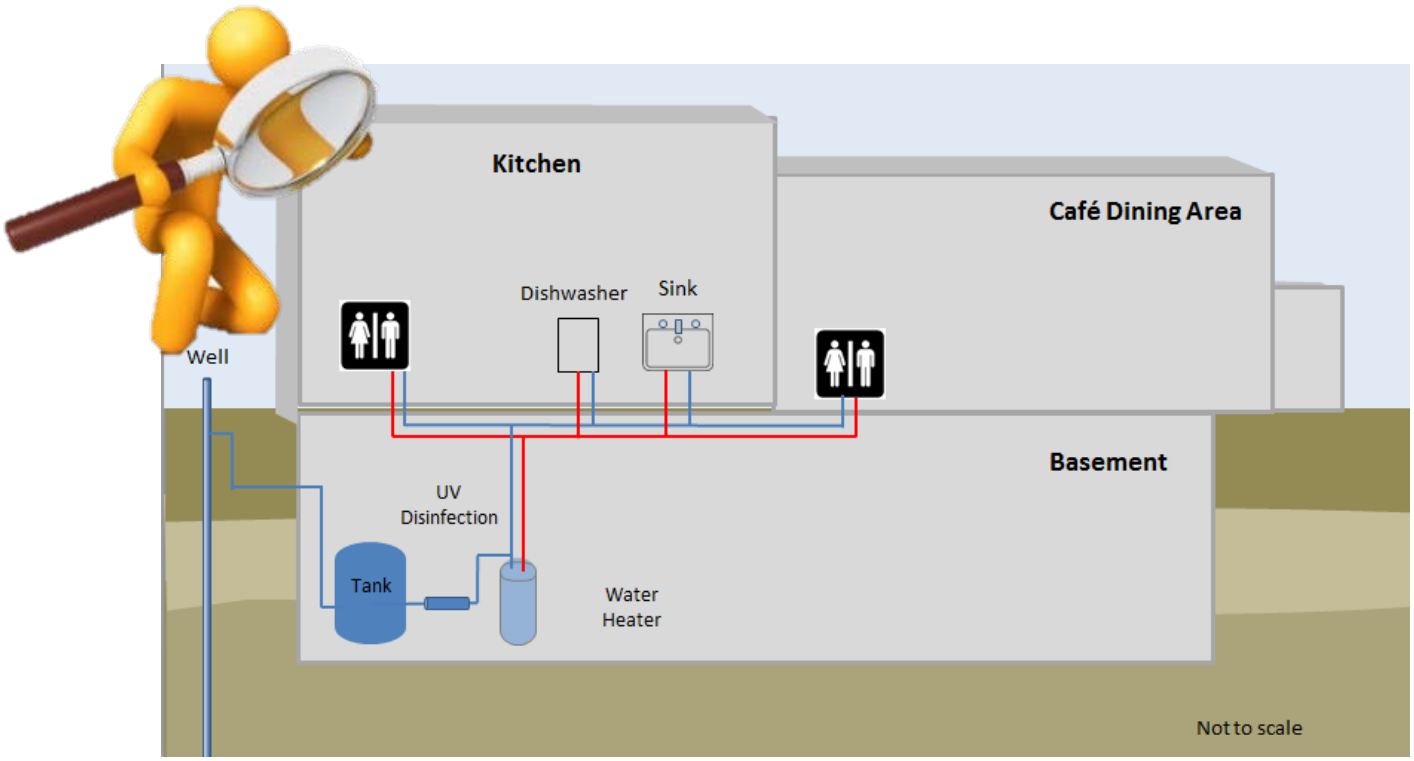
Revised Total Coliform Rule
Level 2 Assessment Training

Water Supplier
Participant Guide



Bureau of Safe Drinking Water

2017

pennsylvania
DEPARTMENT OF ENVIRONMENTAL
PROTECTION

WS04.10.17

RTCR Level 2 Assessments

Water Supplier Training

Table of Contents

Important Resources:

