher rate of occurrence of both contaminants as the chlorine residual decreased. Specifically, the CDPHE found the following:

Coliform Bacteria and Residual Chlorine Data (July 1, 2011—November 15, 2013)			
	Samples Received	**Number of TC+**	**% of Positives**
< 0.1 mg/L	3,357	102	3.0%
<0.2 mg/L	7,805	160	2.0%
≥0.2 mg/L	83,433	462	0.55%
Totals	91,238	622	0.7%

Regarding *E. coli*, the CDPHE found that ~ 48% of all *E. coli* positive results occurred when disinfectant residuals were < 0.2 mg/L (CDPHE, 2014).

Review of other State data

Nineteen other states have disinfectant residual requirements that are ≥0.2 mg/L. Summarized in the following table:

State	**Minimum Distribution System Residual (mg/L)**
Alabama*	0.2 (free), 0.5 (total)
Colorado*	0.2 (free or total)
Delaware	0.3 (free)
Florida*	0.2 (free), 0.6 (total)
Georgia	0.2 (free)
Illinois*	0.2 (free), 0.5 (total)
Indiana	0.2 (free), 0.5 (total)
Iowa	0.3 (free), 1.5 (total)
Kansas*	0.2 (free), 1.0 (total)
Kentucky*	0.2 (free), 0.5 (total)
Louisiana*	0.5 (free or total)

Missouri	0.2 (total)
Nebraska	Surface water: 0.2 (free), 0.25 or 0.5 (total); Groundwater:0.1 (free)
North Carolina*	0.2 (free), 1.0 (total)
Ohio*	0.2 (free), 1.0 (total)
Oklahoma	0.2 (free), 1.0 (total)
Tennessee*	0.2 (free)
Texas*	0.2 (free), 0.5 (total)
West Virginia*	0.2 (total)
* States with mandatory disinfection	

Review of Industry standards

- The 2012 edition of *The Great Lakes-Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers* (**Ten States Standards)** specifies that the minimum free chlorine residual in water distribution systems should be 0.2 mg/L. The minimum chloramine residual, where chloramination is practiced, should be 1.0 mg/L at distant points in the distribution system.
- The **Water Research Foundation** (WRF) recommends a free chlorine residual of 0.20 mg/L and a total chlorine residual of 0.50 mg/L for an optimized distribution system (Water Research Foundation, 2010, Criteria for Optimized Distribution Systems).
- Both the EPA and the Department have developed Area Wide Optimization Programs for Distribution Systems and recommend maintenance of residuals ≥0.20 mg/L free chlorine at all locations in the distribution system at all times. In addition, the EPA recommends maintenance of residuals ≥1.50 mg/L monochloramine at all locations in the distribution system at all times to provide a disinfection barrier against both microbial contamination and nitrification prevention.
    - The goal of the Distribution System Optimization Program is to sustain the water quality leaving the plant throughout all points in the distribution system. To further define distribution system optimization, ''optimization'' refers to improving drinking water quality to enhance public health protection without significant capital improvements to the water treatment plant or distribution system infrastructure.

Based on all this information and industry input, PA established a distribution residual requirement of ≥0.2 mg/L.

DRR Basics

The DRR establishes:

- Sample siting plan requirement
- Minimum distribution disinfection residual level of 0.2 mg/L beginning 4/29/19
- Weekly monitoring
- Revised reporting requirements
- Distribution system investigation

Note: For groundwater systems, the 4-log Entry Point requirement of ≥0.40 mg/L (or permitted level) DID NOT CHANGE.

The DRR also revises some requirements for **surface systems**:

- Requires filter plants to maintain ≥0.20 mg/L residual at the **entry point**.
- Requires filter plants to calculate Giardia log inactivation at least once/day and report this value to DEP.

Other provisions:

- DRR requires systems **that provide chloraminated water** to develop and implement a nitrification control plan.

Key Points

- The required minimum distribution disinfection level is changing from 0.02 mg/L to 0.2 mg/L to be:
  - A truly detectable level
  - A residual that controls microbial growth
- Complying with the new rule will be covered in this course.

Lesson 2: Monitoring and Reporting Requirements

Objectives

By the end of the lesson on Monitoring and Reporting Requirements, you will be able to:

- Determine what type of disinfectant residual monitoring is required
- Describe the distribution disinfectant residual monitoring requirements under the DRR
- Properly report distribution disinfectant residual results under the DRR

Applicability and Effective Date

As a reminder from the last lesson, the following systems are required to comply with the requirements of the DRR:

- Community water systems;
- Nontransient noncommunity water systems that use chlorine or chloramine, or that purchase water from a system using chlorine or chloramine;
- Transient noncommunity water systems that use either a surface water or groundwater under the direct influence of surface water (GUDI) source;
- Transient noncommunity water systems that have 4-log treatment of viruses under the Groundwater Rule.

The distribution residual monitoring requirements that will be covered in this lesson have an effective date of 1-year after DRR was published. That makes the monitoring requirements effective date **April 29, 2019**. Beginning on that date, all water systems noted above are required to begin compliance monitoring according to the provisions of DRR.

Types of Monitoring

According to 109.710, the type of monitoring required is as follows:

- Systems using chlorine should monitor for free chlorine.
- Systems using chloramines should monitor for total chlorine.
- Systems with any mixing zones* should monitor for *both* free and total chlorine in the mixing zone(s). Mixing zones should be identified in the DRR sample siting plan (SSP).
- Systems that use chloramines and periodically conduct a free chlorine burn should monitor for *both* free and total chlorine during a free chlorine burn.

*Mixing zones occur wherever there may be mixing of water treated with chlorine and water treated with chloramine. This situation occurs at and around interconnections between systems that use different disinfectants. For example, a system that disinfects their water

with chlorine but also purchases water from a system that disinfects with chloramines will have a mixing zone around the interconnection. Such a system should have identified monitoring locations within the mixing zone in their DRR SSP and should be monitoring both free and total chlorine at any sites located within the mixing zone.

Disinfectant Residual Monitoring Requirements

According to 109.301(13), the monitoring requirements for chlorine and chloramine in the distribution system under the DRR are as follows:

- Water systems are required to monitor for disinfectant residuals according to their sample siting plan (SSP) for the Disinfectant Requirements Rule (DRR).
- Monitoring for disinfectant residual must occur at the same time and from the same locations as coliform sample collected under the Revised Total Coliform Rule (RTCR). Note that this is not a new requirement, but has been in place for many years.
- Disinfectant residual monitoring must occur at representative locations within the distribution system **at least once per week**. *This is a new requirement*.
- All distribution residual monitoring must occur during normal operating conditions.

Monitor According to DRR SSP:

All applicable systems were required to submit to the Department a sample siting plan (SSP) for disinfectant residual monitoring in the distribution system. The SSP was due by October 29, 2018. Since disinfectant residual monitoring must occur at the same time and same locations as coliform monitoring required by the RTCR, the DRR SSP was intended to act as an addendum to a water system's existing RTCR SSP.

The intent of the DRR SSP is to identify representative locations in the distribution system for disinfectant residual monitoring. Representative locations should include locations that fit into one or more of the location categories:

1. General Distribution Location
2. Dead ends
3. First service connection
4. Finished water storage tanks
5. Interconnection with other systems
6. Areas of high water age
7. Previous coliform detections
8. Mixing zones

In addition, the SSP identifies a monitoring schedule at each location. In other words, the SSP indicates which locations will be monitored during each week of each month. That includes week 5 for any months that contain 5 weeks.

In order to comply with the DRR regulations, water systems are required to conduct monitoring according to the schedule and at the locations listed in their SSP.

Monitor Weekly:

In addition to monitoring according to the SSP, DRR also requires *weekly* monitoring. This means that at least one sample must be analyzed at least once per week.

A week for DRR monitoring is from Sunday to Saturday; the DRR requires that at least one sample is analyzed during that time. Let's look at the month of July 2019 as an example:

July 2019						
Sun	Mon	Tues	Wed	Thurs	Fri	Sat
	1	2 Week 1	3	4 Week 1	5	6
7	8	9 Week 2	10	11 Week 2	12	13
14	15	16 Week 3	17	18 Week 3	19	20
21	22	23 Week 4	24	25 Week 4	26	27
28	29	30 Week 5	31	Aug 1 Week 1	2	3

- If a water system does their sampling on Tuesdays, they would sample on July 2 in week 1, July 9 in week 2, July 16 in week 3, July 23 in week 4, and they would need a week 5 sample on July 30.
- However, if they do their sampling on Thursdays, they would sample on July 4, 11, 18, and 25. The following Thursday is August 1, which would be week 1 of the next month.

It does not matter what day of the week monitoring occurs, and it does not matter whether a week that spans two months is considered week 5 of one month or week 1 of the next, *as long as sampling occurs at least once during each 7-day Sunday to Saturday timeframe*.

To further illustrate this example, let's see how monitoring carries over into the next month:

28	29	30 Week 5	31	Aug 1 Week 1	2	3
4	5	6 Week 1	7	8 Week 2	9	10
11	12	13 Week 2	14	15 Week 3	16	17
18	19	20 Week 3	21	22 Week 4	23	24
25	26	27 Week 4	28	29 Week 5	30	31
Sept 1	2	3 Week 1	4	5 Week 1	6	7

- The system that samples on Thursdays only had 4 weeks in July, but has 5 weeks in August (monitoring on Aug 1, 8, 15, 22, 29).
- On the other hand, the system that samples on Tuesdays had 5 weeks in July, but only has 4 weeks in August (monitoring on Aug 6, 13, 20, 27).
- Either way, it evens out in September, when both systems are back on the same week 1.

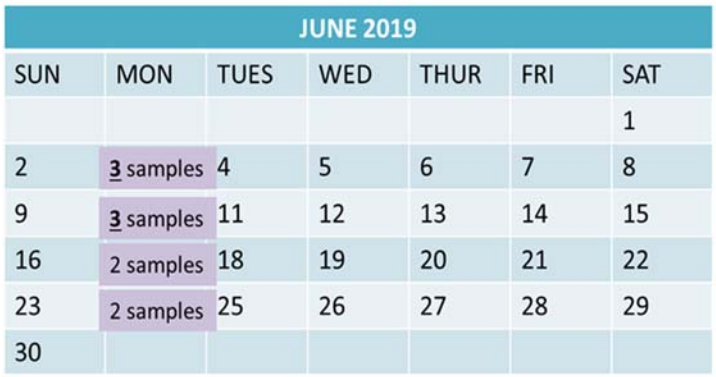
So, the bottom line is to collect samples according to the sample siting plan from the appropriate locations for each week as it falls on the calendar.

It is critical to still meet the minimum number of samples required for the month! Monitoring weekly does *not* eliminate the need to collect the required number of *monthly* samples.

For example, a system with a population of 12,000 customers must monitor a minimum of 10 RTCR samples per month based on population. Since distribution chlorine monitoring is required at the same time and same location as coliform samples, that means a minimum of 10 disinfectant residual samples as well.

- This system cannot just monitor 2 samples per week, because in months with only 4 weeks, they would only collect a total of 8 chlorine (and coliform) samples.

- Instead, they need to first plan for the correct number of *monthly* samples, and then make sure they are monitoring disinfectant residual at least *weekly*. If they collect 3 samples each in weeks 1 and 2, and 2 samples each in weeks 3 and 4, they will have their required 10 for the month.



- Note that this will mean that in months with 5 weeks, they will need at least one extra chlorine residual sample for the month! In a month with 5 weeks, they would need to add at least one additional distribution chlorine residual sample in week 5.

The previous examples used a water system that always monitored on the same day of the week. It should be noted that it is not necessary to monitor on the same day each week.

- If there is a holiday or any other reason monitoring cannot occur on the same day as it normally does, it is fine to sample on different days of the week.
- This is also true for weeks that overlap 2 months, even if a different day of the week puts the sample into one month or the other. Again, as long as monitoring occurs *each week* (from Sunday to Saturday) and according to the SSP, the weekly requirement will be met.

It should also be noted that the requirement for weekly monitoring requires monitoring at *representative locations* at least once per week. In order for monitoring to be representative, there may be instances when more than one weekly sample is required.

- For example, in a system with multiple isolated distribution systems, the water quality in each separate distribution system is independent of and not represented by the other distribution system(s). In this case, in order for monitoring to be representative, weekly monitoring should occur in *each* distribution system. The DRR SSP should have identified representative monitoring locations.

Additional Monitoring Requirements

There are a couple of additional requirements and important points regarding DRR monitoring:

- **For any site that does not maintain the minimum residual of 0.2 mg/L during one month, that site must be included in monitoring during the following month.**
    - It is important to note that *this is in addition to the monitoring outlined in the sample siting plan.*
    - However, if the same sites are monitored each month, monitoring would already be occurring at each site, so no additional samples would be necessary.

Example: Woodview Municipal Water System

This CWS collects 2 total coliform samples per month for RTCR, alternating between 4 locations (701 and 702 are monitored one month, 703 and 704 the following month, and so on), during the first and third weeks of the month. For DRR, they monitor for chlorine residuals at the same 2 locations each month every week (monitoring at 701 and 702 weekly one month, and at 703 and 704 weekly the following month).

- Here is their monitoring schedule for July:

July 2019						
Sun	Mon	Tues	Wed	Thurs	Fri	Sat
	1	2 ***701*** 702	3	4	5	6
7	8	9 701 702	10	11	12	13
14	15	16 ***702*** 701	17 **0.12 mg/L**	18	19	20
21	22	23 701 702	24	25	26	27
28	29	30 701 702				

701 ***702*** Coliform and chlorine residual monitoring

701 702 Chlorine residual monitoring only

- At location ID 701 on July 16 they have a low residual, measuring only 0.12 mg/L. This means that they need to be sure to monitor at location ID 701 in the following month.
- Here is their monitoring schedule for August:

August 2019						
Sun	Mon	Tues	Wed	Thurs	Fri	Sat
			1	2	3	4
5	6	7 ***703*** 704	8 701	9	10	11
12	13	14 703 704	15	16	17	18
19	20	21 ***704*** 703	22	23	24	25
26	27	28 703 704	29	30	31	

703 ***704*** Coliform and chlorine residual monitoring

703 704 Chlorine residual monitoring only

- Their *routine* monitoring schedule, according to their DRR SSP, includes monitoring at location ID 703 and 704 only for August. So, they need to *add at least one sample* for disinfectant residual at location 701 this month, which can occur at any time during the month. In this example, they have added a disinfectant residual sample on August 8 at location 701.

- Water systems may substitute online monitoring and recording in the distribution system for grab monitoring.
    - DRR does not specify a required recording frequency for continuous analyzers. Recording frequency is one of the required elements on the SSP for systems indicating that they are using continuous analyzers.
    - Any online instrumentation used for compliance monitoring must be validated according to 109.304 and Method 334.0.

Conducting Disinfectant Residual Monitoring

Disinfectant residual is one of the accreditation-by-rule, or ABR, parameters. All of the requirements for ABR parameters also apply to disinfectant residual.

109.304(c) specifies that accreditation by rule parameters do not need to be analyzed by an accredited lab, but they must be analyzed by:

- a certified operator,
- a person operating under a standard operating procedure from a certified operator,
- an environmental laboratory.

As specified in 109.304(a), these ABR parameters must be analyzed using approved analytical techniques. For chlorine, that means following EPA Method 334.0.

Method 334.0 is a quality control protocol, published by EPA in 2009, that outlines practices that must be followed for chlorine analysis, in order to ensure accurate and reliable free and total chlorine measurements. Water systems in PA must ensure that both analysts and equipment used for compliance measurements adhere to the requirements of Method 334.0.

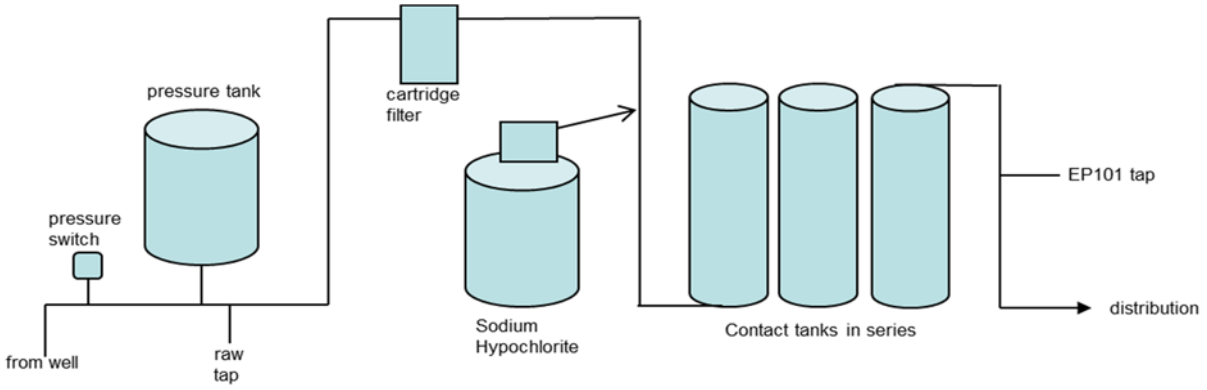
Method 334.0 resources:

- The EPA Method 334.0 Fact Sheet summarizes the requirements of the method.
- Also, the Department has a webpage dedicated to Method 334.0 with lots of resources for water systems, including links to the documentation forms, links to YouTube tutorials on the requirements, and a link to the actual EPA method. https://www.dep.pa.gov/Business/Water/BureauSafeDrinkingWater/DrinkingWaterMgmt/Pages/Method-334.0.aspx

KNOWLEDGE CHECK – Monitoring Requirements Activity

System #1: Give it a Chai Tearoom

TNC with 4-log treatment, population 100. One building, food/beverage prep, dish- and hand-washing.



1. Is Give it a Chai required to comply with the DRR monitoring requirements? Why or why not?

2. If so, what type of monitoring is required (free chlorine, total chlorine, or both)?

3. How many disinfectant residual samples must they collect per month for DRR? Per week?

Their DRR SSP indicates weekly monitoring at site ID 701, which is also their RTCR location.

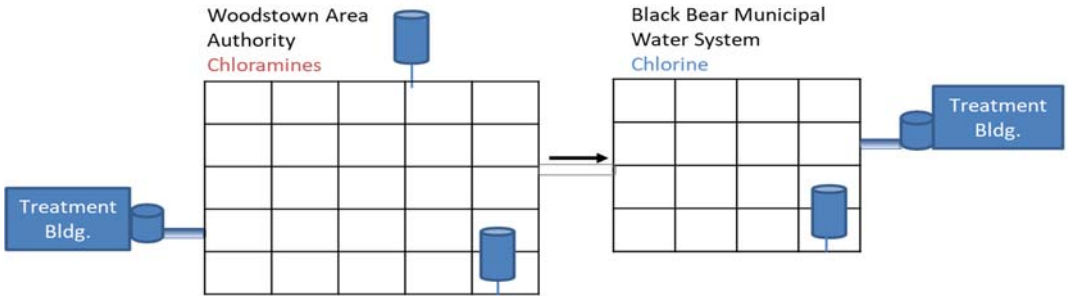
Here are their weekly results for July 2019 at location ID 701:

July 2	0.25 mg/L
July 9	0.21 mg/L
July 16	0.18 mg/L
July 23	0.13 mg/L
July 30	0.24 mg/L

4. Is any additional monitoring required in August? Why or why not?

System #2: Black Bear Borough Municipal Water System

CWS with GW sources, hypochlorite, population 4,500 (minimum of 5 RTCR samples based on population). Also purchase treated water via interconnection with neighboring system, Woodstown Area Authority, which uses chloramines in their distribution system.



5. What type of disinfectant residual monitoring is required by this system?

6. How many distribution disinfectant samples are required per month? Per week?

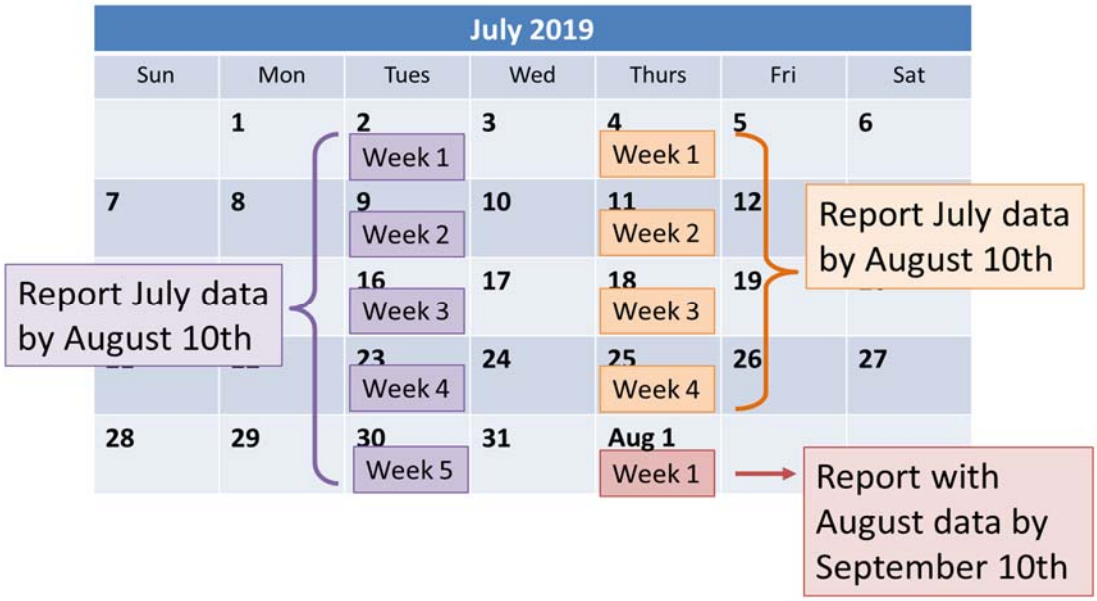
Reporting Requirements

Now that the monitoring requirements for distribution disinfectant residuals have been covered in detail, here are the reporting requirements.

- Distribution residuals should now be reported on the **SDWA-1** form. *This is a new requirement.* This change from SDWA-S form reporting was effective immediately upon publication of the new rule, April 28, 2018. This reporting requirement is detailed in 109.701(a)(1), General Reporting Requirements.
- As with other parameters, all monthly data must be reported no later than the 10th of the following month. This is not a new requirement.
- Since reporting is now required on the SDWA-1 or detail form, water systems are now required to report **individual results**, not a monthly average. All individual location IDs must be reported as they are listed on the SSP. *This is a new requirement.*
- Also, it is important to note **results should NOT be rounded** for reporting. If a system measures 0.49 mg/L, they should report 0.49 mg/L, not 0.5. All digital analyzers using an approved method should read results to 2 decimal places; be sure to report to 2 decimal places as well.

- All results must be reported electronically through DWELR, the Drinking Water Electronic Laboratory Reporting system. This is not a new requirement.
- All distribution residuals should be reported with the appropriate month, and all results for each month should be reported together.

  Going back to our July 2019 example, if monitor occurs during week 5 on July 30th, that result is reported with the rest of the July results, by August 10th. If instead only 4 weeks are monitored in July, and monitoring occurs during the split week in week 1 of August, the 4 weeks in July are reported by August 10th, but the August 1st result is reported with August data, by September 10th.



When reporting compliance data for disinfectant residuals, it is important to report properly. There are a few new things to keep in mind with regard to reporting:

- Use the correct *contaminant code*. There are new contaminant codes for reporting. Use **1013** for free chlorine and **1000** for total chlorine.
- Use the correct *sample type*. Use sample type **D** for routine monitoring, as well as for chlorine residuals monitored with any RTCR check samples. Use sample type **S** for RTCR seasonal start up samples or with any other special total coliform samples, such as those collected to lift a boil water advisory. Do NOT use sample type C for disinfectant residual.
- Use the correct *method codes*. The method code refers to the EPA approved method used for analysis. The most common one is the DPD colorimetric method, which uses method code 301.

Refer to the DRR reporting instructions for distribution residuals. In addition to the above information, the reporting instructions includes examples of how to report in DWELR. This one-page document can be found on the last page of Appendix A and on the DRR webpage: https://www.dep.pa.gov/Business/Water/BureauSafeDrinkingWater/DrinkingWaterMgmt/Regulations/Pages/Proposed-Disinfection-Requirements-Rule--.aspx

Grab Sample Reporting:

If using grab sampling, report ALL individual results. Do NOT pick and choose which data to report. Any samples analyzed, even in addition to what is listed in the SSP, should be reported.

If more than one sample is analyzed at one location on the same day, report each measurement for that location ID individually with the corresponding sample times. For compliance, an average will be calculated by PADWIS (more on compliance in the next lesson).

- A water system may take more than one grab sample per day if the initial measurement of the day is low (below 0.2 mg/L), and corrective actions are taken to try to increase the residual. The system would determine whether those corrective actions were effective by conducting additional monitoring.
- For example, if the initial reading at location ID 701 on May 4 is only 0.10 mg/L and the system conducts flushing in the area, subsequent measurements are essential to see whether efforts were successful in increasing the residual.
- If these 3 follow up readings are analyzed, at the end of the month, all 4 measurements for location 701 on 5-4-19 must be reported, with the appropriate times and results.

Date: May 4, 2019 Location ID: 701	Time	Result
Initial Reading	08:00	0.10 mg/L
Follow up reading #1	09:00	0.15 mg/L
Follow up reading #2	09:45	0.31 mg/L
Follow up reading #3	12:30	0.33 mg/L

Continuous Analyzer Reporting:

If using a continuous online analyzer to continuously monitor distribution residuals, report a single daily result. That single daily result should be a daily average of all recorded measurements from the online analyzer.

The recording frequency for continuous analyzer data should be notated on the DRR SSP. There is no requirement for recording frequency according to DRR, but it was a required element of the SSP for systems indicating that they would be using an online analyzer.

IMPORTANT: It is critical to note that this is for distribution monitoring ONLY!

This must not be confused with EP continuous monitoring and recording.

- EP residual (for SW/GUDI and GW systems serving >3300) must be monitored and recorded *continuously*, with a recording frequency of at least every 15 minutes.
- Reporting for EP residuals consists of reporting the *daily minimum* and the time at which that occurs.

Systems using online analyzers should report a daily average for *one day* of the week, during the weeks indicated on their SSP. It does not matter for which day of the week the daily average is reported. However, if the location is also an RTCR monitoring location, report the daily average for the *same day* of the week on which the RTCR sample is collected.

When reporting daily average results from an online analyzer, a sample time should not be reported. Location IDs that have online analyzers will be notated in PADWIS, so not reporting a sample time will not cause an error when reporting since the data is an average. However, if the online analyzer is down, and temporary grab chlorine residual sampling is necessary with coliform sample collection, it is fine in that case to report a sample time.

DRR Reporting: Making an Informed Decision

The Safe Drinking Water program requires electronic reporting of all sample results. The electronic reporting application is called The Drinking Water Electronic Laboratory Reporting application, or **DWELR**. DWELR is accessed through DEP Greenport. For information on how to obtain access to DWELR, please refer to Appendix A: DWELR Basics

With DWELR access, water systems can submit, or report, data for their water system, and they can also view data that has been submitted on their behalf by a laboratory.

> *COMPLIANCE TIP:* Regardless of who reports a water system's results, **it is ultimately the responsibility of the public water system to ensure correct and on-time reporting!**

Some PWSs that are required to comply with the monitoring and reporting requirements of DRR may currently have distribution chlorine residuals reported by their laboratory. After April 29, 2019, when *weekly* chlorine residual results must be analyzed and reported, all PWSs will need to determine what is best for them with regard to reporting.

Here are the options for monitoring and reporting:

- PWS collects, analyzes and reports <u>all</u> distribution disinfectant results for the month.
- PWS collects, analyzes and reports distribution disinfectant results *only* on the weeks a coliform sample is not collected.
- PWS collects and analyzes distribution disinfectant results and asks their lab to report under the PWS lab ID.
- Lab or circuit rider collects, analyzes and reports all weekly results.

> *COMPLIANCE TIP:* The Department recommends that <u>every</u> PWS maintain a DWELR account, even if they don't report. **A VIEW ACCESS account will allow the PWS to review and proof-read data reported on their behalf for correctness.** If a PWS is conducting analyses, they are also required to have a registered lab ID.

For more information on electronic reporting, refer to the DWELR web page: https://www.dep.pa.gov/Citizens/My-Water/PublicDrinkingWater/Pages/Electronic-Reporting-System.aspx.

Also, help is available by calling the Data Management Section of the Bureau of Safe Drinking Water in Central Office at 717-772-4018.

DWELR Data Validation Checks

For DRR, the details in reporting, such as using the correct location IDs and contaminant IDs, are especially important. Because compliance is location based, it is critical for PWSs and labs to report properly. One incorrectly reported record could generate multiple violations over multiple months!

Data validation checks are built into the DWELR system to help minimize errors. PWSs and laboratories should **review error reports and proof-read data BEFORE it moves out of the DWELR system at midnight on the 10th of the month**, so that they can *make corrections within the DWELR application*.

There are three steps that every PWSs can take that will drastically decrease incorrectly reported data and consequently decrease potential violations and the need for manual corrections.

Step 1: Review Error Report

After submitting data, it is important to review the **Error Report**. The Error Report will list all records that have *ERRORS* or *WARNINGS* and provide information about the error or warning. Records can be corrected directly on the Error Report page and resubmitted. This process should be repeated until there are no more errors listed on the Error Report.

The DWELR system sends out automated e-mails on the 1st, 5th and 9th of the month, notifying users that they have *ERRORS* or *WARNINGS* in their records that they should correct. Users that receive these e-mails should review their data closely and make corrections as necessary, *before* the 10th of the month. These e-mail messages have the Data Management Section phone number to call for assistance (717-772-4018).

ERROR Messages: An error message is generated in DWELR when data are *not valid*. Some examples of invalid data that will generate an error message include:

- Invalid location IDs (not in PADWIS as an entry point, sample point, or plant ID)
- Sample type and location ID mismatches (such as reporting an entry point location as sample type 'D')
- Mismatch in sample and analysis date for chlorine residual data
- Invalid contaminant ID or analysis method
- Missing or incorrectly formatted data (such as sample time)
- Data reported in the future

WARNING Messages: A warning message is generated in DWELR when data are greater or less than a certain threshold. *Warning messages do NOT signify that data are not valid.* The warning message is intended to give the DWELR reporter a "heads up" that the result *MAY* be out of compliance -- perhaps a value was entered incorrectly, or perhaps additional data needs to be entered for compliance purposes. PWS's should always take a second look at data that has generated a warning message.

Step 2: Proofread

Under the DWELR menu choice "View and Edit Records," retrieve a printer-friendly .pdf version of the DWELR submission. Print out and review the .pdf report for any typographical errors, as it is typically easier to proofread and detect errors on the printed page. Just because data are valid does not mean it is entered correctly. PWSs should look closely at PWSIDs, dates, location IDs, times, sample types, contaminant codes, contaminant IDs, and results.

Saving and printing a copy of the .pdf report has some additional benefits as well. It provides a record of the data that were submitted. It also makes it easier to make corrections. Any corrections can be made by marking up a copy of the .pdf report and faxing the marked-up copy to the Data Management Section.

Step 3: Review What Lab Has Submitted

PWSs can review what the lab has submitted on their behalf. This can be done via a DWELR VIEW ACCESS account.

If a PWS is collecting their own samples to be delivered to and analyzed by their laboratory, it is critical that they fill out the chain-of-custody form correctly. The chain-of-custody is a legal document that tracks the sample as it changes hands from the client to the lab, but it also serves the key purpose of telling the lab how to report the sample, including the location ID and sample type.

Reviewing data through DWELR VIEW ACCESS, a PWS should make sure that all data analyzed for the month are reported, and that results are reported correctly, by comparing records to the chain-of-custody and laboratory report. If any records are missing or incorrect, the PWS should notify the lab promptly so that the lab can correct it *before* the 10th of the month. It is recommended that a PWS view their data on or about the 7th of the month. That should typically allow time for the lab to make any corrections before midnight of the 10th of the month.

Please refer to Appendix A: DWELR Basics for information on obtaining access (to either submit or view data) to DWELR.

Other Reporting Requirements

There are a few other reporting requirements related to the DRR.

- Systems conducting a free chlorine burn must report to DEP the **beginning and ending dates of the free chlorine burn**. This is applicable to systems that chloraminate and periodically conduct free chlorine burns in their distribution system.

  - These systems must report the beginning and ending dates *in writing*. There is no specific form systems should use to report this information; report via email, fax, a letter, or other method to the local district office.
  - This information should be reported *as soon as possible*, but ideally within 10 days of the free chlorine burn.
  - In addition, systems conducting free chlorine burns must adhere to any related permit special conditions, including the need to notify their customers of the treatment change.
- Another reporting requirement of DRR is the Sample Siting Plan (SSP).
  - The SSP was initially due by October 29, 2018. The SSP must contain required elements listed in 109.701(8)(i). If DEP determines that the DRR SSP does not meet all of the content requirements, a revised SSP must be submitted within 30 days of notification from DEP that addresses the deficiencies.
  - If a water system determines that their SSP needs to be revised, they must notify DEP, and submit a revised plan within 30 days of that notification.
  - For new systems, the SSP must be submitted prior to serving water to the public.
- One-hour reporting is required any time a water system fails to meet the treatment technique. This is covered in Lesson 3 Compliance.
- A Distribution System Investigation (DSI) is required any time a single location is below the minimum required residual in two consecutive months. Any time an investigation is required, the water system must submit a report to DEP within 60 days. This will also be covered in more detail in a later lesson.

KNOWLEDGE CHECK – Monitoring and Reporting Scenario

PWSID: 6543210 PWS Name: Green Snake Township Municipal Water System

CWS, GW sources, hypochlorite disinfection, population 2,600 (minimum 3 RTCR samples per month)

DRR SSP:

Location ID	Site location - address & tap location (if Site *not* used for RTCR monitoring)	Location also used for: (check all that apply)	Representative Location Code (check all that apply)	On-line Analyzer or Grab Sample?	On-line Analyzer Recording Freq.	Grab Sampling Frequency*
701	see RTCR plan	☐ DRR only ☒ RTCR ☐ LCR ☐ TTHM / HAA5	☐ 1 ☐ 5 ☐ 2 ☐ 6 ☐ 3 ☐ 7 ☒ 4 ☐ 8	☒ On-line Analyzer ☐ Grab Sample	hourly	week 1 and 4
702	see RTCR plan	☐ DRR only ☒ RTCR ☐ LCR ☐ TTHM / HAA5	☐ 1 ☐ 5 ☒ 2 ☐ 6 ☐ 3 ☐ 7 ☐ 4 ☐ 8	☐ On-line Analyzer ☒ Grab Sample		week 2 and 5
703	see RTCR plan	☐ DRR only ☒ RTCR ☐ LCR ☒ TTHM / HAA5	☐ 1 ☐ 5 ☐ 2 ☒ 6 ☐ 3 ☐ 7 ☐ 4 ☐ 8	☐ On-line Analyzer ☒ Grab Sample		week 3 every other month
704	see RTCR plan	☐ DRR only ☒ RTCR ☐ LCR ☐ TTHM / HAA5	☐ 1 ☐ 5 ☐ 2 ☒ 6 ☐ 3 ☐ 7 ☐ 4 ☐ 8	☐ On-line Analyzer ☒ Grab Sample		week 3 every other month

Distribution free chlorine results for May 2019:

May 1	701	0.25 mg/L	
May 8	702	0.28 mg/L	07:25
May 15	703	0.09 mg/L	06:55
May 22	701	0.22 mg/L	
May 29	702	0.30 mg/L	07:05

1. When and how should these May results be reported?

2. Why is there no sample time for the May 1 and May 22 results?

3. What additional sample should be reported for location 701 on either May 1 or May 22?

4. Complete the SDWA-1 form for these May results.

   (Hint: results were analyzed using the DPD method, which is reported using method code 301.)

SDWA 1 - BACTERIOLOGICAL / RESIDUAL DISINFECTANT / TURBIDITY / DBP ANALYSIS

Current Lab Certifications		Contaminants not Requiring Certification								
PWSID	PWS Name	Contam ID	Analysis Method	Result	Analysis Date	Location ID 1	Location ID 2	Sample Date	Sample Type	Sample Time
6543210	Green Snake Township									
6543210	Green Snake Township									
6543210	Green Snake Township									
6543210	Green Snake Township									
6543210	Green Snake Township									

5. Do any of these results indicate additional samples required next month? Why or why not?

Key Points

- Disinfection Requirements Rule (DRR) monitoring and reporting requirements for distribution disinfectant residuals are effective April 29, 2019.
- Monitoring and reporting requirements for DRR are applicable to:
  - Community water systems (CWS);
  - Nontransient noncommunity (NTNC) water systems using chlorine or chloramines (or purchasing water from a system using chlorine or chloramines);
  - Transient noncommunity (TNC) systems using surface water or GUDI sources;
  - TNC systems with Groundwater Rule 4-log treatment of viruses.
- The DRR distribution monitoring requirements are as follows:
  - Systems must monitor in accordance with their DRR sample siting plan (SSP).
  - Systems must monitor at the same time and same location as Revised Total Coliform Rule (RTCR) samples.
  - Systems must monitor at least once per week at representative locations.
  - Monitoring should occur during normal operating conditions.
  - For any individual sites that do not maintain the minimum residual in any given month, those sites must be included in monitoring the following month.
  - System may substitute online monitoring for grab sampling.
- Reporting requirements for DRR are as follows:
  - Report individual results on the SDWA-1 form.
  - Report results with the appropriate location IDs.
  - Report electronically by the 10th of the following month.
  - Use correct reporting codes (contaminant ID, method code, etc).
  - Report samples as type D or S.
  - For grab samples, report <u>all</u> individual results, including if more than one sample per location ID per day is analyzed.
  - For online monitoring, report a daily average on any day of the week as indicated in the SSP. If the site is also a RTCR monitoring location, report the daily average for the same day that the RTCR sample is collected.

Lesson 3: Compliance

Objectives

By the end of this lesson, you will be able to

- Understand how to determine compliance with the Disinfection Requirements Rule (DRR) treatment technique
- Identify situations that result in noncompliance
- Describe the violation types associated with DRR distribution residuals

Treatment Technique

DRR compliance is based on a treatment technique requirement. Applicable water systems must maintain a minimum residual disinfectant concentration throughout the distribution system, sufficient to assure compliance with microbiological MCLs and treatment techniques. The minimum level specified in 109.710 is **0.2 mg/L**, OR another level approved by DEP for systems using an alternate oxidizing disinfection treatment.

Note that the minimum level of 0.2 mg/L has only *one significant digit*. This is key when it comes to compliance determinations.

- Any distribution residual results of 0.15 mg/L or above are in compliance, because 0.15 mg/L rounds to 0.2 mg/L, therefore it meets the minimum level.
- However, 0.14 mg/L and below rounds down to 0.1 mg/L and does not meet the minimum level.

It is critical to note that this is different from the EP minimum requirement of 0.20 mg/L for surface water systems, which has *two* significant digits. A residual of 0.15 mg/L at the EP of a surface water system is out of compliance.

Compliance Determinations

Compliance determinations are broken down by source water type (groundwater (GW), surface water (SW), or groundwater under the direct influence of surface water (GUDI)), and the number of distribution disinfect residual samples collected per month, according to the DRR sample siting plan (SSP).

GW systems collecting <40 samples per month:

For GW systems that collect <40 disinfectant residual samples per month in the distribution, if no more than 1 sample per month is less than the minimum of 0.2 mg/L for 2 consecutive months, the system is in compliance with the treatment technique.

For example, consider a GW system that collects 20 samples per month:

- If they have 1 (or zero) sample that is less than 0.2 mg/L during 2 consecutive months, they are in compliance with the treatment technique.

- However, if they have 2 (or more) samples that are less than the minimum during 2 consecutive months, they are not in compliance. They would have a treatment technique violation at that point.

All other systems:

All other systems are grouped together with the way compliance with the treatment technique is determined. This includes:

- **GW systems that collect 40 or more samples per month**, and
- ***All* SW/GUDI systems**, regardless of the number of samples collected per month.

For these systems, if no more than 5% of the samples in a month are less than the minimum of 0.2 mg/L for 2 consecutive months, the system is in compliance with the treatment technique.

For example, consider a system (either GW or SW) that collects 60 samples per month:

- 5% of 60 samples is 3 samples, so…
- If 3 samples (or fewer) are less than 0.2 mg/L during 2 consecutive months, they are in compliance. Since 3 samples is *equal to* 5%, but not more than 5%, of the number of samples per month, this does not trigger a treatment technique violation.
- However, if 4 (or more) samples are less than the minimum in 2 consecutive months, that is more than 5%, so that is a treatment technique violation, and the system is not in compliance.

It is important to note that for SW/GUDI systems that collect fewer than 20 samples per month, this compliance determination will mean that if they have even 1 sample in 2 consecutive months that is below the minimum of 0.2 mg/L, they will be out of compliance with the treatment technique.

For example, consider a SW system that collects 10 samples per month:

- 5% of 10 samples is 0.5
    - NOTE that this number does not get rounded!
- Since 1 sample is more than 5%, if they have even 1 sample less than 0.2 mg/L in 2 consecutive months, they are out of compliance.

For all compliance determinations, the number of samples less than 0.2 mg/L is based on *<u>any</u>* sites that are below the minimum. It does not need to be the same sites in two consecutive months that are below the minimum.

Full Group Activity: For each of the 3 systems that follow, first consider how compliance will be determined for the system (based on the system type and number of samples per month), and then determine the number of distribution residual samples below the minimum level of 0.2 mg/L per month in 2 consecutive months that would cause the system to be *out of compliance* with the treatment technique.

System #1: A small CWS using 2 groundwater sources and hypochlorite disinfection that provides water to 250 residents. They collect 1 RTCR sample per month and 4 distribution chlorine residuals.

System #2: A CWS treating a surface water source that serves 30,000 customers and collects 30 total coliform and 30 distribution chlorine samples per month.

System #3: A large CWS with 15 wells, all designated as groundwater, with a population of 75,000 and collecting 80 RTCR and chlorine residual samples per month.

Compliance is Based on the Number of Samples in the DRR Sample Siting Plan (SSP):

It is important to note that compliance is based on the number of samples collected each month *as specified in the DRR SSP* for the system.

- Any extra samples that the system takes and reports are <u>not</u> added to the total number of samples listed in the SSP.
- The <u>lowest</u> results reported are used for compliance. For example, if 20 samples are required per the DRR SSP, and 25 are reported, the 20 *lowest* results will be used for the compliance determination.
- Any samples reported as special or "S" samples are not counted toward compliance.

Example: Consider a GW system that has 50 sites listed in their DRR SSP; even if they take and report extra samples, compliance is based on 50 samples each month.

- For one month, they take extra samples, and they report a total of 60 samples. The next month, they take and report 62 samples.

- Compliance is based on the 50 *lowest* results reported each month, since 50 is the number of samples indicated in their SSP.
- Since 5% of 50 samples is 2.5, they can have 2 (or fewer) samples below the minimum in 2 consecutive months and still be in compliance.
- However, since 3 is more than 5% of 50, if they have 3 (or more) samples below the minimum in 2 consecutive months, they will have a treatment technique violation.

If at any time a system wants to add sites, they can do that by revising their sampling plan and resubmitting the plan to the Department. Remember from the last lesson that if they want to revise their SSP, they must notify the Department of any revisions, and then submit a revised plan to the Department within 30 days of that notification.

The exception regarding extra samples is if a system conducting grab sampling analyzes more than one sample *per day at the same location*.

- The system should report ALL individual results, with the corresponding sample times.
- Multiple grab sample results reported from the same location on the same day will be used to determine a *daily average* for that location.
- That daily average will then count as one sample for compliance.

Look at this example from the last lesson:

Date: May 4, 2019 Location ID: 701	Time	Result
Initial Reading	08:00	0.10 mg/L
Follow up reading #1	09:00	0.15 mg/L
Follow up reading #2	09:45	0.31 mg/L
Follow up reading #3	12:30	0.33 mg/L

Report all 4 individual results!

***One* daily average calculated for compliance:**
(0.10 + 0.15 + 0.31 + 0.33)/4 = 0.22 mg/L

- In this example, the initial reading and the three follow up samples at location ID 701 are all used to calculate a daily average result of 0.22 mg/L. That one daily average result is used in compliance determinations.
- Since the daily average used for compliance is not <0.2 mg/L, this system does not have a non-compliant result at location 701 on this date, and they do not need to make sure they sample at location ID 701 the following month (unless it is part of their routine sampling schedule to analyze a sample there every month).

KNOWLEDGE CHECK – Compliance Determination Activity

For each of the following, please provide the number of distribution disinfectant residual samples below 0.2 mg/L per month in two consecutive months that would cause the system to be **out of compliance** with the treatment technique.

1. A state park (TNCWS) with membrane filtration of a surface water source, serving up to 800 visitors per day. They collect 2 RTCR samples per month, and 8 distribution chlorine samples per month.

2. A school (NTNCWS) with 4-log treatment of viruses for their groundwater source, serving 300 students, faculty, and staff all in one building.

3. A CWS with conventional filtration of one surface water source, with a population of 48,000. They collect 50 RTCR and distribution chlorine residual samples per month.

Scenario:

A CWS uses 2 surface water sources. Based on population, they collect 30 total coliform and distribution chlorine residual samples per month.

4. How many chlorine samples below 0.2 mg/L in 2 consecutive months will cause this system to be out of compliance with the DRR treatment technique? Why?

In September and October, they conduct their semi-annual flushing and they collect and report extra chlorine residual samples. They report a total of 45 samples for September and 52 for October.

5. How many chlorine samples below 0.2 mg/L in each of these 2 months (September and October) will cause the system to be out of compliance with the treatment technique? Why?

In December, they have a large industrial customer go out of business near one of their monitoring locations (708) on a dead end. They measure a residual of 0.11 mg/L on 12-5 at 08:15 at location ID 708. They conduct flushing at the dead end and resample. Follow up sample results are 0.17 mg/L at 08:55 and 0.26 mg/L at 09:20.

6. What results should they report? What number will be used for the compliance determination?

Additional Considerations

There are a couple of additional points regarding compliance.

- For any systems *required* to report both free and total chlorine at any one location, compliance is based on the *higher* of the two measurements.
    - This applies to systems that have a mixing zone at interconnections and are required to report both free and total chlorine at monitoring locations within the mixing zone.
    - It also applies to systems that chloraminate and are required to report both free and total chlorine during a free chlorine burn.
    - In both examples, if free chlorine is below the minimum level but total chlorine is above, the higher total chlorine result is used for compliance.
    - Note that this is only applicable to systems that are *required* to report both. For example, if a system is required to monitor and report free chlorine, and they report both free and total chlorine, compliance will only be based on their free chlorine result. In this case, if their free chlorine is < 0.2 mg/L, it will used for the compliance determination, regardless of whether their total result is >0.2 mg/L.
- Any time a water system fails to meet the minimum residual at the *same location* for 2 consecutive months or more, they are required to conduct an investigation to determine the cause and any appropriate corrective actions, and to submit a written report to the Department within 60 days.
    - There does not need to be a treatment technique violation for this to occur.
    - More information about Distribution System Investigations will be provided in a later lesson.

Violations

There are several types of violations water systems can incur relative to the DRR.

Treatment technique violations: Any time any water system fails to maintain the minimum residual in the allowable number of samples for 2 consecutive months, as described earlier in this lesson, a treatment technique violation is generated.

- For GW systems collecting < 40 samples per month, this occurs any time 2 (or more) samples are less than the minimum residual of 0.2 mg/L in 2 consecutive months.
- For all other systems, this occurs any time more than 5% of their monthly samples (based on the number indicated in their DRR SSP) are less than the minimum residual of 0.2 mg/L in 2 consecutive months. This includes:
    - GW systems collecting ≥ 40 samples per month, and
    - *Any* SW/GUDI system (regardless of the number of samples required per month).

If a system incurs a treatment technique violation, they are required to notify the Department within one hour, according to 109.701(a)(3). They are also required to issue Tier 2 Public Notification (PN), according to 109.409.