DEP RTCR Website:

http://tinyurl.com/PaRTCR2

EPA Assessment Guidance Manual:

http://tinyurl.com/EPA-assessments

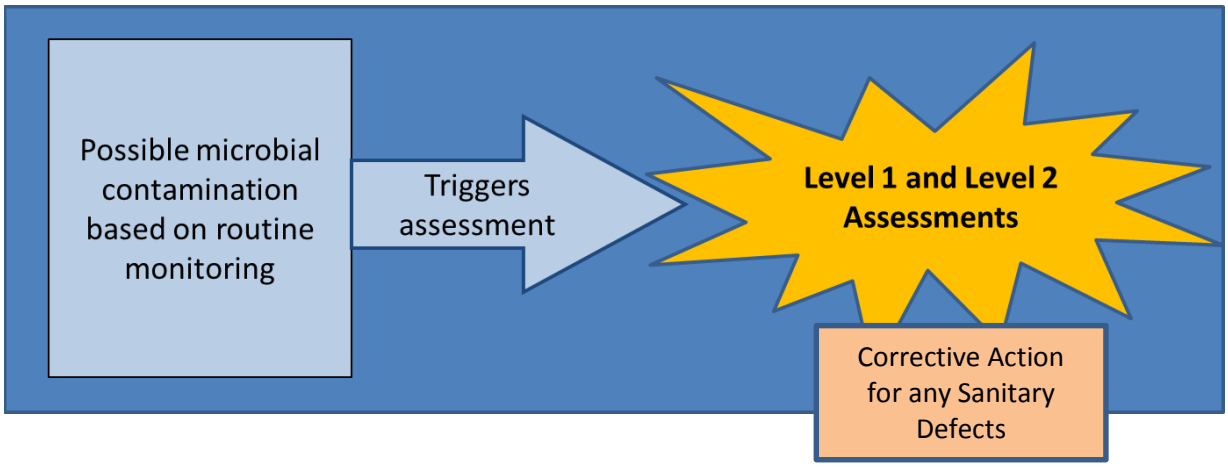
Lesson 1: Preparing to Conduct the Assessment

Objectives

- Purpose and importance of assessments
- Sanitary Defects
- Preparing to Conduct the Assessment

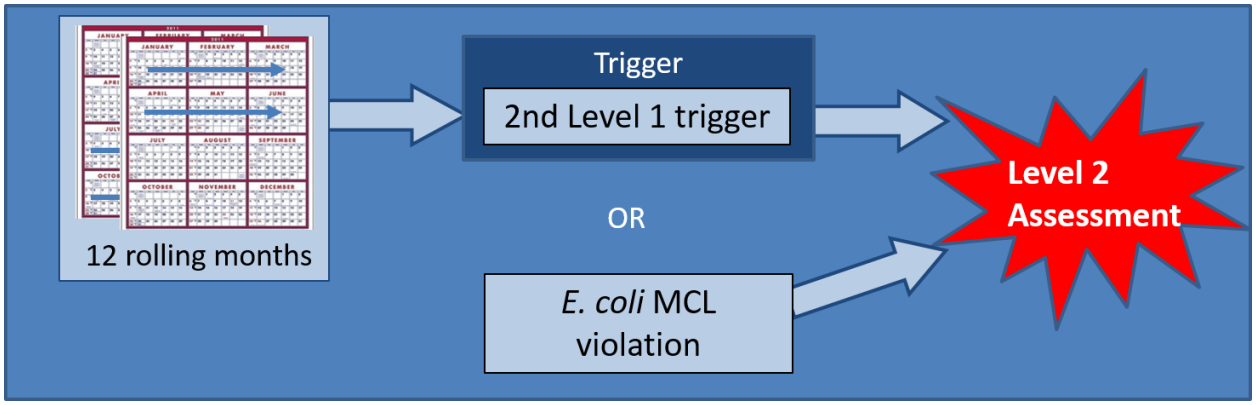
Assessments

Under the RTCR, if your routine monitoring shows evidence of microbial contamination, it triggers a Level 1 or Level 2 assessment. The assessor identifies any sanitary defects and corresponding corrective actions.