The treatment technique is based on 2 consecutive months with residuals less than 0.2 mg/L. What happens if the 3rd and subsequent months continue to have more than the allowable number of sample results below the minimum residual?

In this case, a *new* treatment technique (TT) violation is incurred each month, requiring a new Tier 2 PN. The system remains in violation until they have at least one month in compliance. Therefore, if months 1 and 2 cause a TT violation, and month 3 does not show that the system is in compliance, then months 2 and 3 will cause a new TT violation, and so on.

Example: Consider a GW system that collects <40 samples per month; they are out of compliance if they have 2 or more samples per month below the minimum residual of 0.2 mg/L in 2 consecutive months.

Date	mg/L	Date	mg/L	Date	mg/L
July 2	0.25	Aug 6	0.21	Sept 3	0.14
July 9	0.31	Aug 13	0.10	Sept 10	0.11
July 16	0.12	Aug 20	0.09	Sept 17	0.19
July 23	0.13	Aug 27	0.17	Sept 24	0.25
July 30	0.26				

TT violation for July - August

TT violation for August - September

- With the above results, there are 2 results that are < 0.2 mg/L in July, and 2 results that are < 0.2 mg/L in August. At that point, a TT violation is incurred for the months of July and August.
- There are also 2 results in September that are < 0.2 mg/L. Since the system has not shown that they are back in compliance, a new TT violation is incurred as a result of the 2 consecutive months of August and September with more than 1 sample below the minimum residual.

Monitoring and reporting violations: There are also several monitoring and reporting violations a system could potentially incur related to DRR.

There are 5 ways in which a water system can monitor incorrectly:

1. Failure to collect the required number of *monthly* disinfectant residual samples.
2. Failure to collect a *weekly* sample in one or more weeks during the month.
3. When a location ID is below the minimum of 0.2 mg/L one month, a subsequent failure to monitor at that location the following month.
4. Failure to monitor the correct parameter (i.e. free v. total).
5. Failure to monitor according to their DRR sample siting plan (SSP).

For the above missed monitoring violations, Tier 3 Public Notification (PN) is required. PN will be covered in more detail in a later lesson.

Other potential monitoring and reporting violations include:

- Failure to develop a nitrification control plan.
- Failure to submit a SSP for DRR by the deadline. This includes a failure to submit a revised SSP within 30-days.
- Failure to submit a Distribution System Investigation report (covered in a later lesson).

EPA Method 334.0 Violations: Failure to follow an approved method for chlorine residual monitoring, which is an accreditation-by-rule (ABR) parameter, is a violation of 109.304(a). If a water system is not following the required quality control procedures of Method 334.0, the Department will be begin documenting this as a violation as of April 29, 2019.

KNOWLEDGE CHECK – Compliance Determination Scenarios

System #1: Bubbling Brook Manufactured Housing Community

GW sources with chlorine disinfection, population 325; alternate RTCR and DRR monitoring each month between locations 701 and 702.

2019 free chlorine results for DRR compliance for May, June, and July:

Date	ID	mg/L	Date	ID	mg/L	Date	ID	mg/L
May 1	701	0.42	June 5	702	0.30	July 3	701	0.24
May 8	701	0.31	June 5	701	0.32	July 10	701	0.18
May 15	701	0.22	June 12	702	0.25	July 17	701	0.12
May 22	701	0.14	June 19	702	0.13	July 24	701	0.15
May 29	701	0.28	June 26	702	0.27	July 31	701	0.21

1. How many distribution disinfectant residual samples <0.2 mg/L in two consecutive months will cause this system to be out of compliance with the treatment technique?

2. Based on the above results, has Bubbling Brook incurred one (or more) treatment technique violation(s)? If yes, why and for what month(s)?

3. Have they incurred any monitoring violations? Why or why not?

System #2: Raven's Claw Water Authority

Surface water system, hypochlorite disinfection, population 20,000 (20 RTCR samples per month based on population); collect 5 RTCR and DRR samples per week in weeks 1 through 4 of each month, plus one DRR sample in week 5 (Location IDs 701 through 720, repeat 701 in week 5).

2019 free chlorine results for DRR compliance:

Week	Location ID	May results (mg/L)	June results (mg/L)	July results (mg/L)	August results (mg/L)
1	701	0.25	0.29	0.28	0.32
1	702	0.31	0.34	0.31	0.33
1	703	0.28	0.31	0.30	0.34
1	704	0.24	0.25	0.26	0.24
1	705	0.12	0.17	0.14	0.19
2	706	0.26	0.10	0.15	0.16
2	707	0.30	0.33	0.31	0.29
2	708	0.31	0.32	0.28	0.26
2	709	0.17	0.07	0.17	0.12
2	710	0.14	0.20	0.11	0.17
3	711	0.20	0.21	0.22	0.23
3	712	0.23	0.26	0.26	0.27
3	713	0.25	0.18	0.09	0.19
3	714	0.20	0.24	0.17	0.21
3	715	0.19	0.25	0.20	0.22
4	716	0.29	0.31	0.28	0.26
4	717	0.28	0.35	0.31	0.30
4	718	0.32	0.36	0.33	0.31
4	719	0.31	0.34	0.32	0.29
4	720	0.28	0.31	0.28	0.27
5	701	0.26		0.21	

4. How many distribution disinfectant residual samples <0.2 mg/L in two consecutive months will cause this system to be out of compliance with the treatment technique?

5. Based on the above results, has Raven's Claw incurred one (or more) treatment technique violation(s)? If yes, why and for what month(s)? *(HINT: Start by circling all results <0.2 mg/L.)*

6. Have they incurred any monitoring violations? Why or why not?

System #3: High Hopes Academy

NTNC (school) with 4-log treatment of GW sources, hypochlorite disinfection; population of 150 students, faculty, and staff in one building; alternate RTCR and weekly DRR monitoring monthly between location 701 (kitchen) and 702 (2nd floor teacher's lounge).

The following results for mg/L free chlorine are reported for May and June 2019:

May 2019						
S	M	T	W	T	F	S
			1	2	3	4
5	6	7 **701** **0.35**	8	9	10	11
12	13	14	15	16 **701** **0.28**	17	18
19	20 **701** **0.14**	21	22	23	24	25
26	27 **701** **0.13**	28	29	30	31	

June 2019						
S	M	T	W	T	F	S
						1
2	3	4	5 **702** **0.33**	6	7	8
9	10	11	12	13	14	15
16	17 **702** **0.09** **0.15**	18	19	20	21	22
23	24 **702** **0.14**	25	26	27	28	29

7. How many distribution disinfectant residual samples <0.2 mg/L in two consecutive months will cause this system to be out of compliance with the treatment technique?

8. Based on these results, has High Hopes incurred any treatment technique violations? Why or why not?

9. Have they incurred any monitoring violations? Why or why not?

Key Points – Compliance

- Compliance with the Disinfection Requirements Rule (DRR) treatment technique (TT) is determined based on source type and number of distribution disinfectant residual samples per month.
    - Groundwater (GW) systems collecting <40 samples per month are in compliance if no more than 1 sample per month is less than 0.2 mg/L in 2 consecutive months.
    - GW systems collecting ≥40 sample per month are in compliance if no more than 5% of samples per month are less than 0.2 mg/L in 2 consecutive months.
    - Systems using surface water (SW) and groundwater under the direct influence of surface water (GUDI) and that collect any number of samples per month are in compliance if no more than 5% of samples per month are less than 0.2 mg/L in 2 consecutive months.
- Compliance determinations are based on the number of samples in the DRR sample siting plan (SSP).
- For systems required to report both free and total chlorine, compliance is based on the higher result.
- Treatment technique (TT) violations occur when a water system fails to maintain the minimum residual in the required number of samples for 2 consecutive months.
    - For GW systems collecting <40 samples per month, a TT violation occurs any time 2 (or more) samples are less than the minimum residual of 0.2 mg/L in 2 consecutive months.
    - For GW systems collecting ≥40 samples per month, and for *any* SW system (regardless of the number of samples per month), a TT violation occurs any time more than 5% of their monthly samples (based on the number indicated in their SSP) are less than the minimum residual of 0.2 mg/L in 2 consecutive months.
- A violation of the treatment technique requires one-hour notification to the Department and Tier 2 PN.
- Missed monitoring violations require Tier 3 PN.
- Failure to submit a SSP and failure to monitor according to the SSP are manually generated violations.

Lesson 4: Distribution System Investigations (DSI)

Objectives – Distribution System Investigations (DSI)

By the end of the lesson on Distribution System Investigations, you will be able to:

- Identify what triggers a Distribution System Investigation (DSI)
- Describe the information needed to complete the Distribution System Investigation and Corrective Action Form
- Describe the DSI submission requirements

DSI Triggers

The requirement for a water system to conduct a DSI is located in Chapter 109.710(e)(5):

> "a public water system that fails to meet the minimum level specified in subsection (c) or (d) at any sample location for 2 consecutive months or more shall conduct an investigation to determine the cause and appropriate corrective actions and shall submit a written report to the Department within 60 days."

This is a lengthy citation, so let's break it down to fully understand what it means.

- The first part of the citation states "a public water system that fails to meet the minimum level specified in subsection (c) or (d)…", which refers to the requirement to maintain a minimum of 0.2 mg/L disinfectant residual in the distribution system.
- The next part states "…at any sample location…". This translates into any *single* compliance monitoring location; it must be the *same* location that fails to meet the minimum of 0.2 mg/L to trigger a DSI.
- Following that it states "…for 2 consecutive months or more…". The investigation is triggered when any single monitoring location is below the 0.2 mg/L minimum residual for 2 consecutive months or more.
    - Any additional consecutive months, such as the third month of results < 0.2 mg/L in a row, will *not* trigger a new investigation
    - A new investigation will be triggered if the same site is back above the minimum residual for a month or two and then has another 2 consecutive months < 0.2 mg/L.

Example #1:

Site 701 distribution residual results

July	0.14 mg/L	
August	0.10 mg/L	**Investigation Triggered**
September	0.12 mg/L	

No additional investigation is triggered in September, but the system should include their September sample in the investigation.

Example #2:

Site 701 distribution residual results

July	0.14 mg/L	
August	0.10 mg/L	**Investigation Triggered**
September	0.22 mg/L	*back above regulatory limit*
October	0.13 mg/L	
November	0.12 mg/L	**<u>New</u> Investigation Triggered**

The system is back above the regulatory limit in September, but since October and November are below the minimum again, a new investigation is required.

It is important to note that if a system has **two sites** that are below the minimum of 0.2 mg/L for two consecutive months, **they will trigger <u>two</u> DSIs**. Since the DSI requirement is *site specific*, any site that is < 0.2 mg/L for two consecutive months will trigger a DSI. Later in this lesson we will discuss the DSI form and how to handle completing and submitting the form if more than one DSI is triggered.

Additional DSI Triggers:

There are two additional reasons for a new investigation to trigger, *even if there are consecutive months < 0.2 mg/L*.

1. The first is that the due date for the first investigation has passed.
2. The second is if a completed investigation is received by DEP *prior to* the due date.

In either case, the DSI trigger clock is reset, so that additional consecutive months with low results at the same location will trigger a new investigation. We will revisit these additional triggers later in this lesson after discussing DSI due dates and submission.

Distribution System Investigation and Corrective Action Form

Let's go back to 109.710(e)(5) …

- The next part of the citation states that the water system "shall conduct an investigation to determine the cause and appropriate corrective actions…".

To conduct an investigation, water systems can use the Distribution System Investigation and Corrective Action Form, DEP Form 3930-FM-BSDW0567. The draft version of this form is in Appendix B.

The Distribution System Investigation and Corrective Action Form asks for a description of the sampling event that triggered the investigation, what the investigation involved, corrective actions, and a corrective action completion schedule. Water systems are *not required* to use the DEP form; however, it is highly recommended, to ensure that a thorough investigation occurs.

This form is broken into six parts:

- Part I: General Information
- Part II: Non-compliant sample information
- Part III: Investigation Questions
- Part IV: Issues Descriptions and Corrective Actions
- Part V: Verification
- Part VI: State Review

Part II:

A DSI is always going to have at least two non-compliant DRR samples associated with it that are below the required minimum distribution disinfectant residual level of 0.2 mg/L. The purpose of Part II of the form is to gather information specific to all of the non-compliant samples that contributed to triggering the DSI.

- A separate table should be completed for *each* non-compliant sample. There are four of these tables under this part of the form. If more than four non-compliant samples occurred during the two-month timeframe in which the investigation was triggered, there are additional tables located on page 7 of the form.
- If a system triggers an investigation and then has additional non-compliant samples later in the month or the following month while they are conducting the DSI, they should include all of the non-compliant samples on their DSI form.

Below is an example of the non-compliant sample information table.

Non-Compliant Sample #1:	Sample Location ID#:	Sample Location:	
Sample Date:	Name of Sample Collector:		
Chlorine Residual: Free ☐: mg/L	Total ☐: mg/L		
Was the sample collected according to the DRR sample siting plan?		YES ☐	NO ☐
Was the instrument used for the disinfectant analysis EPA Method 334.0 compliant?		YES ☐	NO ☐
Has the analyst who performed the disinfectant residual monitoring and analysis passed the analyst initial demonstration of capability (IDC) under EPA Method 334.0?		YES ☐	NO ☐

- The first two boxes, sample location ID# and sample location, should match the DRR sample siting plan.
- The sample date, name of sample collector and chlorine residual should be available in the sample log for a grab sample or on the data recorder for an on-line analyzer.
- The three questions determine if the sample was collected appropriately. The investigator should be able to answer these based on records at the water system.
    - Note that the NO answer box is grayed out for each of the three questions.
    - A NO answer indicates a regulatory issue found with the sampling practices. If uncorrected, the system could receive a violation during their next inspection.

Part III:

Next is Part III: Investigation Questions. This part of the form contains questions for specific portions of the water system. The primary purpose of the questions is to identify the cause of the low disinfectant residuals in the distribution system. Therefore, this is where the bulk of the investigation will occur.

Part III is broken into three sections (A through C):

- Section A is for the plumbing system and should only be completed at water systems that have a single service connection.
- Section B is for the distribution system and should only be completed at a water system that has multiple service connections.
- Section C is for distribution system storage facilities.

Below is an example of what one of the sections look like; it is Section A for water systems with a single service connection.

A. Plumbing System for a PWS with a *Single Service Connection*

**If PWS has multiple service connections check here and skip to section B* ☐.

Questions	Answer to Question		
	YES	NO	N/A
1. Was there any time during the 30 days prior to the investigation being triggered that the disinfectant residual entering the plumbing system was less than the water system's residual goal?	☐	☐	
2. Were any water related customer complaints received within the 30 days prior to the investigation being triggered?	☐	☐	
3. If plumbing work was conducted in the system within the 30 days prior to the investigation being triggered, was the plumbing system properly disinfected after work was completed?	☐	☐	☐
4. Did the system experience low or negative pressure within the 30 days prior to the investigation being triggered?	☐	☐	
5. Were there any positive bacteriological samples in the vicinity of the non-compliant location within the 30 days prior to the investigation being triggered?	☐	☐	
6. Were additional disinfectant measurements collected as part of this investigation?	☐	☐	
7. Does water quality data collected in the plumbing system as part of this investigation show results indicative of an issue?	☐	☐	☐

- At the beginning of each section is a statement telling the investigator to skip to the next section if this section is not applicable. For example, if the water system doesn't have a plumbing system because there is more than one service connection, the investigator would check this box and skip to the next section.
- For each question, there are three possible answers YES, NO, or N/A. The N/A response is blacked out for questions where N/A would not be appropriate. For these questions the answer must be either YES or NO.
- Any time the investigator checks an answer located in a gray box, it is an issue that must be explained in Part IV of this form.

Part IV:

Part IV is where the investigator explains any issues that were found as part of the investigation, corrective actions they are going to take to correct the issue, and the schedule they are going to follow while correcting it.

There are eight issue boxes available in this part of the form. If the water system identifies more than eight issues and needs more boxes, there are more on page 8 of the form.

The investigator should complete the following:

- In the first line of this table, the investigator should provide the section letter and question number from Part III that correspond to the issue that was discovered.
- In the Issue Description box, the investigator explains the issue or the problem that was found during the investigation.
- In the Corrective Action and Completion Schedule box the investigator describes the corrective action(s) that are planned to correct the issue and the schedule by which the water system plans to complete the corrective action(s).

Here is an example of a completed table in Part IV:

Section Letter	C	Question #	3
Issue Description		**Corrective Action and Completion Schedule**	
The tank inspection conducted last year showed a large amount of sediment in the bottom of the tank.		***The sediment was removed in June of 2017.***	

- In Part III, Section C, the investigator answered YES to question 3, "Did the most recent tank inspection identify the need to remove sediment or issues with the structural integrity?" Since that answer is in the shaded box, it indicates an issue that needs to be described here in Part IV.
- The investigator then described the issue in the Issue Description box and stated the Corrective Action and Completion Schedule in the appropriate box.
- In this example the corrective action has already been completed, so there is no completion schedule needed, just the date on which the corrective action was completed.

It is important to note that **water systems should contact DEP prior to completing any corrective action that goes above and beyond normal system maintenance**. If a corrective action involves a treatment change or construction of any sort, a permit may be required to complete the corrective action. In that case, failure to obtain a permit would result in a violation.

Part V:

Part V. of the form is the verification. The purpose of the verification is for the investigator and the responsible official of the water system to certify that the information provided on the DSI form is accurate and true. They do this by signing and dating below the certification statement.

Below is an excerpt from Part V of the form.

I hereby certify that the information contained herein is true and correct to the best of my knowledge, information and belief.

Investigator's Signature:	**Date:**
Responsible Official's Signature:	**Date:**

It is important to clarify that ***all* investigation forms need to be signed and dated by *both* the Investigator and the Responsible Official**.

Below the signature boxes are notes regarding submission of the DSI form.

- The first note refers to the regulatory language, which states that the water system "shall submit a written report to the Department within 60 days". The next part of this lesson will cover how to determine when the 60 days begins and ends.
- The second and third notes indicate where to submit the forms. This will also be discussed in the next part of the lesson.

DSI Submission

Let's go back once more to 109.710(e)(5) …

- The last part of the citation states that the water system "shall submit a written report to the Department within 60 days."

The DSI report must be submitted to the local DEP office **within 60 days of triggering** the investigation; therefore, it is critical to know how to determine when the 60 days begins and ends.

- The **trigger date** is the **first day of non-compliant sample results** in the 2nd consecutive month at the same location.
- To determine the due date of the report, Day 1 of the 60-day time period is the day *after* the trigger date.

Let's look at an example…

On the following page is a monitoring schedule for July and August for a system that monitors every Wednesday at the same site, location ID 701.

July

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2	3	4 Routine Sample	5	6	7
8	9	10	11 Routine Sample <0.2 mg/L	12	13	14
15	16	17	18 Routine Sample	19	DSI Trigger Date: August 15th	
22	23	24	25 Routine Sample	26	27	28
29	30	31			DSI Due Date: October 14th	

August

Sun	Mon	Tue	Wed	Thu	Fri	Sat
			1 Routine Sample	2	3	4
5	6	7	8 Routine Sample	9	10	11
		14	15 Routine Sample <0.2 mg/L	16 Day 1	17	18
19	20	21	22 Routine Sample <0.2 mg/L	23	24	25
		28	29 Routine Sample	30	31	

- Non-compliant samples that were <0.2 mg/L were recorded at location ID 701 on July 11, August 15, and August 22.
- A DSI was triggered, with a trigger date of August 15. That is the date of the first non-compliant sample result in the 2nd consecutive month.
- The DSI report is due in 60 days. Day 1 of the 60 days is August 16, the day after the trigger date. The DSI is due on October 14.

Failure to submit a <u>complete</u> DSI within 60 days of the trigger date is a reporting violation. This violation does not require PN, but it must be included in the CCR for a community water system.

Methods to submit the DSI:

There are several methods by which a water system can submit their DSI:

- Regular mail
- Certified mail
- Fax
- Email (scanned)
- Hand deliver to district office

If using either regular or certified mail to submit the investigation, water systems should pay attention to the second and third notes under the verification section of the DSI form that were mentioned earlier.

- The second note explains how the water system should address their envelope to mail the form.
- The third note contains a link to eLibrary and the form number of the document that contains district office addresses.

One concern about submitting the form by mail is the shortened timeframe for conducting the DSI. The department needs to *receive* the form within the 60-day timeframe, so the water system needs to allow for postal delivery time.

If submitting the DSI form by fax or email, the system should contact their Sanitarian first, to ensure they have the correct fax number for the district office or email address. If the DSI is being sent via email, it must be a scanned .pdf document of a signed DSI form.

The last option is for the water system to hand deliver the DSI form to the district office, which is another way to maximize the amount of time they have to complete the DSI.

Regardless of what method a water system uses to submit their completed DSI, the submission date is the date DEP *receives* the form. This is consistent with other Department submission policies. Therefore, the Department must **receive** the DSI by the due date. Once the Department receives the DSI and enters the received date into PADWIS, the water system will be sent an automatically generated email that the DSI was received.

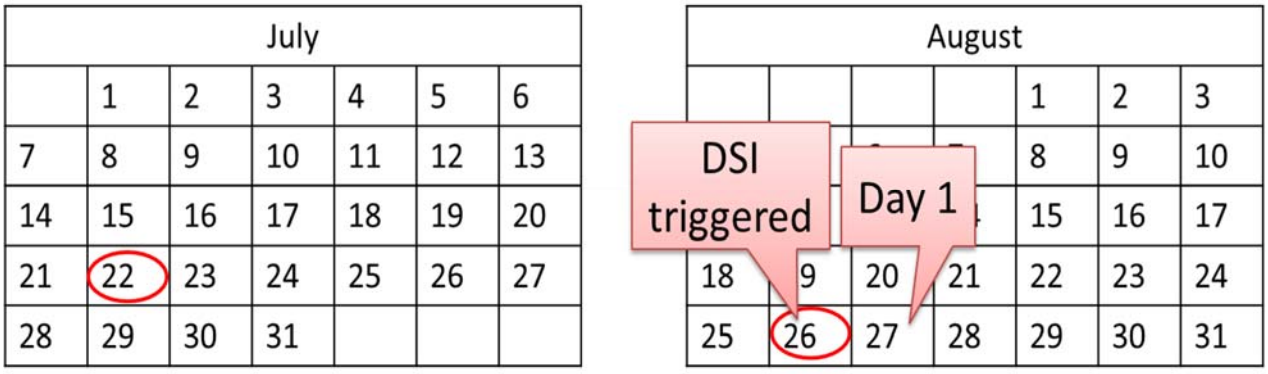
Additional Triggers – Resetting the DSI trigger clock:

As noted earlier, there are two ways in which additional consecutive months with low results will trigger a new DSI, after the DSI trigger clock is reset.

1. The first is if the due date for the first investigation has passed. If the water system does not submit an investigation by the 60-day deadline, *the DSI clock will be reset on the day after the due date* of the first DSI.

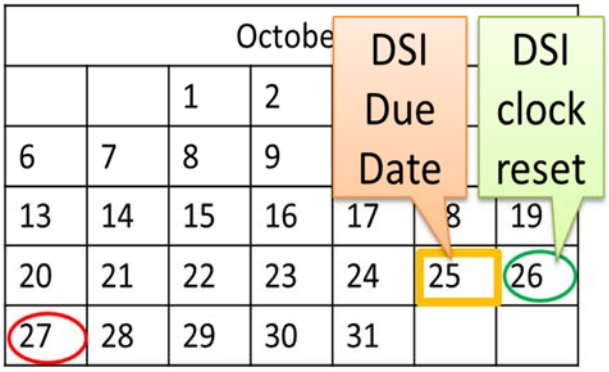
   For example, if a water system has low residuals <0.2 mg/L at location 701 in July and in August, that will trigger an investigation.

   - If the August sample was analyzed on August 26th, then Day 1 of the 60-day deadline is August 27th, and the investigation is due on October 25th.



   - The same system then submits data for location 701 for a September 20th sample and an October 27th sample, both of which are <0.2 mg/L. They do not submit a DSI by the October 25th due date.

September						
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

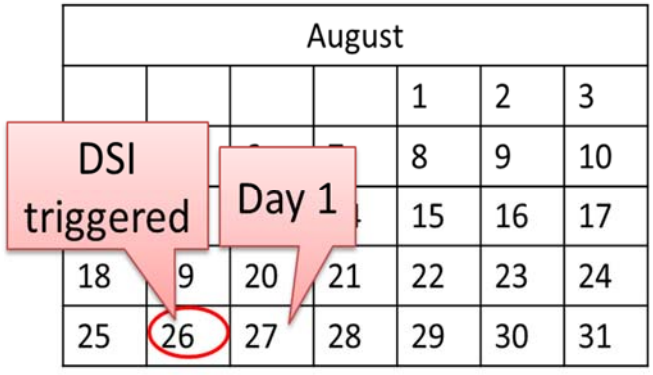


- In this example, a new investigation is not yet triggered at this point.
- The DSI clock is reset on October 26th, the day following the original 60-day due date.
- The September sample should have been included with the investigation that was due on October 25th, since it occurred before the due date and before the clock was reset.
- However, if this system has a low residual again at location 701 in November, a new investigation would be triggered at that point, because the system would have 2 consecutive months, after the DSI clock was reset, with low residuals at the same location.

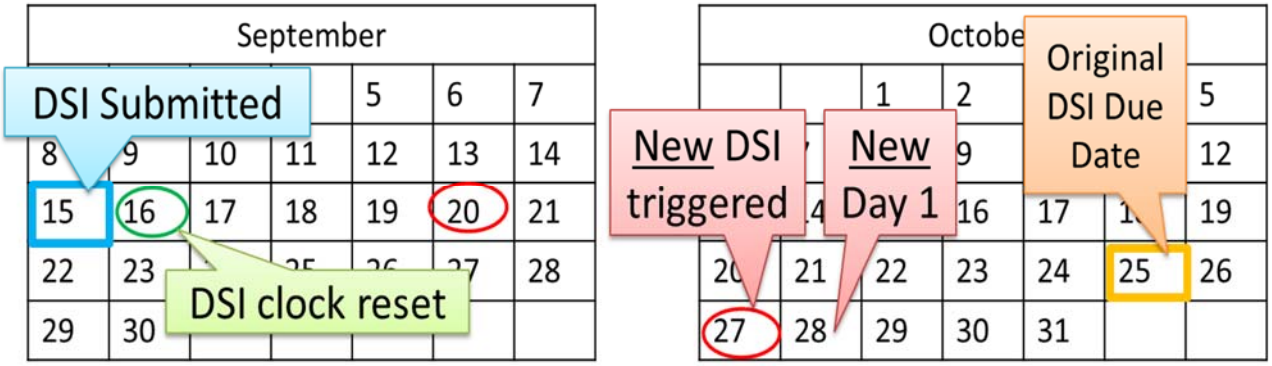
2. The second additional trigger reason is if a completed investigation is received by the Department *prior to* the 60-day deadline. In this case, *the DSI clock is reset on the day after the complete investigation received date*.

   For example, if a water system has the same July and August results as the last example at location 701, they trigger an investigation, due on October 25th.

July						
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			



- In this example, however, they submit their completed investigation early on September 15th.
- The DSI is submitted with a received date of September 15th, and the DSI clock is reset on September 16th.
- The water system then submits data for September 20th and October 27th at location 701, which are both <0.2 mg/L.



- In this example, *a new investigation is triggered* at this point.
- Since the clock was reset on September 16th, the September 20th and October 27th results will trigger a new investigation.
- October 27th is the new trigger date, and October 28th is Day 1 for the new 60-day DSI deadline.

Submission when multiple DSIs are triggered:

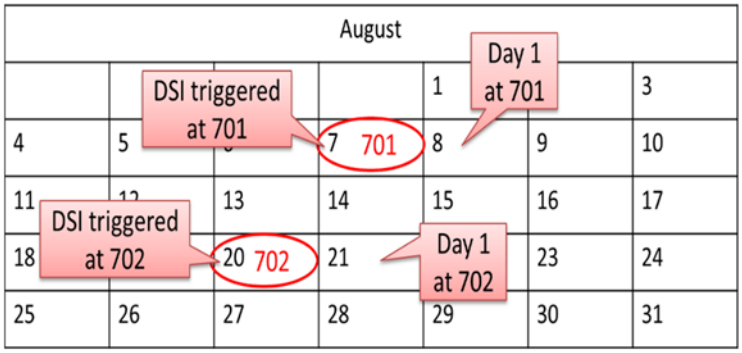
When a water system triggers more than one DSI in a month, how many forms are they required to submit?

- For a large system, if the two sites that triggered are located far apart in their distribution system, they have two options:
  1. They can investigate each portion of the water system that had the low residual and submit two separate DSI forms; or
  2. They can investigate the entire water system and submit one DSI form for both.
- For a small system, it will most likely be easiest for them to investigate their entire water system and submit one DSI, since the sites will most likely be located nearby in their distribution system.

It is important to note that **multiple DSIs triggered in one month may have different due dates**. Since the DSI is site specific, each DSI that is triggered is based on the dates of low residuals at each specific site.

The significance is that if a system triggers two (or more) DSIs in a month, and they choose to investigate the entire system and submit one DSI report form, they need to *submit it by the **earliest** due date*.

For example, consider a system that has a low residual at site 701 for the 2nd consecutive month on August 7th, and a low residual at site 702 for the 2nd consecutive month on August 20th.



- The trigger dates for the two DSIs are different: August 7th is the trigger date for 701; August 20th is the trigger date for 702.
- Since the trigger dates are different, that means that Day 1 of the 60-day deadline is also different for the two DSIs. Day 1 of the 60-day deadline is August 8th for 701 and August 21st for 702.
- Subsequently, the due date for each DSI is also different. The due date for the DSI at site 701 is October 6th. The DSI for site 702 is due on October 19th.
- If this system choses to conduct and submit one investigation that covers both locations, it must be submitted by the *earlier* due date, October 6th.

Key Points

- A Distribution System Investigation (DSI) is triggered when a single monitoring location is <0.2 mg/L for 2 consecutive months.
- The Distribution System Investigation and Corrective Action Form can be used by water systems to conduct a complete investigation.
- The DSI report must be submitted within 60 days of triggering an investigation.
    - The trigger date is the first day of a non-compliant sample result in the 2nd consecutive month.
    - To determine the due date, day 1 of 60 days is the day after trigger date.

Lesson 5:

Best Management Practices for Distribution Disinfection Management

Introduction:

By the end of this lesson, you will be able to:

- Describe how water age and disinfect demand affect distribution system water quality
- Identify several best management practices (BMPs) for disinfectant residual management

Background:

"Best management practices" are methods or techniques to comply with the disinfectant residual requirements.

The implementation of best management practices can help water suppliers comply with the disinfectant residual treatment technique by:

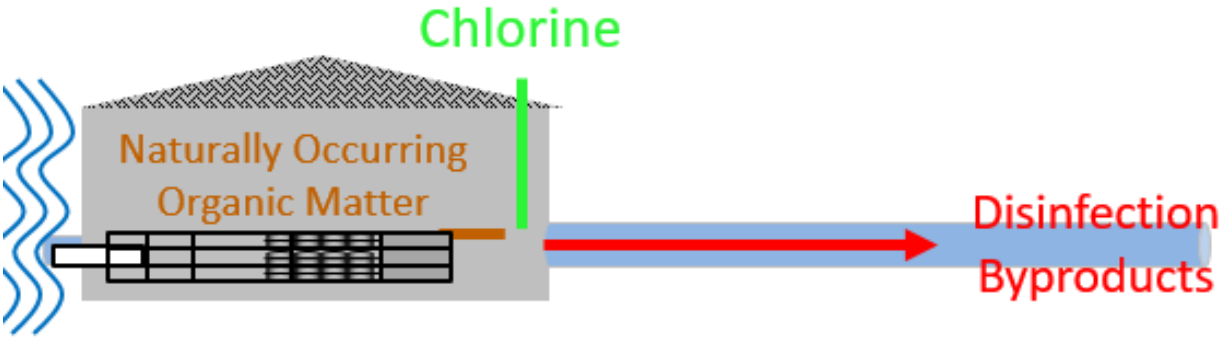
1. Lowering chlorine demand
2. Maintaining an adequate disinfectant residual throughout the distribution system

Examples include flushing and storage tank management, which are explained in this lesson.

BMPs to maintain disinfectant residuals also help to control disinfection by-product (DBP) formation by lowering the chlorine demand and reducing water age.

Distribution System Water Quality

The DRR focuses on ***distribution*** chlorine residual levels and issues. However, remember that ***distribution*** system water quality starts with the ***treatment plant*** and water quality does not improve after leaving the plant.



Surface water filter plants, in particular, must consider reducing DBP formation potential at the plant.

- For example, systems should determine the optimum coagulant dose and pH range for total organic carbon (TOC) removal prior to disinfection.

We are making this point about treatment plants because some systems may increase the chlorine residual at the treatment plant to meet distribution residual goals. However, doing this may increase DBP formation in the distribution. A better approach is to consider best management practices in the distribution system.

Distribution System: Water Age

Assuming in plant water quality is the best it can be, we turn our attention to the distribution system. Regardless of the type of source, surface water or groundwater, water quality begins degrading immediately after leaving the treatment plant. Within the distribution system, chemical, biological, and physical changes occur:

- Water reacts with pipe walls, biofilm, and sediment
- **Disinfectant residual decreases**
- Microbial activity increases
- Residual organic matter and the disinfectant continue to react and form disinfection byproducts.

Therefore, **water age** is a major consideration for water quality and a focus of BMPs.

Water age can vary from system to system and **within** a system.

Results from Water Age Study:

System	Water Age
North Carolina: 300,000 customers; 1,100 miles of main (tracer study)	2 to 75 hours (3 days)
California utility	Exceeding 400 hours (16.5 days) in some areas
Canadian utility: 24,000 customers; 86 miles of main	Dead-end areas: 300 to 600 hours (12.5 to 25 days)
Examples from: EPA document “Effects of Water Age on Distribution System Water Quality” 2002	

Minimizing water age can:

- Lower the disinfectant decay
- Reduce disinfection byproduct formation

Distribution System: Chlorine Demand

The other distribution water quality issue is chlorine demand. Chlorine reacts with organic matter and microbial contaminants in the distribution. This reaction with the disinfectant leaves behind an inactive form of chlorine. The organic matter and microbial contaminants can cause excessive demand on the disinfectant.

So, BMPs also are targeted towards reducing these chlorine-demanding contaminants in the distribution system.

Best Management Practices

Flushing

Flushing involves opening a distribution connection (hydrant) to the atmosphere and discharging water from the system. Flushing:

- Removes the "stale" or old water and pulls in "fresher" water with higher chlorine residual
- Can create scouring action and remove the buildup of sediment and biofilms
    - This decreases chlorine demand

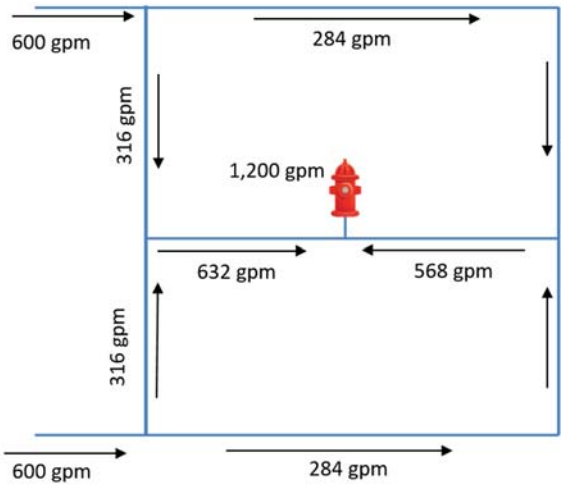
Flushing was traditionally used for periodic removal of sediment or in a "reactive mode" to water quality complaints or issues. Flushing is now being recognized as a way to address areas of high water age and/or poor water quality.

Flushing Methods

<u>Conventional Flushing Program</u>

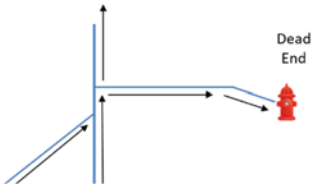
Conventional flushing may be considered **spot flushing** or stagnant area flushing.

As shown in the graphic to the right, a hydrant is opened and water flows from all directions.



- This replaces stagnant water through bulk water turnover and reduces water age.
- This causes less flow in a given pipe, so velocities may be too low to clean/scour the pipes. Generally, velocities should be greater than 2.5 feet per second (fps).
- Conventional flushing requires a large quantity of water when compared to directional flushing that we will discuss next.

Also considered conventional flushing is "**dead-end" flushing** in an area of complaints or a known stagnant area. As show in the diagram, a hydrant is opened at a dead-end and this creates is a single flow path.

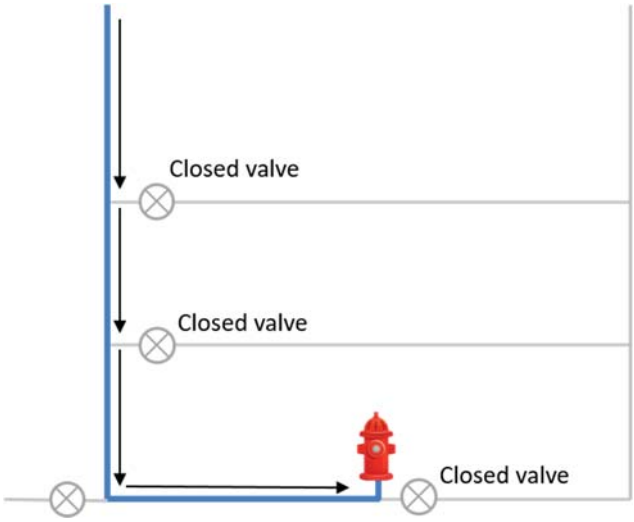


Unidirectional Flushing Program

In unidirectional flushing, the system isolates each pipeline to create flow in a single direction. This results in an organized sequential main cleaning from a "clean" starting point.

Unidirectional flushing:

- Creates higher velocities to better clean pipe (>2.5 fps)
- Requires less water
- **Negatives:**
  - Requires extensive planning
  - Manual operated process that is labor intensive



Flushing Mechanisms

Manual

In manual flushing, operators physically open and close hydrants and/or valves. This can be labor intensive if there are multiple locations.

Automated Flushers

Systems can install automated flushers. In automated flusher units, there is an enclosure that contains electrically actuated valves, a controller, a battery and a means of discharging with backflow prevention.

- Some units also have dechlorination measures built-in.
- Flushers are available with timers, the ability to set flow rates, and residual sensors to trigger flushing

Automated units can be set to intermittent or continuous operation

The DEP Clean Water program requires discharge permits on automatic flushing units.

Evaluating Your Flushing Protocol

Water systems should evaluate or create a flushing protocol. There are several considerations.

Where:

- Will you create a full-scale system-wide flushing program?
- Or, will your program focus in portions of the system, such as:
  - Mains subject to sedimentation
  - Dead-ends
  - Areas with water quality issues

Use distribution water quality records to determine the best locations for flushing. This includes areas with lower chlorine residual measurements and/or coliform positive samples.

When:

- Determine how flushing is scheduled:
  - On a regular basis (monthly, quarterly, etc.)
    - Use water quality records to determine when to flush
  - On a seasonal basis (usually spring or fall)
  - In response to complaints or water quality issues (complaints or coliform hits or low chlorine residual).

Flushing duration:

- How long will flushing last? Systems can base it on:
  - Time
  - Quantity
  - Appearance (flush until clear)
  - Water quality
    - Monitor water quality during flushing (chorine residual, pH, temperature)

Dechlorination:

Dechlorination is an important consideration when flushing. You cannot discharge chlorinated water to waters of the Commonwealth, which includes storm drains.

- Dechlorination may be necessary and there are various options available.
- The DEP Clean Water program has a fact sheet called *Planned and Unplanned Discharges of Chlorinated Water to Surface Water* that is in Appendix C. Also included in Appendix C is the *Chlorinated Water Incident Report Form*.

Flushing Reference Material:

Numerous publications are available to assist in developing or reviewing procedures before hydrant flushing, including:

- AWWA M28: Rehabilitation of Water Mains, Third Edition
- AWWA M68: Water Quality in Distribution Systems

These are available through AWWA at https://store.awwa.org/, then clicking on “Manuals of Practice”.

Storage Tank Management

Storage tanks often contribute to significant water quality degradation. This is primarily due to water age issues within the tank.

Turnover Time:

- The amount of time that it takes for the volume of the water in a tank to be completely replaced.
- Both the EPA and the DEP Optimization Programs have a guideline of a *maximum* of 5 days turnover time
  - For example:
    - 1 million-gallon tank draws 20% of its tank volume per day
    - The total volume of the tank (1 MG) will be replaced in 5 days.

- In tanks, longer turnover times lead to excessive water age. This leads to:
  - Disinfectant residual decay and
  - An increase in DBP formation

Assessing Tank Turnover

- Tank turnover is a calculated value.
  - EPA developed a spreadsheet with a turnover calculator for tanks and it can be found on the DEP Distribution Optimization website.

I. Tank Characteristics (See Glossary worksheet for illustrations of Tank Characte		
	**Data must be entered into this section for the spreadsheet to fu	
	**Do not enter tank dimensions if the tank is NOT cylindrical, rectar	
	**Hydropillar tanks can be approximated as cylindrical tanks depen	
A.	Name of Tank	Example
B.	Volume (MG)	0.5
If the SCADA/ telemetery reports tank level in feet answer question C, then answer questions E, F, and G. If the SCADA/ telemetry does not report the tank level in feet, answer "n" in question C and then answer questions D1, D2, E3, F, and G.		
C.	Is the tank Cylindrical (C), Rectangular (R), Hydropillar[1] (H), or None of these (n)?	c
D1.	Does the SCADA/ telemetry report tank level in volume (y/n)?	n
D2.	If SCADA/ telemetry is reported in volume, are the tank mixing equations applicable - see note 4 (y/n)?	
E1.	(if cylindrical/hydropillar/) Tank diameter or (if rectangular) Longest Sidewall length, D (ft)	50
E2.	(If rectangular) Shortest Sidewall length, L (ft)	
E3.	(all tanks) Inlet Diameter, d (ft)	1.00
F.	(all tanks) Maximum Operating Water Depth, H (ft)	24
G.	(all tanks) Is the tank operated fill-draw (fd) or flow-through[2] (ft)?	fd
	H/D ratio	0.48

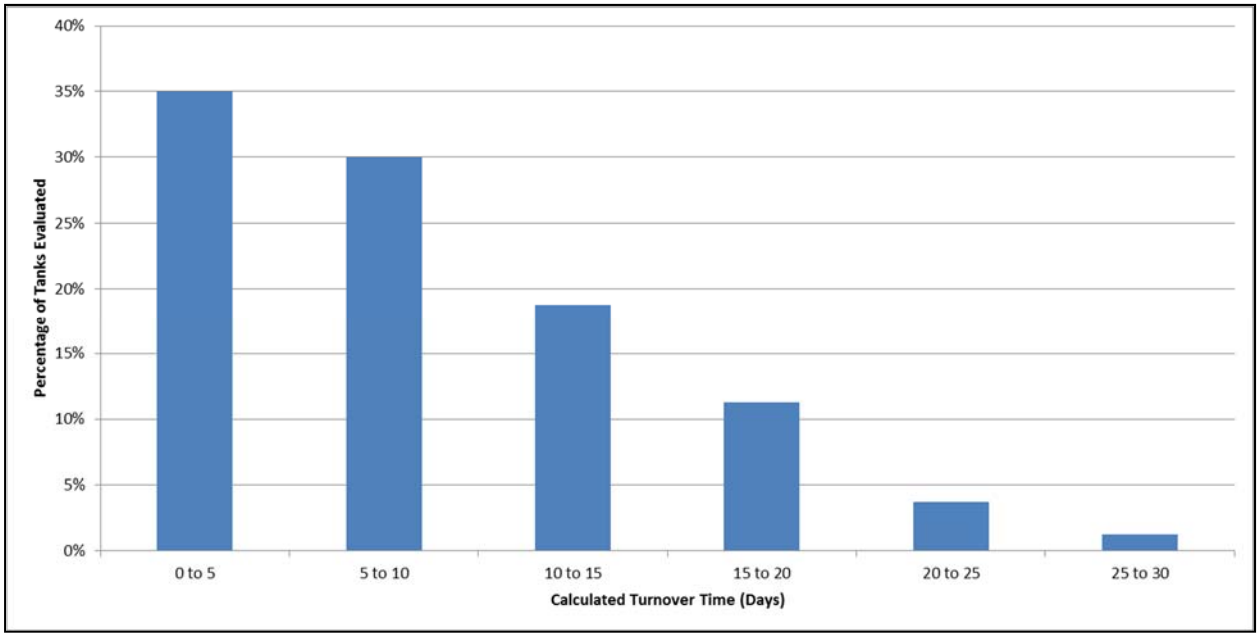
To download the spreadsheet:

- Use Google or your favorite search engine to search for: "PA DEP distribution optimization"
  - Open the DEP Optimization website and click the link on the right side for "Distribution System Optimization Goals"
  - Under the heading "Tank Operations", scroll until you see the link for "Drinking Water Storage Tank Assessment Software"
- The spreadsheet **inputs** include tank diameter, sidewall length, and maximum operating water depth.

- There are several outputs from the spreadsheet, but for course we are most interested in turnover time. Example:

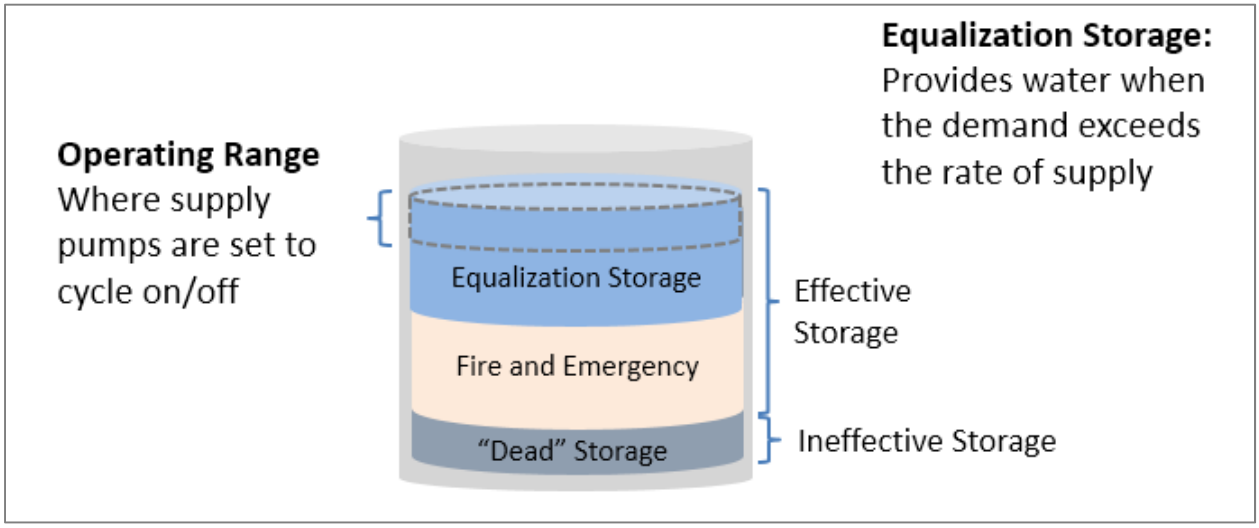
Avg Duration (Fill + Draw Time)	0.5	days
Avg Flow Rate into tank	0.06	MGD
Avg Tank Vol	0.26	MG
Turnover Time	**4.6**	**days**

Many systems are aware that storage tanks may be an issue, but tank water age has not been assessed. Here are the results of 80 tank assessments at 21 systems in PA. This study was done by the DEP Distribution Optimization program.