Level 2 Assessment Triggers

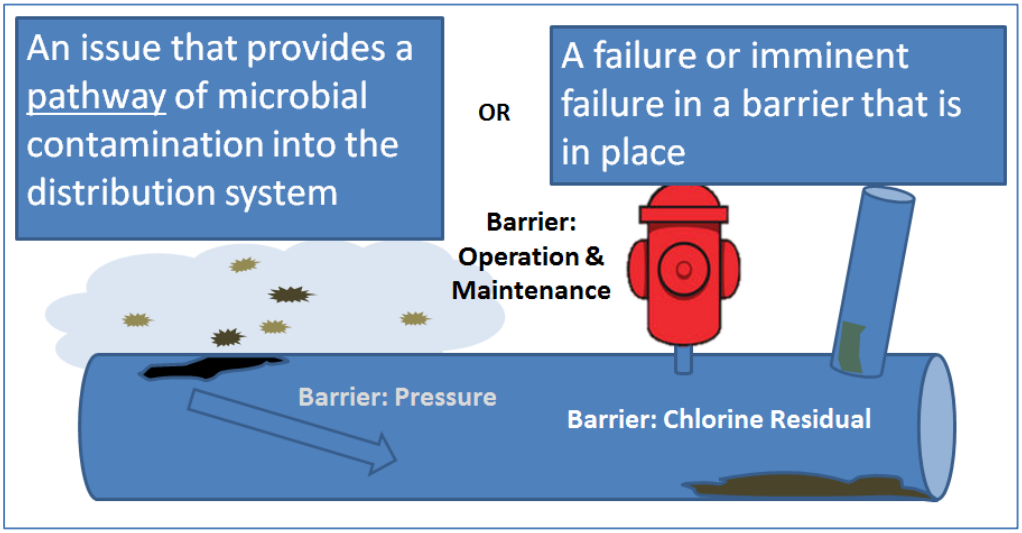
This training is focused on Level 2 assessments, which represent a greater health threat than Level 1 situations. Level 2's are triggered when a system has an *E. coli* MCL violation or triggers a second Level 1 assessment in a rolling 12 month period:



Sanitary Defects

A Sanitary Defect is:

- A defect that could provide a **pathway** of entry for microbial contamination into the distribution system **OR**
- A failure or imminent failure in a **barrier** that is already in place. Barriers include such things as: disinfectant residual, proper O&M, system pressure, backflow prevention.



Examples pathways:

- Cross connection between potable water and a source of contamination
- Intrusion through pipe leaks, broken meters, leaking pipe joints
- Contamination during line break repair or installation

Example barrier failures:

- Inadequate disinfection residual within system
- Failure of UV light disinfection
- Pressure loss associated with a break

The Level 2 Assessment: Are you Properly Certified?

Certified operators must conduct Level 2 assessments AND they must be properly certified for the system. This includes both the class and subclass. This is fully explained in the document titled "Water Operator Classification and Subclassification Definitions for Level 2 Assessments" in Appendix A of this manual.

Preparing to Conduct the Assessment

Proper preparation before the assessment is very important. An assessor should never show up to an assessment without having properly prepared.

Appendix A of this manual contains a valuable checklist for preparing for the assessment.

Ask the water system for:

- Chain of Custody / Sample Log / Sample Results from Laboratory
- Contact Information for Laboratory if Lab Collected the Sample
- Raw Water Quality Data
- Customer Complaint Logs
- Coliform Sample Siting Plan
- Permits
- Most Recent Sanitary Survey (DEP Inspection)
- Most Recent Inventory
- All Inspection and Narrative Forms from Partial Inspections/Site Visits conducted since last San. Survey
- Level 1 Assessment (when L2 triggered because of two L1 Assessments)

Please note that Level 2 assessments evaluate the entire system. If the system has physically separated distribution systems, the entire system (all distribution systems) need to be assessed. This is required because potential defects or management issues that resulted in positive samples in one of the distribution systems could allow for future positives in the other distribution system(s). Or, the wells could be drawing from the same contaminated aquifer.