- 35% of tanks assessed met the operational guideline of 5 days
- 65% did not, suggesting water age may be an issue for these tanks
- Average of 8.8 days turnover time

Managing Tanks: Adjusting Operating Ranges



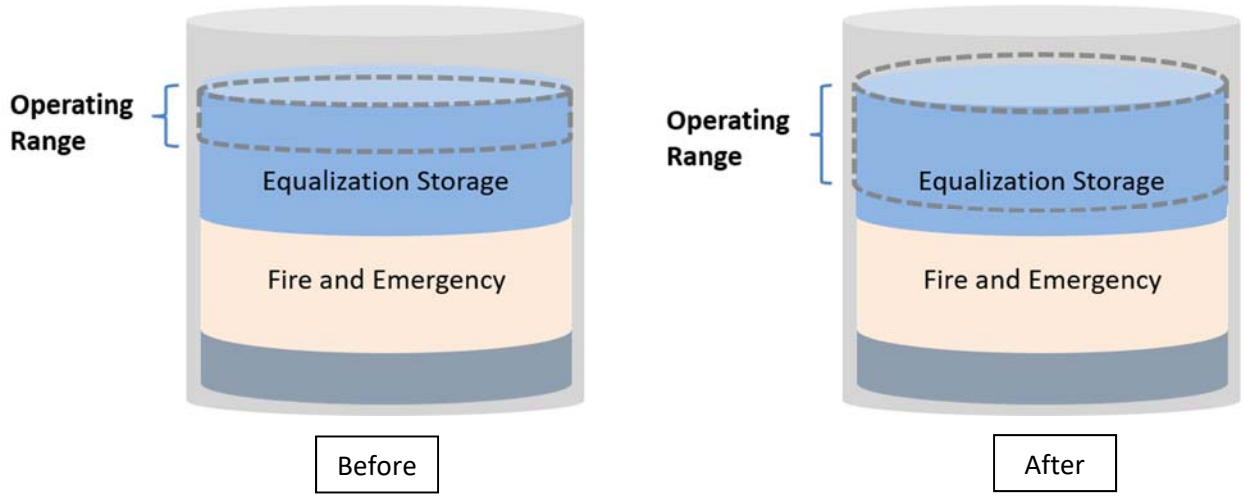
The "equalization" and the fire and "emergency storage" are what is considered the **"effective storage"**.

For tanks that "float" on the system, meaning that they provide pressure for the system, there is always "dead" or ineffective storage that is used to maintain the system pressure.

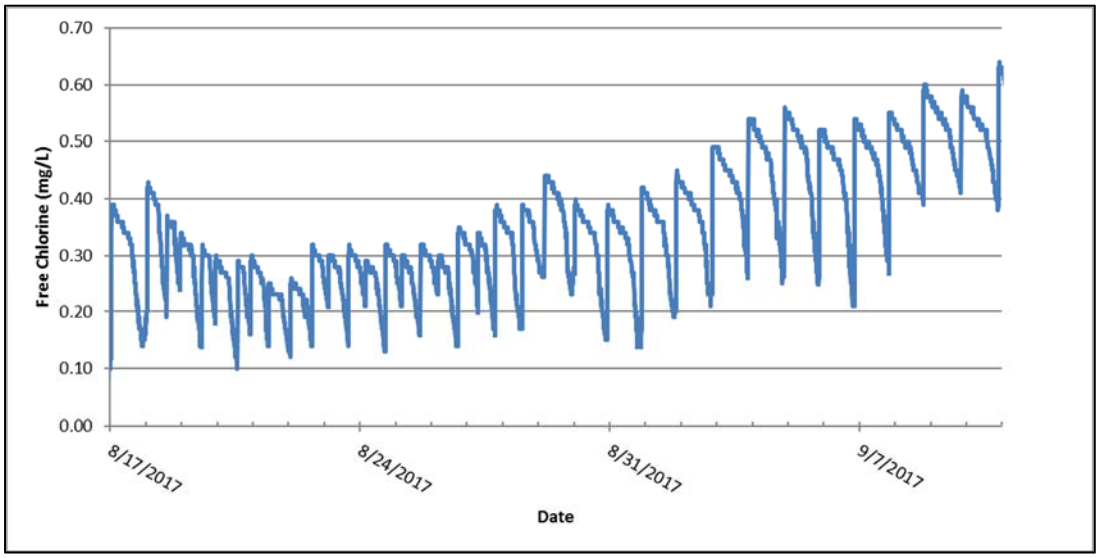
Within the equalization storage is the actual **operating range** where systems set their pumps to cycle on/off. Normally, it is set to use only a portion of the effective storage before the tank is refilled.

Adjust Operating Ranges: Deep Cycle Tanks

To deep cycle a tank, systems decrease the lower operating level. In other words, the tank is drawn down further before filling. This exchanges a greater volume during each cycle, allowing "older" water to exit the tank and bringing fresh water in.



Deep Cycling Example Data:

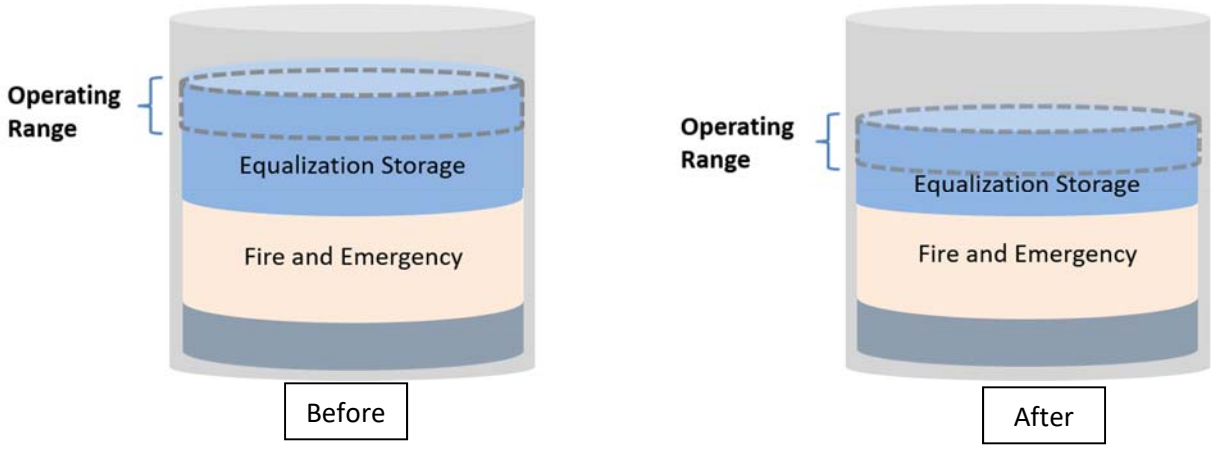


This graph that shows the impact of changing the operating levels of the tank.

- On 8/29, the system began deep cycling the tank and consequently the draw cycle changed from 2 per day to 1 per day. This is revealed by the widening sawtooth pattern. This sawtooth pattern is the free chlorine going up and down in the tank during fill and drawn cycles. The higher residual occurs during the draw cycle, and then the chlorine level falls as higher water age supply is drawn from the tank.
- With the increased volume of water exchanged, the overall residual levels in the tank began increasing as more "fresh" water was and allowed them to bring the residual up in the tank.

Adjust Operating Ranges: Increase % of Total Volume Exchanged

Another tactic is to increase the *percent* of total volume exchanged. To increase the percentage of volume exchanged, systems lower both the upper and lower operating levels in the tank. Essentially, you are maintaining less storage volume, which causes a greater percentage of the tank to be exchanged. In turn, you are reducing the water age in the tank by bringing in a higher percentage of "fresh" water.



A system would first need to determine if, and how much, the storage can be lessened. Water system engineers can determine the required equalization volume for a system by reviewing demand patterns based on flow and storage tank volume changes, historical production, pumping, and tank level records.

Remember: It is critical to maintain adequate pressure and volume for emergency situations

Back to the Tank Assessment Spreadsheet

You can use the spreadsheet to estimate the effect of changing the operating levels of the tank. You can input a different maximum tank level or minimum level and see how the calculated turnover changes.

- Here is an example excerpt from the spreadsheet with changes to the max and min operating level. The turnover time was reduced from 4.6 to 4.2 days.

	No Changes	Scenario A
High/Max Level	18.71	17.00
Low/Min Level	16.79	15.00
Turnover Time	4.6	4.2

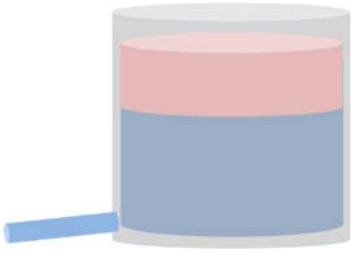
Managing Tanks: Remove Unnecessary Tanks from Service

Some systems can consider removing storage tanks, if possible. This may be the case in an area in which an industrial facility (large user) has left or closed.

Managing Tanks: Mixing

Poor mixing in tanks leads to **stratification.** Here is how stratification occurs:

- Heat from sun warms water
- Less dense warm water floats to top
- When tank drains, warm water stays on top.
- Fresh water filled from the bottom is colder.
- This creates a thermocline that traps the “older” water at the top.
- Older water may finally be pulled into system during heavy use



Stratification leads to inconsistent water quality:

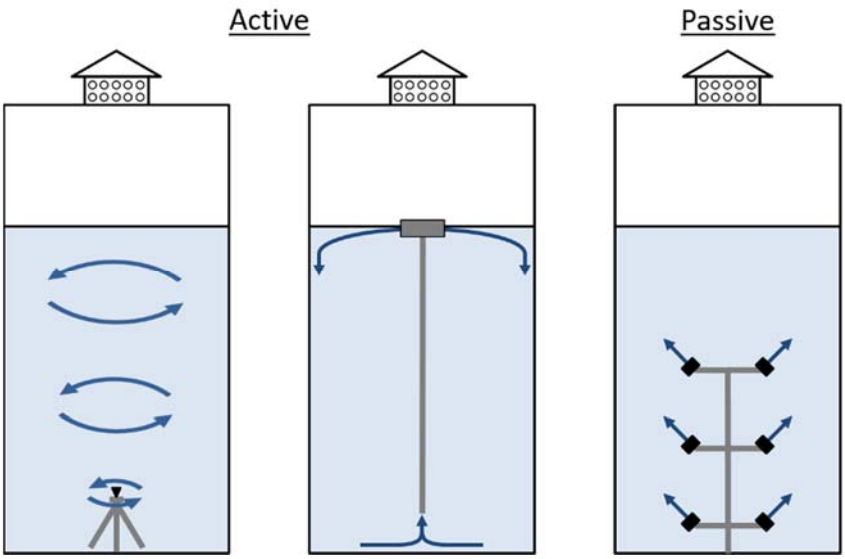
- Disinfectant residual, pH, and temperature vary across the depth of tank

Remember that mixing does NOT decrease water age or improve the quality of water entering the tank. In other words, low chlorine residuals coming into the tank will not increase in the tank with mixing.

However, mixing DOES homogenize water quality by preventing stratification. This promotes consistent disinfectant residual and decreases overall chlorine demand.

Mixing systems in storage tanks are classified as active or passive.

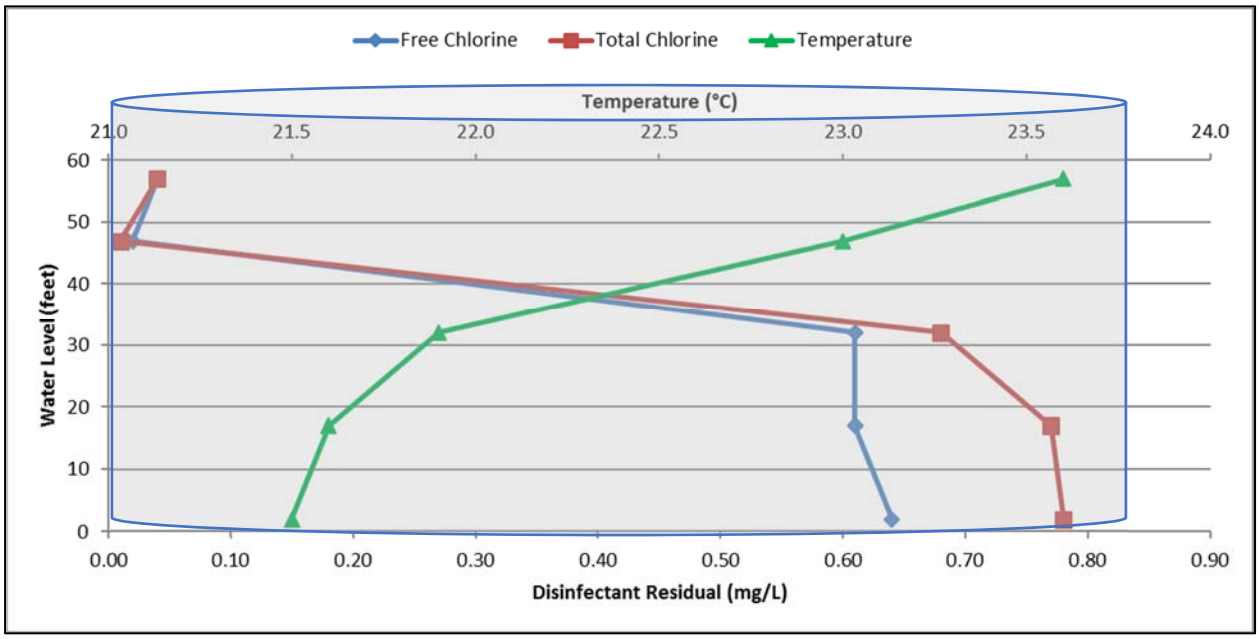
The active systems are on all the time no matter what the level of tank. The passive system, shown on the right side only has an effect during filling of the tank.



Important Note: A permit is required for the addition of tank mixers. Contact your local DEP office.

Thermal Stratification: Unmixed Standpipe

Here is some actual data from a study that DEP did of an unmixed storage tank. There is an overlay graphic of a tank to help you visualize the data within the tank setting.

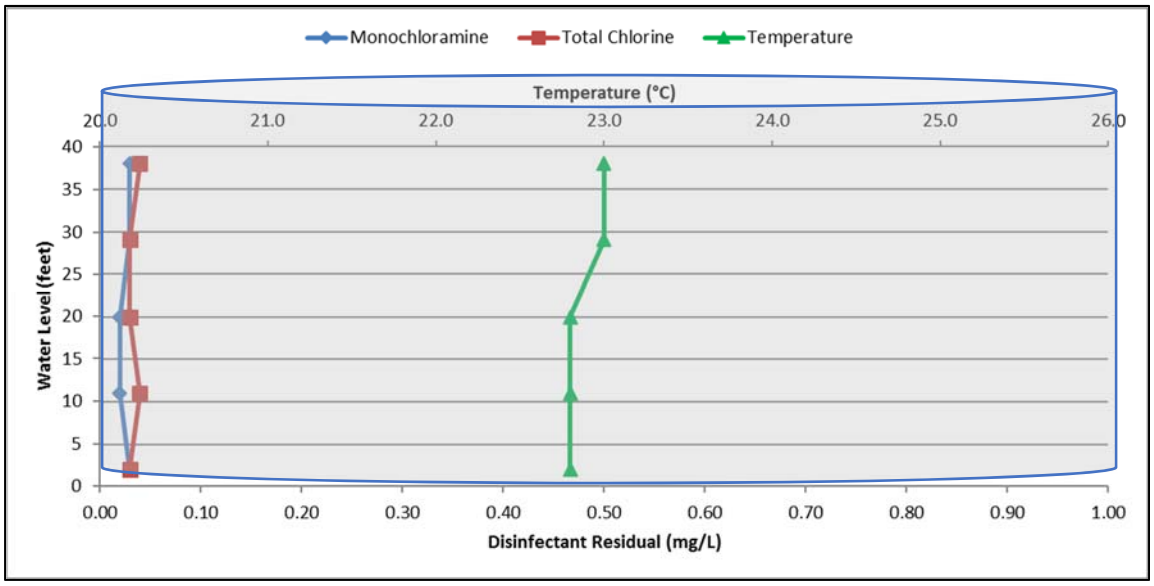


- The water level in feet is shown on the left side, with 0 feet being the bottom of the tank.
- The temperature scale is shown across the top
- The disinfectant residual scale is shown across the bottom.
- The temperature data, which is shown with triangular data points, reveals thermal stratification. Near the bottom of the tank the temperature is 21.5 degrees C. At about 32 feet there is a sharp increase in temperature. Please note that the thermal stratification takes place with about 2 degrees C. It does not take much of a temperature change to be stratified.
- You can also see that the free chlorine residual (shown in diamond data points) drops sharply at 32 feet and up.

Because of the thermal stratification, the warm, less dense water stays at the top of the tank and doesn't get removed during draw cycles. The water age continues to increase at the top of the tank.

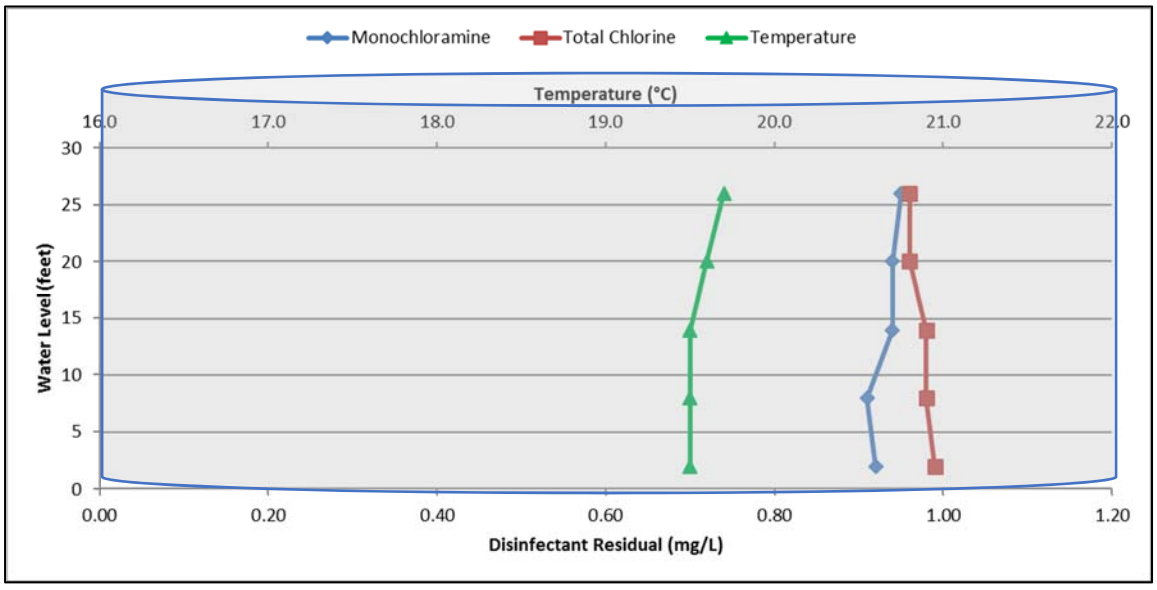
Standpipe with Mixing System:

Show here is a storage tank with a mixing system from another DEP study. You can see that the temperature and residual stay consistent throughout the tank.



Note also, that the chlorine residual in this tank was not very good, even if it was consistent.

Systems should NOT assume a tank needs a mixing system. The graph below shows a tank WITHOUT a mixing system that was not stratified.



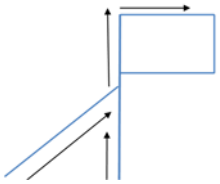
The tank has a turnover time of around 4 days. Based on the design of the tank and the operational strategy, there is likely no need for a mixing system.

Systems should evaluate their tanks to determine if a mixing system is necessary prior to spending tens of thousands of dollars in capital improvements that may not be necessary or help improve water quality.

Other Possible BMPs

Looping Dead-ends:

In some systems with physical dead-ends, the system may be able to loop these dead-ends. This is done by connecting a dead-end main to another water main. This eliminates the physical dead-end.



Disinfectant Residual Boosting

Disinfectant residual boosting in the distribution system is another possibility for systems with water age issues. This involves the addition of a second dose of chlorine at strategic locations in the distribution system.

- Boosting can be used to increase the chlorine residual in distant areas of distribution
- Boosting is a good alternative to increasing in-plant chlorine doses and may then allow for lower in-plant chlorine doses, which can help delay the formation of DBPs. However, systems still must maintain compliance with treatment plant disinfection requirements.

There are several considerations when boosting residual chlorine in the distribution:

- Residual should be monitored before and after chlorine addition to optimize the treatment and monitor performance.
- Alarms and site visits are critical for remote locations
- Boosting chloraminated residuals is very complex (discuss with engineer)
- A permit is required for the addition of chlorine boosting in the distribution. Talk to your local DEP office.

Distribution System Component Maintenance

Distribution system components are potential sources of organic matter and microbial contamination.

- Example sources of contamination in the distribution include: Aging pipes, improperly installed valves, cross connections

Contamination is then a source of chlorine demand, which “uses up” the disinfectant residual in the distribution.

<u>Asset Management Plan</u>

Because of the potential sources of contamination in the distribution, a best management practice is to create an asset management plan that addresses the planned replacement of distribution system components. Water system use the plan to make sure that planned maintenance can be conducted and capital assets (pumps, motors, pipes, etc.) can be repaired, replaced, or upgraded on time and that there is enough money to pay for it.

For more information on Asset Management, speak with your local DEP office and ask about the Capability Enhancement program.
https://www.dep.pa.gov/Business/Water/BureauSafeDrinkingWater/CapabilityEnhancement/Pages/AssetManagement.aspx

Leak Detection

As a practice, systems should have a leak detection program to reduce "non-revenue" or "unaccounted for" water. Systems should consider system-wide surveys on a regular basis followed by any necessary repairs. Leaks are not simply a loss of revenue for a water utility, but the leak is a potential pathway for contamination.

There are various methods for detecting water distribution system leaks. These methods usually involve using sonic leak-detection equipment, which identifies the sound of water escaping a pipe.

Proper Pipe Replacement and Repair

Closely tied to leak detection and asset management is the topic of proper pipe replacement and repair. There are many considerations for repair and replacement of pipes to prevent contamination and subsequent chlorine demand.

- Trained crew, proper technique, appropriate materials, adequate tools
- Follow AWWA Standard C651

Cross-Connection Control and Backflow Prevention Program

Finally, systems should implement a Cross-Connection and Backflow Prevention program. If a system already has a program, it should be reviewed and potentially upgraded. Implementing or upgrading a Cross-Connection and Backflow Prevention Program can prevent the flow of contaminants into a system.

- In PA, it is the responsibility of the customer to eliminate cross-connections and provide backflow devices to prevent contamination of the distribution system from their building/facility. For example, a commercial building with a sprinkler system is required to install and test backflow prevention devices.
- Through local ordinances the water supplier's jurisdiction and enforcement can be established. The water system's program can set customer requirements for cross-connection and backflow prevention at the customer.
- The water system's program should then monitor customer compliance and backflow prevention testing.

BMP Activity: Riverville Community Water System

The system failed to maintain a 0.2 mg/L free chlorine residual in the distribution during two consecutive months. This occurred at one location (704) in the southeast residential section of the system. They conducted the required distribution system investigation and found the following issues:

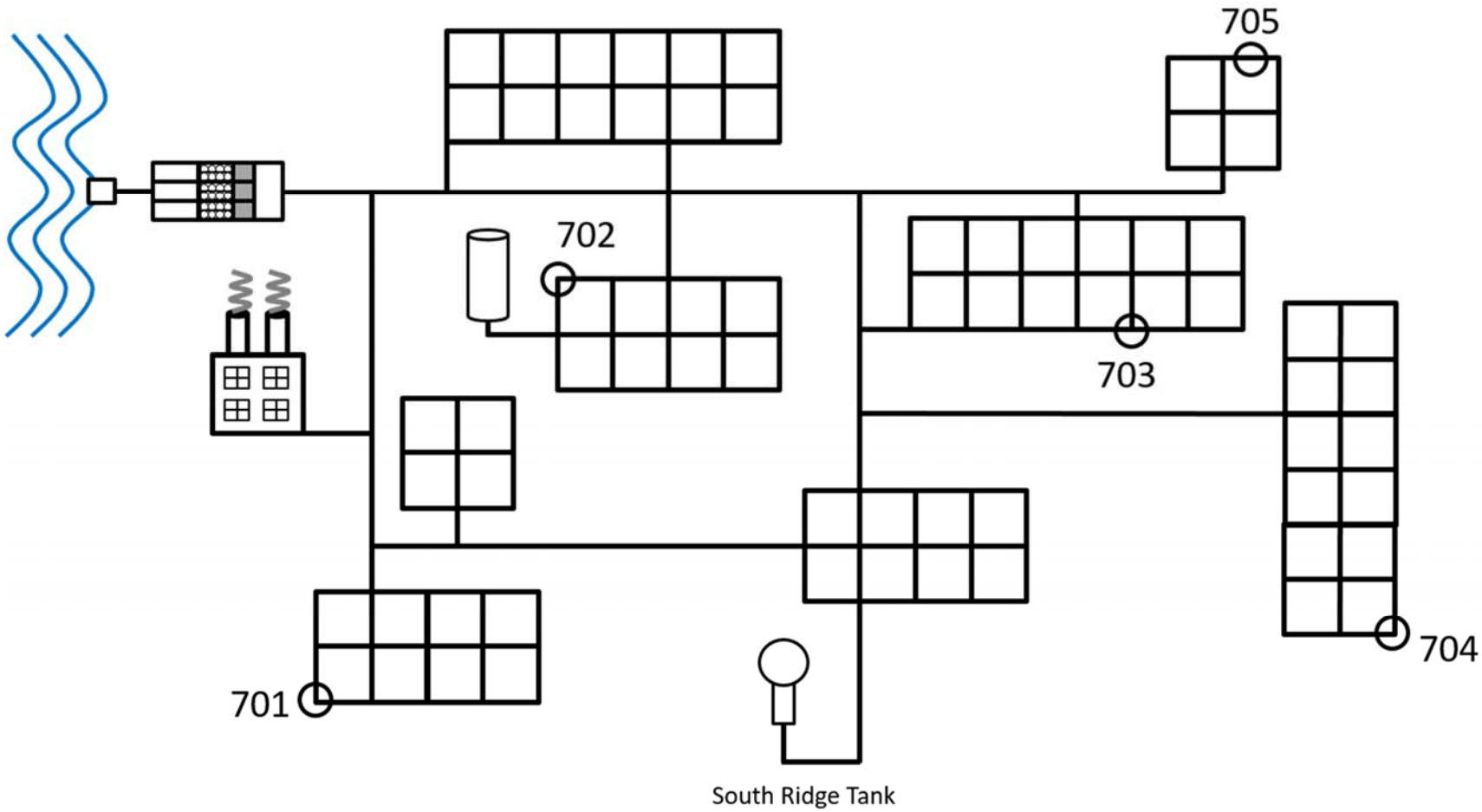
- Distribution:
  - Pressure measurements in the area did not indicate a problem with low or negative pressure
  - There have been recent taste and odor customer complaints in the area of the low residuals prior to triggering the investigation.
  - The percent unaccounted for water has not been analyzed
  - There is not a regular flushing program in place
  - There are not any physical dead-ends near location 704
  - Additional disinfectant residual measurements collected as part of the investigation revealed low measurements (0.08 to 0.14 mg/L) near location 704.
  - The area is located at one of the further reaches of the distribution, which is about 2 miles from the treatment plant. It is a residential area (see map on next page).
- Storage:
  - South Ridge Storage tank: There is a common inlet/outlet pipe. Chlorine residual measurements collected at the tank reveal a slight degradation in water quality:
    - Fill cycle: 0.53 mg/L free chlorine residual
    - Draw cycle: 0.31 mg/L free chlorine residual
    - Turnover time has not been calculated

1. What are possible short-term corrective actions for the low residual issue at location 704?

2. What are possible longer-term solutions to consider?

3. In regard to the South Ridge Storage tank, what could the system consider doing?

4. Which of your above potential solutions require permits?


705
702
703
704
701
South Ridge Tank

Resources and Reference Material for Distribution BMPs:

AWWA Manuals and Standards:

The following are available through the AWWA bookstore:
https://www.awwa.org/Publications

- AWWA Manuals of Practice:
    - AWWA M28: Rehabilitation of Water Mains, Third Edition
    - AWWA M68: Water Quality in Distribution Systems
- AWWA Standards:
    - AWWA C651: Disinfecting Water Mains

PA DEP Technical Assistance:

DEP has assistance programs in both distribution optimization and capability enhancement. The distribution program can assist systems with distribution analysis, such as tank storage studies.

The Capability Enhancement program provides asset management planning assistance and includes an operator outreach program for technical assistance.

https://www.dep.pa.gov/Business/Water/BureauSafeDrinkingWater/

- DEP Distribution Optimization Program
- DEP Capability Enhancement Program

Key Points

- The primary goals of best management practices for disinfectant residuals are to:
    - Reduce water age
    - Reduce chlorine demand
- Systems have several options to consider
- Which BMPs and how they will be applied are system-specific considerations, which requires systems to evaluate their own circumstances.

Lesson 6: Public Notification and Consumer Confidence Reports

Lesson Objectives

After this lesson you will be able to:

- Decide which Tier level of public notice (PN) to issue
- Locate and use the disinfection-related PN templates

Lesson Agenda

- Table of tier deadlines & general situation descriptions
- List of specific situations for each PN tier
- Appendix of disinfection-related public notices
- Tier examples & applicable PN templates
- Delivery method review
- CCR
- Scenarios

PN Deadlines

Disinfection-Related Public Notice Deadlines for Public Water Systems (PWSs)			
Tier	**Deadline to Contact DEP**	**Deadline for Notice**	**PWS Violation and Situation Description**
1	1 hour	24 hours	**Acute threat to public health:** • Example: Breakdown of treatment at the **entry point**
2	1 hour	30 days	**No immediate threat to public health**: • Example: Treatment technique violation for low distribution disinfection residual
3	48 hours	1 year	**No direct impact to public health:** • Example: Failure to monitor

Specific Situations for Each Tier Classification

1. **Tier 1 Violations requiring notice within 24 hours:**
   - Failure of a SW/GUDI system to maintain the 1.0-Log *Giardia* inactivation at the **entry point** for more than 4 hours.
   - Failure of a SW/GUDI system to meet the minimum **entry point** disinfection level for more than 4 hours **when 1.0-Log *Giardia* inactivation has not been calculated.**
   - Failure of a groundwater system – that is permitted to provide 4-log treatment of viruses - to maintain a minimum **entry point** disinfection residual of 0.40 mg/L (or other DEP-approved minimum residual) for more than 4 hours.
   - Failure of a disinfection process, for a SW/GUDI or groundwater system, that results in no detectable residual at the **entry point** for any amount of time.

2. **Tier 2 Violations requiring notice within 30 days**
   - Treatment technique violation for entry point disinfection residual not being met when 1.0-Log *Giardia* inactivation is still being calculated and provided:
     - Failure of a SW/GUDI system to maintain a minimum entry point disinfection residual of 0.20 mg/L for more than 4 hours **while still calculating and providing 1.0-Log *Giardia* inactivation.**

       *This **Tier 2 PN** requirement is a change*
   - Treatment technique violation for **low distribution disinfection residual**:
     - Failure of a groundwater system that collects 40 or more samples per month* or any SW/GUDI system to maintain a minimum distribution disinfection residual of 0.2 mg/L in more than 5% of the samples in 2 consecutive months.

       *This **Tier 2 PN** requirement is new because of DRR*
     - Failure of a groundwater system that collects less than 40 samples* per month to maintain a minimum distribution disinfection residual of 0.2 mg/L in more than 1 sample in 2 consecutive months.

       *This **Tier 2 PN** requirement is new because of DRR*

       ***** distribution disinfection residual samples

3. **Tier 3 Violations and other situations requiring notice within 1 year**
   - Failure of a SW/GUDI system to calculate the once/day *Giardia* log inactivation.
   - Failure of a SW/GUDI system to calculate a single *Giardia* log inactivation whenever the disinfectant residual at the entry point falls below 0.20 mg/L.
   - Failure of a SW/GUDI system to report *Giardia* log inactivation for a month.
   - Failure of a SW/GUDI system to monitor the entry point disinfection residual.
   - Failure of a Groundwater system - that is permitted to provide 4-Log treatment - to monitor the entry point disinfection residual.
   - Failure of a SW/GUDI system to perform recordkeeping by keeping on-site records about the entry point disinfection residual.
   - Failure of a Groundwater system - that is permitted to provide 4-Log treatment - to perform recordkeeping by keeping on-site records about the entry point disinfection residual.

Example Disinfection-Related Tier 1 Situations and the applicable PN	
Situation	**Public Notification Template**
Failure of a SW/GUDI system to maintain the 1.0-Log *Giardia* inactivation at the **entry point** for more than 4 hours.	**Tier 1 PN Failure to Meet Disinfection Requirements at the Entry Point to the Distribution System for a Surface Water System**
Failure of a SW/GUDI system to meet the minimum **entry point** disinfection level for more than 4 hours **when 1.0-Log *Giardia* inactivation has not been calculated.**	**Tier 1 PN Failure to Meet Disinfection Requirements at the Entry Point to the Distribution System for a Surface Water System**
Failure of a groundwater system – that is permitted to provide 4-log treatment of viruses - to maintain a minimum **entry point** disinfection residual of 0.40 mg/L (or other DEP-approved minimum residual) for more than 4 hours.	**Tier 1 PN Failure to Meet Disinfection Requirements at the Entry Point to the Distribution System for a Groundwater System**
Failure of a disinfection process, for a SW/GUDI or groundwater system, that results in no detectable residual at the **entry point** for any amount of time.	**Tier 1 PN Failure of Filtration or Disinfection Process**

Example Disinfection-Related Tier 2 Situations and the applicable PN	
Situation	**Public Notification Template**
Failure of a SW/GUDI system to maintain a minimum entry point disinfection residual of 0.20 mg/L for more than 4 hours while still calculating and providing 1.0-Log *Giardia* inactivation.	**Tier 2 PN Failure to Meet Disinfection Requirements at the Entry Point While Calculating & Providing 1.0-Log *Giardia* Inactivation**
Failure of any SW/GUDI system or groundwater system that collects 40 or more samples* per month to maintain a minimum distribution disinfection residual of 0.2 mg/L in more than 5% of the samples in 2 consecutive months.	**Tier 2 PN Failure to Meet the Distribution Disinfectant Residual Treatment Technique**
Failure of a groundwater system that collects less than 40 samples* per month to maintain a minimum distribution disinfection residual of 0.2 mg/L in more than 1 sample in 2 consecutive months.	**Tier 2 PN Failure to Meet the Distribution Disinfectant Residual Treatment Technique**
Failure of a GW NTNC – that is not providing 4-log treatment of viruses and that collects less than 40 samples* per month - to maintain a minimum distribution disinfection residual of 0.2 mg/L in more than 1 sample in 2 consecutive months.	**Tier 2 PN Failure to Meet the Distribution Disinfectant Residual Treatment Technique**

***** distribution disinfection residual samples

Example Disinfection-Related Tier 3 Situations and the applicable PN (Reminder: If the timing is appropriate, system can use CCR for Tier 3 PN)	
Situation	**Public Notification Template**
• Failure of a SW/GUDI system to calculate the once/day *Giardia* log inactivation • Failure of a SW/GUDI system to calculate a single *Giardia* log inactivation whenever the disinfectant residual at the entry point falls below 0.20 mg/L	**Tier 3 PN "Failure to Monitor"**
• Failure of a SW/GUDI system to report *Giardia* log inactivation for a month	**Tier 3 PN "Failure to Maintain Records"**
• Failure of a SW/GUDI system to monitor the entry point disinfection residual • Failure of a Groundwater system - that is permitted to provide 4-Log treatment - to monitor the entry point disinfection residual	**Tier 3 PN "Failure to Monitor"**
• Failure of a SW/GUDI system to monitor a single weekly distribution disinfection residual • Failure of a Groundwater System to monitor a single weekly distribution disinfection residual	**Tier 3 PN "Failure to Monitor"**
• Failure to monitor at a location in the previous month even if sampling is done each week: o Example: Total # of required monthly distribution residual samples is 20. Only 19 samples are done for the month & they are done every week in the month; **a sample is missed**. • Failure to monitor during a week in the previous month: o Example: Total # of required monthly distribution residual samples is 20. All 20 samples are done for the month, but only in weeks 1, 2, & 3; not in week 4; **a week is missed.**	**Tier 3 PN "Failure to Monitor"**
• Failure of a SW/GUDI system to perform recordkeeping by keeping on-site records about the entry point disinfection residual • Failure of a Groundwater system - that is permitted to provide 4-Log treatment - to perform recordkeeping by keeping on-site records about the entry point disinfection residual	**Tier 3 PN "Failure to Maintain Records"**

Example Disinfection-Related Situations where no PN is required	
Situations	**Action Required**
• Failure of a SW/GUDI system to maintain the minimum disinfectant concentration residual of 0.2 mg/L at one or more distribution sample sites during the month for one month • Failure of a Groundwater system to maintain the minimum disinfectant concentration residual of 0.2 mg/L at one or more distribution sample sites during the month for one month	**System shall sample those distribution sample sites in the monitoring conducted the following month.**
• Failure to submit a complete DSI (Distribution System Investigation) within 60 days	**No PN required but put in CCR**

PN Delivery Methods Review

Public Notice Delivery Methods for PWSs		
Tier	Deadline for Notice	Delivery Methods
1	24 hours	• **CWS:** Provide direct delivery of public notice to each service connection using one or more of the following methods: hand delivery, electronic mail, automatic telephone dialing systems, or another form of direct delivery approved in writing by DEP. o Provide public notice to transient and nontransient service connections (if applicable) by using appropriate broadcast media (radio or television). • **NCWS:** Post in a conspicuous location* for at least 7 days
2	30 days	• **CWS:** Mail or other direct delivery, and any other method as needed to reach others • **NCWS:** Post in a conspicuous location* for at least 7 days
3	1 year	• **CWS:** Mail or other direct delivery, and any other method as needed to reach others (e.g. via the CCR) • **NCWS:** Post in a conspicuous location* for at least 7 days

* Conspicuous location: A location frequented by consumers

We are recommending that noncommunity systems post Tier 2 and Tier 3 public notice ASAP even though they can technically wait additional time to do so.

Consumer Confidence Reports

- As stated earlier, a failure to monitor, report, or maintain records results in a Tier 3 violation.
- Community water systems that are required to issue Tier 3 PN can instead post the notice in the consumer confidence report if the timing is appropriate.
- All community water systems are required to deliver a Consumer Confidence report to their customers every year by July 1st.
- CWSs must mail a paper copy of the CCR to DEP unless the local DEP office is able to receive an electronic copy (in pdf format.) An electronic pdf CCR can be submitted to the local DEP office in lieu of a paper copy.
- Since the 2019 Consumer Confidence Report covers 2018, there is no change in reporting Chlorine in the Chemical Contaminants table and the Entry Point Disinfectant Residual table.

Scenario Exercises

Directions: For each question on the next 2 pages, follow the directions to fill in the blanks.

Scenario #1

1. The Pineview Water System is a groundwater system that takes their distribution disinfection residual samples at 4 locations (701, 702, 703, & 704.) Their January and February results are shown in the tables below.
   - Table 1 shows their 4 distribution disinfection residuals each Friday of January 2020.
   - Table 2 shows their 4 distribution disinfection residuals each Friday of February 2020.

a. How many of the residual readings for January are under the required level of 0.2 mg/L?

_____

b. How many of the residual readings for February are under the required level of 0.2 mg/L?

_____

c. Does this system need to issue PN? (Yes or No) _____

d. If so, what is the title of the public notice? (write N/A below if PN is not required)

_____

e. Is there any other action this system needs to take?

_____

Table 1 – January distribution disinfection residual readings

Date	701	702	703	704
Jan 4	0.21 mg/L	0.20 mg/L	0.20 mg/L	0.21 mg/L
Jan 11	0.15 mg/L	0.2 mg/L	0.19 mg/L	0.18 mg/L
Jan 18	0.14 mg/L	0.17 mg/L	0.20 mg/L	0.20 mg/L
Jan 25	0.22 mg/L	0.18 mg/L	0.23 mg/L	0.22 mg/L

Table 2 – February distribution disinfection residual readings

Date	701	702	703	704
Feb 1	0.19 mg/L	0.23 mg/L	0.20 mg/L	0.20 mg/L
Feb 8	0.13 mg/L	0.2 mg/L	0.22 mg/L	0.18 mg/L
Feb 15	0.20 mg/L	0.21 mg/L	0.18 mg/L	0.17 mg/L
Feb 22	0.21 mg/L	0.20 mg/L	0.15 mg/L	0.22 mg/L

Scenario #2:

2. The Oak Estates Water System is a groundwater system that takes their distribution disinfection residual samples at 5 locations (701, 702, 703, 704, and 705.) Their March and April results are shown in the tables below.

   - Table 1: 5 distribution disinfection residuals for each Wednesday of March 2020.
   - Table 2: 5 distribution disinfection residuals for each Wednesday of April 2020.

a. How many of the residual readings for March are under 0.2 mg/L? _____

b. How many of the residual readings for April are under 0.2 mg/L? _____

c. Does this system need to issue PN? (Yes or No) _____

d. If so, what is the title of the public notice? (write N/A below if PN is not required)

_____

e. Is there any other action this system needs to take?

_____

Table 1 – March distribution disinfection residual readings

Date	701	702	703	704	705
March 6	0.19 mg/L	0.16 mg/L	0.16 mg/L	0.17 mg/L	0.20 mg/L
March 13	0.20 mg/L	0.17 mg/L	0.15 mg/L	0.16 mg/L	0.19 mg/L
March 20	0.21 mg/L	0.18 mg/L	0.14 mg/L	0.15 mg/L	0.18 mg/L
March 27	0.22 mg/L	0.19 mg/L	0.15 mg/L	0.14 mg/L	0.17 mg/L

Table 2 – April distribution disinfection residual readings

Date	701	702	703	704	705
April 3	0.23 mg/L	0.22 mg/L	0.21 mg/L	0.20 mg/L	0.19 mg/L
April 10	0.17 mg/L	0.16 mg/L	0.14 mg/L	0.14 mg/L	0.15 mg/L
April 17	0.20 mg/L	0.21 mg/L	0.18 mg/L	0.17 mg/L	0.20 mg/L
April 24	0.21 mg/L	0.20 mg/L	0.15 mg/L	0.22 mg/L	0.20 mg/L

Lesson Key Point:

- The workbook and appendix for this lesson contains templates and reference tables to use in issuing public notification for disinfection-related circumstances.

Lesson 7: DRR – Other Provisions

With the publication of the DRR, there were additional additions and clarifications to Chapter 109. The following changes are included:

- Nitrification Control Plan
- VOC/SOC Monitoring Requirements
- Clarification on SOC Monitoring Waivers
- Asbestos Requirements
- Clarification on IOC Monitoring
- BVRB Requirements
- Reduced Bromate Monitoring

Nitrification Control Plan

Regulatory Citation: § 109.716

The Nitrification Control Plan is a new requirement under the DRR. Any PWS using chloramines or purchasing water containing chloramines must develop and implement a system-specific Nitrification Control Plan by 4/29/2019. This includes consecutive systems.

The nitrification control plan must conform to guidelines in industry standards, such as AWWA's M56 Manual on Nitrification. DEP has developed a template for systems to use that need help in creating a Nitrification Control Plan.

Nitrification Control Plan required elements include:

- List of parameters to be monitored, monitoring locations and sampling schedule.
- Response plan with expected water quality ranges and action levels.
    - For example, for chlormaniting systems, the plan would include a monochloramine goal and action level. If monochloramine falls below the action level, the plan should include the possible operational changes to meet the goal.

The Nitrification Control Plan does NOT get submitted to DEP, but the PWS needs to periodically review it & update it as needed.

Failure to have a plan that meets the required content elements or *failure to follow the plan* is a violation of 109.716.

VOC/SOC Monitoring Requirements

Regulatory Citation: § 109.301(5)(iii)(B) and § 109.301(6)(ii)(B)

This citation clarified that quarterly monitoring is required for an initial detection of a VOC/SOC. The reduced (annual, previously detected) frequency will not be granted until the water system obtains results from a minimum of *4 consecutive quarterly samples* that are *reliably and consistently* below the MCL.

> Reliably & Consistently is in 109.1 Definitions. For IOC/VOC/SOC, it is 80% of the MCL value.

SOC Waivers

Regulatory Citation: § 109.301(6)(vii)(A)

Language was added to clarify that PWSs must apply for a monitoring waiver for PCBs/Dioxin (it is **not** automatic).

Previous language:

"A system is granted a waiver from monitoring for dioxin and PCBs unless the Department determines that there is a source of dioxin or PCB contamination which poses a threat to a drinking water source."

This language has been deleted.

Asbestos Monitoring

Regulatory Citation: § 109.301(7)(i)(A)-(E)

Language regrading Asbestos was re-written and re-organized to be consistent with other IOCs in that *monitoring is required **unless** a waiver is requested and approved.*

For system not granted a waiver, monitoring is required during the 1st 3-year period of each 9-year cycle; the next 9-year cycle begins in 2020, so monitoring will be required sometime in 2020-2022.

- PWS must sample at each EP and from at least 1 representative location in the distribution system.
- PWS must submit written sample site plan that includes a materials evaluation to identify the representative DS location.

Asbestos Waiver

Regulatory Citation: § 109.301(7)(i)(F)

This citation clarifies Asbestos waiver requirements.

- PWS must submit documentation that waiver criteria have been met.
- Waiver may be granted for *either* EP monitoring, distribution system monitoring or *both*.
- All IOC/VOC/SOC waiver requests must be done using DEP forms. Monitoring waiver application form was NOT changed.

IOC Monitoring

Regulatory Citation: § 109.301(7)(iii)(C)

Previous language was ambiguous and often misinterpreted, so language was added to clarify that quarterly monitoring is required if any IOC result exceeds the MCL value until

results from *4 consecutive quarterly samples* that are *reliably and consistently* below the MCL are obtained.

- Remember, quarterly monitoring is required after an MCL exceedance, even if there is no MCL violation (i.e. the average of the E & C samples is below the MCL value).

After analyses of *4 consecutive quarterly samples* indicate that contaminant levels are *reliably and consistently* below the MCLs:

- The required monitoring at an entry point where treatment has **NOT** been installed is reduced to annual (SW) or triennial (GW/GUDI).
- The required monitoring at an entry point where treatment **HAS** been installed is reduced to annual.
  - Note: *Performance monitoring* is still required quarterly.

Bottled Water, Vended Systems, Retail Facilities & Bulk Water Hauling (BVRB)

Regulatory Citation: § 109.1003(a)(1)(xiii)-(xiv)

BVRB systems using Surface Water(SW)/Groundwater Under Direct Influence of surface water (GUDI) sources or purchasing water from SW/GUDI sources will also have to comply with the federal & state Surface Water Treatment Rule requirements that mandate:

- Maintain 0.20 ppm Cl_2 or ClO_2 residual (or 0.1 - 0.4 ppm ozone residual) at the entry point (EP).

OR

- Collect HPC samples same time/same location (if HPC result < 500 colonies/ml, the sampling point is in compliance).

Systems must report either disinfectant residual, HPC result or both for each routine coliform sample.

Any BVRB system in this category (including permit-by-rule systems) that removes the residual chlorine will need to begin collecting HPC samples at the same time as the weekly (or monthly) coliform samples.

Additional BVRB requirements tied to Stage 2 DBP Rule:

To get primacy for the Stage 2 DBPR, language had to be added to Subchapter J.

- **§ 109.1003(a)(1)(ix)** clarifies language regarding DBP monitoring.
  - TTHMs/HAA5s must be taken during peak historical month. TTHMs/HAA5s were originally required in the month of warmest water temp (Stage 1); requirement changed to peak historical month under Stage 2.
    - In reality there is no difference to BVRB systems. They will still be sampling in the same month because that is likely the only month with historical data.

    - Locational Running Annual Average (LRAA) is determined for each EP.

- **§ 109.1003(a)(1)(xi)** clarifies that a chlorine dioxide exceedance at EP is automatic MRDL violation.

    - DEP is now more stringent for the MRDL violation for chlorine dioxide. For other PWSs, the MRDL violation is based on follow-up sampling within 24 hours of an MRDL exceedance at the EP. BVRBs do not have a distribution system in which to take these samples, so an MRDL exceedance at the EP is an automatic violation. We do not currently have any BVRBs that are using chlorine dioxide.

- **§ 109.1003(b)(2)** clarifies who may conduct daily chlorite testing.

    - Added language to be consistent with 109.304 (samples analyses must be done using EPA approved methods) and to allow daily chlorite samples to be analyzed by certified operator/appropriate personnel.

- **109.1008(i)** clarifies who must also develop a Stage 2 DBP Rule monitoring plan

    - Any BVRB that meets the definition of a CWS or NTNC must also create a Stage 2 DBP Rule monitoring plan.

Bromate (DBP Rule)

Regulatory Citations: § 109.301(12)(iv)(B)(II) and § 109.1003(a)(1)(xii)(B)(II)

Language was added to be consistent with federal regulations for reduced monitoring.

- Only results obtained by specific methods qualify for reduced monitoring.
- Once granted, PWS must continue to use these methods to remain on the reduced frequency.

Background information on this issue:

- Methods approved under the Stage 1 DBPR did not have sufficient sensitivity, so EPA required source water bromide monitoring in addition to entry point (EP) bromate testing to qualify for and remain on reduced monitoring frequency.
- Better methods were available and approved under the Stage 2 DBPR, so EPA eliminated the source water bromide requirements.
- However, they did not rescind the initial methods for compliance monitoring. Instead, language was added to only accept data from the newer methods for reduced monitoring.
- PWSs may continue to use old methods for compliance monitoring, but they will never get to a reduced frequency.

Tab A

Appendix A:

Drinking Water Electronic Laboratory Reporting System (DWELR) Basics

DWELR Access

All drinking water compliance data must be reported electronically via DWELR. A PWS may submit data for Accreditation by Rule (ABR) parameters that they analyze. Laboratories must submit data on behalf of the PWS for parameters they analyze.

To analyze and report data, a PWS needs to have a registered laboratory ID and access to DWELR, which is accessed through DEP Greenport. There are three steps:

Step 1: Obtain a Registered Environmental Laboratory ID

A PWS should first check to see if they already have a lab ID assigned. They can do this at the following link:
http://www.depreportingservices.state.pa.us/ReportServer/Pages/ReportViewer.aspx?/Labs/Registered_labs

If a lab ID has not been assigned, the PWS must apply for one. There is a one-time fee of $50 that must accompany the application. The laboratory registration application is available from the DWELR website:

https://www.dep.pa.gov/Citizens/My-Water/PublicDrinkingWater/Pages/Electronic-Reporting-System.aspx

Step 2: Self-register in Greenport

Go to Greenport at the link below and click on self-register. The Greenport User Name will be needed for the DWELR application form. *Each person requiring DWELR access needs to register for their own Greenport account.*

http://www.depgreenport.state.pa.us

Step 3: Submit the DWELR Application form

This form is also available from the DWELR website:

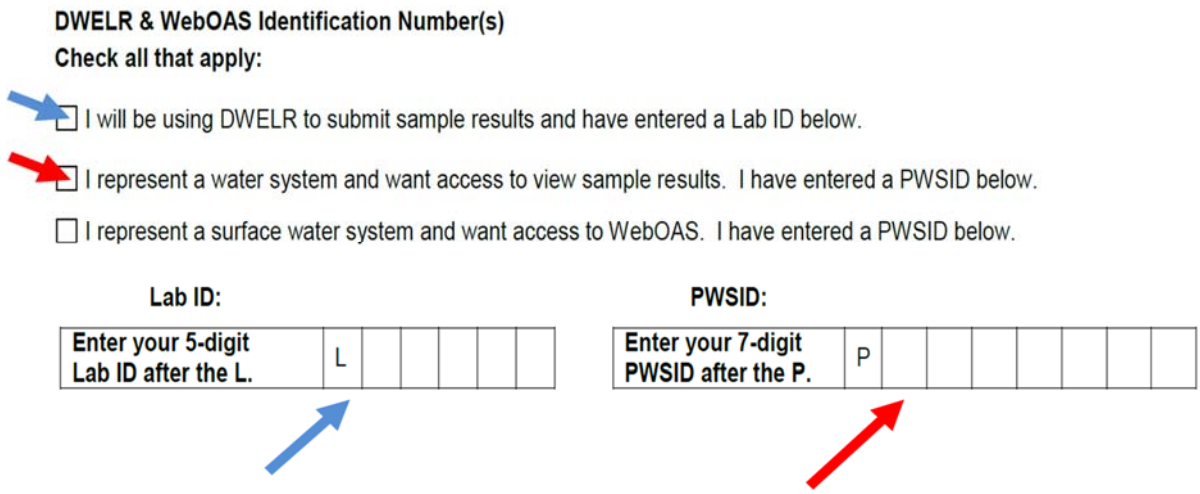
https://www.dep.pa.gov/Citizens/My-Water/PublicDrinkingWater/Pages/Electronic-Reporting-System.aspx.

There is no fee to submit this form. The PWS should submit it by mail or by fax as indicated in the instructions. *A separate form is required for each person requesting DWELR access.*

Even if a PWS does not plan on reporting data, they should still request a VIEW ACCESS account for DWELR! That way, they can access DWELR to review data submitted on their behalf by their laboratory. For VIEW ACCESS, a PWS can skip step 1 above and only complete steps 2 and 3.

> *COMPLIANCE TIP:* **If a PWS is requesting DWELR access to submit data, they should also request VIEW ACCESS at the same time.** That way, in addition to using DWELR to report data that they analyze, they can also review data submitted on their behalf by their laboratory.

On the DWELR application form, a 5-digit lab ID must be provided for SUBMIT ACCESS, and a 7-digit PWSID must be provided for VIEW ACCESS.



Note that there are actually three options on the DWELR application for the type of access requested. The third option is for surface water systems that would like access to WebOAS, which is the optimization program.

DWELR Entry

There are two methods of data entry in DWELR:

1. Online screen data entry to enter individual results.
2. Data file uploads to enter multiple results. Accepted formats for file upload include Excel, comma separated values, and Access database. Templates for reporting are available in DWELR and can be emailed to the DWELR user.

There are several benefits to file uploads into DWELR:

- The PWS can enter data offline and upload all at once at the end of the month. By spending a few minutes each day to fill out a template, at the end of the month the records will be ready to upload.
- The PWS can use the templates available in DWELR to create their own template for their system (with system specific information saved) and use "SAVE AS" each month.
- The PWS can have another record of their data.
- They can copy and paste dates (since distribution chlorine results have the same sample and analysis dates), sample types, PWSID and Lab ID.

Monthly data may be entered anytime during the month; however, data are required to be reported no later than midnight on the 10th of the following month.

Corrections to data may be made in DWELR any time before midnight on the 10th. After midnight on the 10th of the month, data move out of the DWELR system.

DRR DWELR Reporting:

A job aid, DRR Reporting Instructions, can be found at the end of this Appendix A on page A-4. It is also available on the DRR webpage:

https://www.dep.pa.gov/Business/Water/BureauSafeDrinkingWater/DrinkingWaterMgmt/Regulations/Pages/Proposed-Disinfection-Requirements-Rule--.aspx

Disinfection Requirements Rule (DRR) Reporting Instructions: *What's New for Distribution Residual Measurements?*

Beginning with the **May 2018** compliance period, report all ***individual*** distribution system disinfection residual measurements conducted at the same time/locations as RTCR coliform samples using the **SDWA-1** form *(do not report the average result value)*.

- Record the ***RTCR* Location ID.**
- Use the new **Contaminant IDs**: **Free Chlorine** is **1013** and **Total Chlorine** is **1000**.
- Use the appropriate **Analysis Method** Code **(see Table 1. *Analysis Methods,* below).** Report **Results** to 2 decimal places.
- Use the appropriate **Sample Type:**
  - **D** for chlorine residuals analyzed with **routine or check RTCR samples**.
  - **S** for chlorine residuals analyzed with total coliform samples to lift a Boil Water Advisory or for RTCR seasonal startup. For this sample type, record a 3-digit location ID that is meaningful to you.

Example: A small water system with a population of 525 collects one routine total coliform sample during May. The result is total coliform positive, so the system collects three check samples. During the month, the system also collects total coliform samples on two consecutive days to lift a Boil Water Advisory. The certified operator analyzes the free chlorine residual using a DPD hand-held colorimeter for each of these samples.

SDWA 1 - BACTERIOLOGICAL / RESIDUAL DISINFECTANT / TURBIDITY / DBP ANALYSIS

SDWA-1

PWSID	PWS Name	Contam ID	Analysis Method	Result	Analysis Date	Location ID 1	Location ID 2	Sample Date	Sample Type	Sample Time	Lab ID	Sample ID
1234567	Not Found.	1013	301	0.25	050618	701		050618	D	1030	11111	
1234567	Not Found.	1013	301	0.36	050818	701		050818	D	0700	11111	
1234567	Not Found.	1013	301	0.37	050818	701		050818	D	0715	11111	
1234567	Not Found.	1013	301	0.38	050818	701		050818	D	0730	11111	
1234567	Not Found.	1013	301	0.55	051818	BWA		051818	S	0800	11111	
1234567	Not Found.	1013	301	0.54	051918	BWA		051918	S	0805	11111	

Table 1. *Analysis Methods*

Contam ID	EPA Method	Method Code	Contam ID	EPA Method	Method Code
1013 Free Cl	DPD Colorimetric: SM 4500-Cl G, Hach Method 10260	301	**1000** Total Cl	DPD Colorimetric: SM 4500-Cl G, Hach Method 10260	301
	Indophenol Colorimetric: Hach Method 10241	597		Amperometric Titration: SM 4500-Cl D, ASTM 1253-08, -- 14	587
	Amperometric Titration: SM 4500-Cl D, ASTM 1253-08, -- 14	587		DPD Ferrous Titrimetric: SM 4500-Cl F	588
	DPD Ferrous Titrimetric: SM 4500-Cl F	588		Low Level Amperometric Titration: SM 4500-Cl E	591
	Amperometric Sensor: ChloroSense	596		Iodometric Electrode: SM 4500-Cl I	592
	Syringaldazine (FACTS): SM 4500-Cl H	590		Amperometric Sensor: ChloroSense	596

Tab B

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF SAFE DRINKING WATER

DISTRIBUTION SYSTEM INVESTIGATION & CORRECTIVE ACTION FORM

I. General Information

Public Water System (PWS) Name:	**PWSID #:**
Name of Responsible Official:	**Phone #:**
PWS Address:	**E-mail:**
Name of Investigator:	**Date Completed:**
Sample Location that Triggered Investigation:	

II. Non-Compliant Sample Information

**Use page 7 to report additional non-compliant samples.*

Non-Compliant Sample #1:	Sample Location ID#:	Sample Location:	
Sample Date:	Name of Sample Collector:		
Chlorine Residual: Free ☐: mg/L	Total ☐: mg/L		
Was the sample collected according to the DRR sample siting plan?		YES ☐	NO ☐
Was the instrument used for the disinfectant analysis EPA Method 334.0 compliant?		YES ☐	NO ☐
Has the analyst who performed the disinfectant residual monitoring and analysis passed the analyst initial demonstration of capability (IDC) under EPA Method 334.0?		YES ☐	NO ☐

Non-Compliant Sample #2:	Sample Location ID#:	Sample Location:	
Sample Date:	Name of Sample Collector:		
Chlorine Residual: Free ☐: mg/L	Total ☐: mg/L		
Was the sample collected according to the DRR sample siting plan?		YES ☐	NO ☐
Was the instrument used for the disinfectant analysis EPA Method 334.0 compliant?		YES ☐	NO ☐
Has the analyst who performed the disinfectant residual monitoring and analysis passed the analyst initial demonstration of capability (IDC) under EPA Method 334.0?		YES ☐	NO ☐

Non-Compliant Sample #3:	Sample Location ID#:	Sample Location:	
Sample Date:	Name of Sample Collector:		
Chlorine Residual: Free ☐: mg/L	Total ☐: mg/L		
Was the sample collected according to the DRR sample siting plan?		YES ☐	NO ☐
Was the instrument used for the disinfectant analysis EPA Method 334.0 compliant?		YES ☐	NO ☐
Has the analyst who performed the disinfectant residual monitoring and analysis passed the analyst initial demonstration of capability (IDC) under EPA Method 334.0?		YES ☐	NO ☐

Non-Compliant Sample #4:	Sample Location ID#:	Sample Location:	
Sample Date:	Name of Sample Collector:		
Chlorine Residual: Free ☐: mg/L	Total ☐: mg/L		
Was the sample collected according to the DRR sample siting plan?		YES ☐	NO ☐
Was the instrument used for the disinfectant analysis EPA Method 334.0 compliant?		YES ☐	NO ☐
Has the analyst who performed the disinfectant residual monitoring and analysis passed the analyst initial demonstration of capability (IDC) under EPA Method 334.0?		YES ☐	NO ☐

III. Investigation Questions

A. Plumbing System for a PWS with a ***Single Service Connection***

**If PWS has multiple service connections check here and skip to section B* ☐.

Questions	Answer to Question		
	YES	NO	N/A
1. Was there any time during the 30 days prior to the investigation being triggered that the disinfectant residual entering the plumbing system was less than the water system's residual goal?	☐	☐	
2. Were any water related customer complaints received within the 30 days prior to the investigation being triggered?	☐	☐	
3. If plumbing work was conducted in the system within the 30 days prior to the investigation being triggered, was the plumbing system properly disinfected after work was completed?	☐	☐	☐
4. Did the system experience low or negative pressure within the 30 days prior to the investigation being triggered?	☐	☐	
5. Were there any positive bacteriological samples in the vicinity of the non-compliant location within the 30 days prior to the investigation being triggered?	☐	☐	
6. Were additional disinfectant measurements collected as part of this investigation?	☐	☐	
7. Does water quality data collected in the plumbing system as part of this investigation show results indicative of an issue?	☐	☐	☐

B. Distribution System for PWS with ***Multiple Service Connections***

**If PWS does not have multiple service connections check here and skip to Section C* ☐.

Questions	Answer to Question		
	YES	NO	N/A
1. Was there any time during the 30 days prior to the investigation being triggered that the disinfectant residual entering the distribution system was less than the water system's residual goal?	☐	☐	
2. Were any water related customer complaints received within the 30 days prior to the investigation being triggered?	☐	☐	
3. If the samples that triggered the investigation were collected from the inside of a building, was there any plumbing work conducted at the site within the 30 days prior to the assessment being triggered?	☐	☐	☐
4. Has the percent of unaccounted for water increased from historical levels?	☐	☐	☐
5. If line breaks occurred within the 30 days prior to the investigation being triggered, were they repaired in accordance with AWWA Standard C651?	☐	☐	☐
6. Did large firefighting events or other situations occur within the 30 days prior to the assessment being triggered that resulted in low pressure in any portion of the distribution system?	☐	☐	
7. Were pressure measurements taken as part of this investigation?	☐	☐	
8. Did pressure measurements collected as part of this investigation indicate that the system is experiencing low or negative pressure?	☐	☐	☐
9. Were any leaks discovered during the course of this investigation?	☐	☐	

10. Does the water system have a coordinated unidirectional flushing program in place?	☐	☐	
11. If the water system conducts flushing, are water quality measurements collected during flushing?	☐	☐	☐
12. Has the water system evaluated the effectiveness of the flushing program?	☐	☐	☐
13. Did flushing occur in the vicinity of the non-compliant location after the first month of low disinfectant residual?	☐	☐	
14. Do dead ends exist in the vicinity of the non-compliant location?	☐	☐	
15. Were there any positive bacteriological samples in the vicinity of the non-compliant location within the 30 days prior to the investigation being triggered?	☐	☐	
16. Were additional disinfectant residual measurements collected as part of this investigation?	☐	☐	☐
17. Does water quality data collected in the distribution system as part of this investigation show results indicative of an issue?	☐	☐	☐

C. Distribution System Storage

**If PWS has no distribution system storage within the scope of the investigation, check here and skip to Part IV* ☐.

Questions	Answer to Question		
	YES	**NO**	**N/A**
1. Are tank overflow discharges screened and access hatches closed to prevent wildlife and debris from entering the tank?	☐	☐	
2. Has the interior of all tanks been inspected in the last five years?	☐	☐	
3. Did the most recent tank inspection identify the need to remove sediment or issues with the structural integrity?	☐	☐	☐
4. Have any of the storage tanks had issues with algae growth?	☐	☐	
5. Have water quality samples representative of water within the tanks been collected as part of this investigation, including but not limited to disinfectant residual and disinfection byproducts?	☐	☐	
6. Have water quality samples been taken during both fill and draw cycles to compare water quality entering the tank vs. water quality leaving the tank?	☐	☐	
7. Does water quality data collected from the storage tanks as part of this investigation show results indicative of an issue?	☐	☐	☐
8. Has the water system conducted any monitoring or special studies on the tanks to determine if water age issues exist?	☐	☐	
9. Do any of the tanks have known issues with water age?	☐	☐	

IV. Issue Descriptions and Corrective Actions

Note: A separate table should be completed for every question from Part III. that is answered in a shaded box. If more than eight issues are identified, use page 8 to report additional issues and corrective actions.

Section Letter		Question #	
Issue Description		**Corrective Action and Completion Schedule**	

Section Letter		Question #	
Issue Description		**Corrective Action and Completion Schedule**	

Section Letter		Question #	
Issue Description		**Corrective Action and Completion Schedule**	

Section Letter		Question #	
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Section Letter		Question #	
Issue Description		Corrective Action and Completion Schedule	

Section Letter		Question #	
Issue Description		Corrective Action and Completion Schedule	

V. Verification

I hereby certify that the information contained herein is true and correct to the best of my knowledge, information and belief.

Investigator's Signature:	**Date:**
Responsible Official's Signature:	**Date:**

NOTES:

- The completed form must be submitted to DEP within **60 days** of a public water system triggering an investigation.
- The completed form is to be addressed to: PA DEP – Safe Drinking Water and sent to the address of the appropriate District Office or County Health Department (CHD) having jurisdiction over the water system.
- District and CDH addresses by county can be found within DEP document number 3930-FM-BSDW0560. This document can be located by searching under "forms" for document number 3930-FM-BSDW0560 on eLibrary at the following link: http://www.elibrary.dep.state.pa.us/dsweb

VI. State Review

NOTE: This table is to be completed by the DEP representative reviewing the investigation

Name of Reviewer:	**Date Reviewed:**
Investigation Complete: YES ☐ NO ☐	
Signature of Reviewer:	**Date:**

Reporting for Additional Non-Compliant Samples (continued from Part II., page 1)

Non-Compliant Sample # :	Sample Location ID#:	Sample Location:	
Sample Date:	Name of Sample Collector:		
Chlorine Residual: Free ☐: mg/L	Total ☐: mg/L		
Was the sample collected according to the DRR sample siting plan?		YES ☐	NO ☐
Was the instrument used for the disinfectant analysis EPA Method 334.0 compliant?		YES ☐	NO ☐
Has the analyst who performed the disinfectant residual monitoring and analysis passed the analyst initial demonstration of capability (IDC) under EPA Method 334.0?		YES ☐	NO ☐

Non-Compliant Sample # :	Sample Location ID#:	Sample Location:	
Sample Date:	Name of Sample Collector:		
Chlorine Residual: Free ☐: mg/L	Total ☐: mg/L		
Was the sample collected according to the DRR sample siting plan?		YES ☐	NO ☐
Was the instrument used for the disinfectant analysis EPA Method 334.0 compliant?		YES ☐	NO ☐
Has the analyst who performed the disinfectant residual monitoring and analysis passed the analyst initial demonstration of capability (IDC) under EPA Method 334.0?		YES ☐	NO ☐

Non-Compliant Sample # :	Sample Location ID#:	Sample Location:	
Sample Date:	Name of Sample Collector:		
Chlorine Residual: Free ☐: mg/L	Total ☐: mg/L		
Was the sample collected according to the DRR sample siting plan?		YES ☐	NO ☐
Was the instrument used for the disinfectant analysis EPA Method 334.0 compliant?		YES ☐	NO ☐
Has the analyst who performed the disinfectant residual monitoring and analysis passed the analyst initial demonstration of capability (IDC) under EPA Method 334.0?		YES ☐	NO ☐

Non-Compliant Sample # :	Sample Location ID#:	Sample Location:	
Sample Date:	Name of Sample Collector:		
Chlorine Residual: Free ☐: mg/L	Total ☐: mg/L		
Was the sample collected according to the DRR sample siting plan?		YES ☐	NO ☐
Was the instrument used for the disinfectant analysis EPA Method 334.0 compliant?		YES ☐	NO ☐
Has the analyst who performed the disinfectant residual monitoring and analysis passed the analyst initial demonstration of capability (IDC) under EPA Method 334.0?		YES ☐	NO ☐

Non-Compliant Sample # :	Sample Location ID#:	Sample Location:	
Sample Date:	Name of Sample Collector:		
Chlorine Residual: Free ☐: mg/L	Total ☐: mg/L		
Was the sample collected according to the DRR sample siting plan?		YES ☐	NO ☐
Was the instrument used for the disinfectant analysis EPA Method 334.0 compliant?		YES ☐	NO ☐
Has the analyst who performed the disinfectant residual monitoring and analysis passed the analyst initial demonstration of capability (IDC) under EPA Method 334.0?		YES ☐	NO ☐

Reporting for additional Issue Descriptions and Corrective Actions (continued from Part IV., page 4-5)

Section Letter		Question #	
Issue Description		**Corrective Action and Completion Schedule**	

Section Letter		Question #	
Issue Description		**Corrective Action and Completion Schedule**	

Section Letter		Question #	
Issue Description		**Corrective Action and Completion Schedule**	

Section Letter		Question #	
Issue Description		**Corrective Action and Completion Schedule**	

Tab C

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Planned and Unplanned Discharges of Chlorinated Water to Surface Waters

This fact sheet addresses the management of chlorinated water discharges, including water disinfected by chloramines, from drinking water systems to surface waters and storm sewers. Chlorinated water discharges may occur during planned routine operation and maintenance activities such as hydrant flushing, or due to unplanned or accidental releases such as water main breaks.

Water suppliers should be prepared to work quickly to resolve planned and accidental releases of chlorinated and cloraminated water not only to restore water for customers, but also to prevent environmental damage.

How can drinking water cause a problem when discharged to surface water?

Chlorine or chloramine and other chemicals are commonly added at levels that are necessary to disinfect and prepare water for public consumption and use, but that may be toxic to fish and other aquatic life. Discharges may also cause soil erosion, carrying sediment to the receiving water. These pollutants may cause fish kills and may also endanger or compromise the environment, and public health and safety.

Should a chlorinated water discharge be directed to the nearest storm drain?

In general, no. Storm drain systems are considered waters of the commonwealth under Pennsylvania's Clean Streams Law. Pollutants may not be discharged to storm sewers without a permit. National Pollutant Discharge Elimination System (NPDES) permits for municipal separate storm sewer systems (MS4s) allow for discharges of potable water to storm sewers but only if the water does not contain detectable concentrations of Total Residual Chlorine (TRC). To remove TRC from potable water, best management practices (BMPs) such as dechlorination are necessary.

What are some types of <u>planned</u> operation and maintenance activities that result in a discharge?

Hydrant and line flushing and testing, well disinfection, storage tank or reservoir draining for cleaning or maintenance, valve replacement, and hydrostatic testing of pipelines are examples of planned activities that may result in a release of chlorinated water and other pollutants.

What does the Department of Environmental Protection (DEP) expect from water suppliers and other sources for planned chlorinated water discharges?

Water suppliers should notify DEP in advance of the planned activity and take necessary steps to prevent a discharge of chlorinated water directly to waters of the commonwealth including storm sewers, streams, and rivers.

For example, for a planned hydrant flushing, the supplier should notify DEP that a discharge will occur and be prepared to collect and/or dechlorinate the water discharged from the hydrant(s).

In cases where automatic flushing devices are used, DEP should be notified of the device location(s) in advance. These devices should be fitted with dechlorinating devices and checked regularly to ensure proper operation.

What kinds of non-routine activities cause <u>unplanned</u> discharges?

Water line breaks, leaks, tank overflows, fire hydrant shearing and other accidents, and emergency flushing are considered unplanned releases.

Should an unplanned discharge of chlorinated water to surface water be reported to DEP?

Yes, immediate notification is required. If a release of chlorinated water occurs and discharges, or may discharge, into waters of the commonwealth, Section 91.33 of DEP's Rules and Regulations requires

immediate notification to DEP by phone. A written follow-up letter may also be required; DEP's Chlorinated Water Discharge Incident Report Form, 3800-FM-BCW0530 may be used to provide the required information.

How are unplanned discharges reported to DEP and other agencies?

These discharges should be reported to the Clean Water Program in the regional office of DEP that has jurisdiction where the incident has occurred. If you are unable to reach someone by phone, do not leave a message; contact the 24-hour emergency number for the regional office or DEP's statewide emergency response number.

Emergency Response Phone Numbers:

Southeast Region: 484-250-5900	Northeast Region: 570-826-2511
Southcentral Region: 866-825-0208	Northcentral Region: 570-327-3636
Southwest Region: 412-442-4000	Northwest Region: 800-373-3398

DEP Statewide Emergency Response: 800-541-2050

In addition, discharges that result in an impact to aquatic life, including fish kills, must also be immediately reported to the PA Fish and Boat Commission at 855-347-4545.

What other problems can be caused by a water main break?

When a large diameter water pipe breaks, physical damage can be caused by the flood of water, such as eroding soil, destroying roads and building foundations, and washing away other utilities, in addition to contaminating nearby bodies of water with debris and chlorinated water. A break may also cause a loss of water pressure throughout the system and result in a boil water advisory since microorganisms can enter the water system through the break.

How can public water suppliers prevent environmental harm from a chlorinated water discharge?

1. Develop a pollution prevention and control (PPC) plan and/or an emergency response plan that includes the implementation of BMPs to handle both planned and unplanned discharges of chlorinated water, and to train staff that will be involved in responses to those discharges. For example, prior to a discharge reaching a surface water, all water releases should be dechlorinated, and, if needed, erosion and sediment control actions implemented, such as containment or the installation of silt fencing. Other typical BMPs may include the use of tablet dechlorination, hay bales to reduce water velocity, blocking of storm sewers, the use of dechlorination storm drain mats, and hydrant dechlorination diffusers, among others. **NOTE:** Dechlorinating agents introduced into chlorinated water discharges must be monitored closely to ensure that the dissolved oxygen or pH levels in the discharge are not negatively impacted.
2. Develop and implement an Operation and Maintenance Plan (O&M Plan), as required by DEP regulation. Every O&M Plan should include both a line replacement program based on such factors as the age of the water line(s), pipe material, and proximity to surface water, and the procedures to follow during line installation.
3. Establish a procedure to properly handle the discharge of heavily chlorinated water used for disinfection after pipe installation or repair, as described in Section II, Special Issues, of the American Water Works Association (AWWA) Standard for Disinfecting Water Mains (ANSI/AWWA Standard C651-14).
4. Collect and dispose of chlorinated water that cannot be dechlorinated or otherwise made safe for discharge by other means, such as into the sanitary sewer or at a sewage treatment plant (with permission only), at an authorized disposal site, or through land disposal (e.g., distribution of the water to vegetated areas for infiltration, assuming a large enough area is available).

What are a public water supplier's responsibilities following a water line break or other chlorinated water discharge?

In addition to the water supplier's responsibilities under the Safe Drinking Water Regulations, all unplanned and accidental releases, such as water system pipe breaks, should be handled as quickly as possible not only to restore water service, but also to prevent environmental damage.

When notified that a water line has broken, a water supplier should be prepared to immediately visit the site, assess the situation, and obtain the following information relating to possible environmental impacts:

1. Could or is chlorinated water entering a nearby surface water?
2. What is the concentration of TRC entering the surface water? Are there visible effects on aquatic life in the surface water (killed or stressed fish or macroinvertebrates)?
3. What is the size, in inches, of the water line that broke? Prepare an estimate of the water loss.
4. Provide an estimate of how long the repair will take.
5. What dechlorination procedures, or other BMPs, are or could be used to minimize impacts of the release?

Could a supplier be penalized if a discharge of chlorinated water from a water main break causes pollution?

Yes. The discharge of chlorinated water to waters of the commonwealth without a permit may constitute a violation of Section 301, 307 and 401 of the Clean Streams Law and DEP's Rules and Regulations. If DEP determines that the discharge is in violation of the Clean Streams Law, the responsible party could be liable for civil penalties up to $10,000 per day.

A real-life example of how a chlorinated water discharge caused environmental damage:

DEP biologists conducting a stream survey found a section of Class A trout stream devoid of aquatic life. Further investigation identified an old public water supply connection that had been improperly disconnected. This release of chlorinated water to a surface water depleted the population of macroinvertebrate life in the stream and ultimately caused a fish kill.

Questions?

Contact the Clean Water Program in DEP's regional offices. Visit DEP's website at www.dep.pa.gov and select "Regional Resources" on the right side of the top banner for contact information.

For more information, visit www.dep.pa.gov.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF CLEAN WATER

CHLORINATED WATER DISCHARGE – INCIDENT REPORT FORM

Cause and Source of Chlorinated Water Release and Discharge

Planned Release Incident during: ☐ Main flushing ☐ Hydrant flushing/testing ☐ Facility Disinfection
☐ Storage/Distribution system maintenance/repair: _____
☐ Other:
Date of planned release notification to DEP: _____

Unplanned Release: ☐ Water main break/leak ☐ Emergency flushing ☐ Broken/sheared hydrant ☐ Tank Overflow
☐ Other: _____

Location of release, including: ID of water facility, hydrant #, facility or main name & address):

Water System Owner/Name or Property owner:
For public water supplies, PWS ID#:

Name, title, and phone number of individual filing report:

Incident Information

Date of incident:	Municipality: County:	Name of Receiving Water/Stream:
Start time of discharge: ☐ Estimated ☐ Actual	End time of discharge:	Volume of discharge, gals: ☐ Estimated ☐ Measured

Date and time incident reported to DEP:
Name of person who reported the incident to DEP:

The chlorinated water release discharged into the surface water or stream:
☐ directly ☐ through a storm sewer ☐ as sheet flow over land ☐ through a swale
☐ other:

Location (point) of discharge to stream:

Did incident occur within a municipal separate storm sewer system (MS4)? ☐ Yes ☐ No

Was the chlorine residual measured at the point of release [discharge]? ☐ Yes ☐ No
If yes: ☐ Free Chlorine ☐ Total Residual Chlorine Result: mg/L

Were dechlorination procedures initiated by the first responder to the incident? ☐ Yes ☐ No
If yes, describe the procedure used; if no, explain:

Was the dechlorination process monitored throughout the discharge? ☐ Yes ☐ No
If yes, describe; if no, explain:

Was an assessment conducted to evaluate the impact on the receiving stream? ☐ Yes ☐ No
If yes, describe observations; if no, explain why an assessment was not completed:

Date and time of assessment:

Were dead fish or other aquatic life impacts observed? ☐ Yes ☐ No
If yes, was the PA Fish & Boat Commission notified? ☐ Yes ☐ No
Date and time of notification:

Additional comments or observations:

Important: Contact information to report incidents is located on the back of this form.

Incident Reporting Contact Information
Speak to a representative - do not leave a message!
After hours, call the regional or statewide 24-Hour Emergency Numbers

Southeast Regional Office
2 East Main St.
Norristown, PA 19401-4915

Main Telephone: 484-250-5900
24-Hour Emergency: 484-250-5900

Counties: *Bucks, Chester, Delaware, Montgomery and Philadelphia*

Northeast Regional Office
2 Public Square
Wilkes-Barre, PA 18701-1915

Main Telephone: 570-826-2511
24-Hour Emergency: 570-826-2511

Counties: *Carbon, Lackawanna, Lehigh, Luzerne, Monroe, Northampton, Pike, Schuylkill, Susquehanna, Wayne and Wyoming*

Southcentral Regional Office
909 Elmerton Ave.
Harrisburg, PA 17110-8200

Main Telephone: 717-705-4700
24-Hour Emergency: 866-825-0208

Counties: *Adams, Bedford, Berks, Blair, Cumberland, Dauphin, Franklin, Fulton, Huntingdon, Juniata, Lancaster, Lebanon, Mifflin, Perry and York*

Northcentral Regional Office
208 W. Third St., Suite 101
Williamsport, PA 17701-6448

Main Telephone: 570-327-3636
24-Hour Emergency: 570-327-3636

Counties: *Bradford, Cameron, Clearfield, Centre, Clinton, Columbia, Lycoming, Montour, Northumberland, Potter, Snyder, Sullivan, Tioga and Union*

Southwest Regional Office
400 Waterfront Drive
Pittsburgh, PA 15222-4745

Main Telephone: 412-442-4000
24-Hour Emergency: 412-442-4000

Counties: *Allegheny, Armstrong, Beaver, Cambria, Fayette, Greene, Indiana, Somerset, Washington and Westmoreland*

Northwest Regional Office
230 Chestnut St.
Meadville, PA 16335-3481

Main Telephone: 814-332-6945
24-Hour Emergency: 800-373-3398

Counties: *Butler, Clarion, Crawford, Elk, Erie, Forest, Jefferson, Lawrence, McKean, Mercer, Venango and Warren*

DEP, Statewide Emergency Response 24-Hour Emergency: 800-541-2050

PA Fish and Boat Commission: 855-347-4545
May be required to leave a message after hours.

Tab D

Appendix D

DRR PN Templates

Appendix Table of Contents	
Document Title	**eLibrary Document Number** *(hyperlinks work in electronic version)*
Tier 1 PN Failure of Filtration or Disinfection Process	**NEW! See New Draft in Appendix**
Tier 1 PN Failure to Meet Disinfection Requirements at the Entry Point to the Distribution System for a Groundwater System	3930-FM-BSDW0151A **See Existing PN Template in Appendix**
Tier 1 PN Failure to Meet Disinfection Requirements at the Entry Point to the Distribution System for a Surface Water System	3930-FM-BSDW0151B **See Existing PN Template in Appendix**
Tier 2 PN Failure to Meet the Distribution Disinfectant Residual Treatment Technique	***** *Not Available Yet* ****
Tier 2 PN Failure to Meet Disinfection Requirements at the Entry Point While Calculating & Providing 1.0-Log *Giardia* Inactivation	***** *Not Available Yet* ****
Tier 3 PN Failure to Monitor	3930-FM-BSDW0196 **See Existing PN Template in Appendix**
Tier 3 PN Failure to Maintain Records	3930-FM-BSDW0202 **See Existing PN Template in Appendix**
CCR Example for Failure to Monitor	**See Example in Appendix**

NEW! Tier 1 Public Notice for Failure of Filtration or Disinfection Process
(New Draft – 3 pages total: 2 instruction pages plus PN template)

3930-FM-BSDW0494 Rev. 8/2018
Instructions

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF SAFE DRINKING WATER

Tier 1 Public Notice
FAILURE OF A FILTRATION OR DISINFECTION PROCESS

Description of Violation

A failure of a key water treatment process involving filtration or disinfection has a significant potential to have serious adverse effects on human health and constitutes a Tier 1 situation.

Examples of a failure (or interruption) of a key water treatment process include:

- For surface water systems, groundwater under the direct influence of surface water systems, and groundwater systems with permitted 4-log inactivation, the disinfectant residual at the entry point is not detectable for **any amount of time** which is caused by an equipment failure or any other interruption of the disinfection feed system
- Individual treatment process or multiple treatment processes operational deficiencies
- Chemical feed deficiencies such as clogged feed lines or empty day tanks
- Filter & filter media deficiencies which are compromising turbidity removal
- Operating beyond the permitted design capacity of the treatment plant
- Process control deficiencies which compromise finished water quality
- Unacceptable Microscopic Particulate Analysis results indicating inadequate particle removal

Direct Delivery Requirements

Community water suppliers must provide within 24 hours, a Tier 1 PN to each **service connection** using one or more of the following forms of **direct** delivery:

- Hand delivery
- Electronic mail
- Automatic telephone dialing systems
- Another form of direct delivery approved in writing by the Department

In addition to providing public notification to each service connection, water suppliers that also serve transient and nontransient service connections must provide an abbreviated notice using broadcast media.

Additional Requirements when using an Abbreviated Message

A water supplier that delivers an abbreviated notice (3930-FM-BSDW0197) must also provide the entire Tier 1 PN (mandatory 10 content elements and Spanish translation regarding the importance of the notice) in one of the following ways:

- Posted on a website
- Recorded on a dedicated telephone line
- A method approved in writing by the Department

Noncommunity Delivery Requirements

Noncommunity water suppliers must use one of the following methods:

- Posting in conspicuous locations
- Hand delivery
- Electronic mail
- Mail or direct delivery to each customer and service connection, when known

Mandatory Language

Mandatory language on health effects must be included as written and is presented in this notice in ***italics***.

You must also include mandatory language provided in ***italics*** to encourage notice recipients to distribute the PN to others, where applicable.

Corrective Action (What is being done?)

In your notice, describe corrective actions you are taking. Depending on the corrective action you are taking, you can use one or more of the following statements, if appropriate, or develop your own text:

- We are currently working to [repair/adjust our treatment processes] to achieve the required level of treatment.
- We have [repaired/made adjustments to our treatment processes] and are now achieving the required level of treatment.
- We have modified our operational practices and are now achieving the required level of treatment.

Repeat Notices

For repeat notices, you should state how long the violation has been ongoing and remind consumers of when you sent out any previous notices. If you are making progress in correcting the deficiency or achieving the required treatment, describe your progress. Alternatively, if funding or other issues are delaying your progress, let consumers know.

"Problem Corrected" Tier 1 PN

You must issue a "Problem Corrected" PN (3930-FM-BSDW0188) using the Tier 1 direct delivery methods within 24 hours after you receive permission from DEP.

PN Certification

Send DEP a copy of each type of notice and the certification form (3930-FM-BSDW0076) to DEP within ten days after you issue the notices.

Template Form Field Instructions

When you place your cursor in the blank form fields in the following template, look at the bottom, left corner of your computer (just above the START button) for instructions on the information you should enter in that field. For example, if you place your cursor over the first blank form field in the template, the instructions will read "Insert system name."

3930-FM-BSDW0494 Rev. 8/2018

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF SAFE DRINKING WATER

DRINKING WATER WARNING

FAILURE OF A FILTRATION OR DISINFECTION PROCESS

ESTE INFORME CONTIENE INFORMACION IMPORTANTE ACERCA DE SU AGUA POTABLE. HAGA QUE ALGUIEN LO TRADUZCA PARA USTED, O HABLE CON ALGUIEN QUE LO ENTIENDA.

_____ **is experiencing operational conditions that compromise the water quality.**

BOIL YOUR WATER BEFORE USING

On _____, operational plant conditions or deficiencies were identified at _____.

These deficiencies include:

_____

There is an increased chance that the water may contain disease-causing organisms.

What should I do?

DO NOT DRINK THE WATER WITHOUT BOILING IT FIRST. Bring all water to a boil, let it boil for one minute, and let it cool before using, or use bottled water. Boiled or bottled water should be used for drinking, making ice, brushing teeth, washing dishes, and food preparation **until further notice**. Boiling kills bacteria and other organisms in the water.

Inadequately treated or inadequately protected water may contain disease-causing organisms. These organisms include bacteria, viruses, and parasites which can cause symptoms such as diarrhea, nausea, cramps, and associated headaches.

These symptoms above are not caused only by organisms in drinking water. If you experience any of these symptoms and they persist, you may want to seek medical advice. Guardians of infants and young children and people at increased risk, such as pregnant women, some of the elderly and people with severely compromised immune systems, should seek advice from their health care advisors about drinking this water.

What is being done?

_____

We will inform you when you no longer need to boil your water.

For more information, please contact: _____

_____

_____

at _____

Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses). You can do this by posting this notice in a public place or by distributing copies by hand or mail.

This notice is being sent to you by _____.

PWS ID#: _____ Date distributed: _____

Tier 1 Public Notice Template for Failure to Meet Disinfection Requirements at the Entry Point to the Distribution System for a Groundwater System (From eLibrary)

3930-FM-BSDW0151a Rev. 7/2018
Form

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF SAFE DRINKING WATER

DRINKING WATER WARNING
FAILURE TO MEET DISINFECTION REQUIREMENTS AT THE ENTRY POINT TO THE DISTRIBUTION SYSTEM FOR A GROUNDWATER SYSTEM

ESTE INFORME CONTIENE INFORMACION IMPORTANTE ACERCA DE SU AGUA POTABLE. HAGA QUE ALGUIEN LO TRADUZCA PARA USTED, O HABLE CON ALGUIEN QUE LO ENTIENDA.

BOIL YOUR WATER BEFORE USING

_____ did not meet treatment technique requirements.

We are required to maintain a disinfectant residual of _____ mg/L in the water supplied to consumers. Water samples taken on _____ showed a disinfectant residual concentration of _____ mg/L, which constituted a breakdown in treatment. As a result of this breakdown in treatment, there was a risk that the water may have contained disease-causing organisms.

What should I do?

DO NOT DRINK THE WATER WITHOUT BOILING IT FIRST. Bring all water to a boil, let it boil for one minute, and let it cool before using, or use bottled water. Boiled or bottled water should be used for drinking, making ice, brushing teeth, washing dishes, and food preparation **until further notice**. Boiling kills bacteria and other organisms in the water.

Inadequately treated or inadequately protected water may contain disease-causing organisms. These organisms can cause symptoms such as diarrhea, nausea, cramps, and associated headaches.

The symptoms above are not caused only by organisms in drinking water. If you experience any of these symptoms and they persist, you may want to seek medical advice. Guardians of infants and young children and people at increased risk, such as pregnant women, some of the elderly and people with severely compromised immune systems, should seek advice from their health care advisors about drinking this water.

What is being done?

_____

_____

_____

_____

_____

We will inform you when you no longer need to boil your water.

For more information, please contact: _____

_____

_____

at _____

Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses). You can do this by posting this notice in a public place or by distributing copies by hand or mail.

This notice is being sent to you by _____.

PWS ID#: _____ Date distributed: _____

Tier 1 Public Notice Template for Failure to Meet Disinfection Requirements at the Entry Point to the Distribution System for a Surface Water System (From eLibrary)

3930-FM-BSDW0151b Rev. 7/2018
Form

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF SAFE DRINKING WATER

DRINKING WATER WARNING
FAILURE TO MEET DISINFECTION REQUIREMENTS AT THE ENTRY POINT TO THE DISTRIBUTION SYSTEM FOR A SURFACE WATER SYSTEM

ESTE INFORME CONTIENE INFORMACION IMPORTANTE ACERCA DE SU AGUA POTABLE. HAGA QUE ALGUIEN LO TRADUZCA PARA USTED, O HABLE CON ALGUIEN QUE LO ENTIENDA.

BOIL YOUR WATER BEFORE USING

_____ did not meet treatment technique requirements.

Through the disinfection process, we are required to provide at least 1.0-log (i.e. 90.0%) inactivation of Giardia cysts that could be in the water supplied to consumers. Water samples taken on _____ showed a log inactivation level of _____, which constituted a breakdown in treatment. As a result of this breakdown in treatment, there was a risk that the water may have contained disease-causing organisms.

What should I do?

DO NOT DRINK THE WATER WITHOUT BOILING IT FIRST. Bring all water to a boil, let it boil for one minute, and let it cool before using, or use bottled water. Boiled or bottled water should be used for drinking, making ice, brushing teeth, washing dishes, and food preparation **until further notice**. Boiling kills bacteria and other organisms in the water.

Inadequately treated or inadequately protected water may contain disease-causing organisms. These organisms can cause symptoms such as diarrhea, nausea, cramps, and associated headaches.

The symptoms above are not caused only by organisms in drinking water. If you experience any of these symptoms and they persist, you may want to seek medical advice. Guardians of infants and young children and people at increased risk, such as pregnant women, some of the elderly and people with severely compromised immune systems, should seek advice from their health care advisors about drinking this water.

What is being done?

_____

_____

_____

_____

_____

We will inform you when you no longer need to boil your water.

For more information, please contact: _____

_____

_____

at _____

Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses). You can do this by posting this notice in a public place or by distributing copies by hand or mail.

This notice is being sent to you by _____.

PWS ID#: _____ Date distributed: _____

Tier 2 PN Failure to Meet the Distribution Disinfectant Residual Treatment Technique

***** *Not Available Yet* ****

Tier 2 PN Failure to Meet Disinfection Requirements at the Entry Point While Calculating & Providing 1.0-Log *Giardia* Inactivation

***** *Not Available Yet* ****

Tier 3 Public Notice Template for Failure to Monitor (From eLibrary)

3930-FM-BSDW0196 10/2015

IMPORTANT INFORMATION ABOUT YOUR DRINKING WATER FAILURE TO MONITOR

ESTE INFORME CONTIENE INFORMACIÓN IMPORTANTE ACERCA DE SU AGUA POTABLE. HAGA QUE ALGUIEN LO TRADUZCA PARA USTED, O HABLE CON ALGUIEN QUE LO ENTIENDA.

Monitoring Requirements Not Met for _____

Our water system violated several drinking water standards over the past year. Even though these were not emergencies, as our customers, you have a right to know what happened and what we did to correct these situations.

We are required to monitor your drinking water for specific contaminants on a regular basis. Results of regular monitoring are an indicator of whether or not our drinking water meets health standards. During _____ we _____ and therefore cannot be sure of the quality of our drinking water during that time.

What should I do?

There is nothing you need to do at this time.

The table below lists the contaminant(s) we did not properly test for during the last year, how often we are supposed to sample for _____ and how many samples we are supposed to take, how many samples we took, when samples should have been taken, and the date on which follow-up samples were (or will be) taken.

Contaminant	Required sampling frequency	Number of samples taken	When all samples should have been taken	When samples were or will be taken

What happened? What was done?

_____

For more information, please contact _____ at _____.

Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses). You can do this by posting this notice in a public place or distributing copies by hand or mail.

This notice is being sent to you _____.

PWS ID#: _____ Date distributed: _____

Tier 3 Public Notice Template for Failure to Maintain Records (From eLibrary)

3930-FM-BSDW0202 10/2015

IMPORTANT INFORMATION ABOUT YOUR DRINKING WATER

FAILURE TO MAINTAIN RECORDS

ESTE INFORME CONTIENE INFORMACIÓN MUY IMPORTANTE SOBRE SU AGUA DE BEBER. TRADUZCALO O HABLE CON ALGUIEN QUE LO ENTIENDA BIEN.

Recordkeeping Requirements Not Met for _____

We violated a drinking water requirement.

- ☐ We failed to retain written records about our recycled flows in accordance with the Filter Backwash Recycling Rule.
- ☐ We failed to notify the Department that we are recycling our waste stream.
- ☐ We incurred a record keeping violation under the Safe Drinking Water Act.

What should I do?

There is nothing you need to do at this time. You may continue to drink the water. If a situation arised where the water is no longer safe to drink, you will be notified within 24 hours.

What happened? What was done?

_____

For more information, please contact _____ at _____

Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses). You can do this by posting this notice in a public place or distributing copies by hand or mail.

This notice is being sent to you _____

PWS ID#: _____ Date distributed: _____

CCR Example: Tier 3 Public Notice Template for Failure to Monitor

(Note: The example below is for a small CWS that only takes 1 distribution disinfection residual a week. They had to note in their annual CCR – in the "Other Information" section – their failure to take one of their weekly disinfection residual readings during June 2019.)

Other Information

Distribution Chlorine Residual: We are required to collect a weekly distribution chlorine residual. We failed to collect this weekly residual during the week of June 17th.