NOTE: If a system cannot provide the most recent inspection and system "inventory", ask the system for their DEP contact information. You can ask the DEP inspector (sanitarian) for the most recent inspection and inventory. However, there is no guarantee that the sanitarian can provide you with this in a timely manner. You may be steered to an informal file review at the regional or district office.

DWRS

You can also get information on the system from the Drinking Water Reporting System (DWRS):

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

Using the system name or PWSID, you can search for "Inventory Information", "Violation History", or Sample Results.

Doing Your Homework

You should review all the information that you obtain about the system. Reviewing and identify these elements will help you understand the system and is a necessary part of the investigation. Determine:

- The water source(s) – groundwater? How many wells? Surface water?
- The treatment type (could be no treatment): UV or chlorination
- Any recent changes to the system (source or treatment)
- Any past history of violations
- Any past issues with raw water quality
- Any recent assessments done
- What was noted in the last inspection?
- Any violations?

Study up on treatment types by reviewing the Job Aids in **Appendix C.**

File to Bring to Assessment

You could bring all your information you gathered, but at the very least bring the following in a paper file or on an electric tablet/laptop:

- Lab results
- Coliform sample siting plan
- Most recent DEP inspection
- DEP PWS Inventory
- Level 1 assessment (if applicable)

You will also need to bring:

- Blank Level 2 assessment form
- Laboratory submission forms

Prepare the appropriate equipment, instruments, and sample collection supplies.

Sample Collection Preparation

The following table will help you determine which bottles/equipment to bring for a particular assessment. The "X" indicates which locations should be sampled for the specific parameter.

Parameter	All			Additional for System with Iron/Mn Treatment		Additional for System with Nitrate Treatment	
	Raw Water	Entry Point	Within Distribution/ Plumbing system	Raw	EP	Raw	EP
Turbidity	X						
Iron/ Manganese	X[A]			X	X		
Coliforms		X[B]	X				
Chlorine		X[C]	X				
Nitrate						X	X

[A] Only required if raw water turbidity is >5 NTU
[B] Only required at EP for multiple service connection system.
[C] Only required at EP for chlorinating systems

Exercise: Preparing to Conduct Assessment

Use the Inventory for Lloyd's Motor Inn on pages 1-6 to 1-9 to answer the following:

1. **How many service connections does the system have?**

2. **How many water sources are there? Please list.**

3. **List the treatment types:**

4. **What samples should be collected during the assessment?**

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DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA Initial Survey Date: 5/17/2002
DEPARTMENT OF ENVIRONMENTAL PROTECTION Updated On: 7/13/2016
BUREAU OF SAFE DRINKING WATER

PWS INVENTORY & BRIEF DESCRIPTION FORM
For Use at NCWSs With ONLY Disinfection or No Treatment

PWS Name: Lloyd's Motor Inn ID #: 9777777 Transient System?: Yes (Y/N)

Owner Name: Wendell Lloyd Ownership Type: A

Municipality: Arnold Township County: Arnold

Service Area: 02

Location Address: 7000 Sherwood Drive

Mailing Address (If Different):

City/State: New Arnold , PA Zip Code: 10000 Telephone #: (555) -5557859

Population Served: 90 Number of Connections: 1 Number of Meters: 1

Production (GPD)*: Hours Operated/Day: 24

Begin Season: N/A End Season: N/A Laboratory Name: California Labs

*GPD = Gallons Per Day

PERSONNEL DATA

RESPONSIBLE OFFICIAL

Name: Wendell Lloyd Title: President

Mailing Address: 7000 Sherwood Drive

City/State: New Arnold , PA Zip Code: 10000 Telephone #: (555) -5559875

WATER SYSTEM PERSONNEL

Name: Certification:

Mailing Address:

City/State: , PA Zip Code: Telephone #: ( )

Hours to Complete Report: Investigator: Supervisor's Initials:

PUBLIC WATER SYSTEM INVENTORY
GENERAL DESCRIPTION/SOURCE WATER INFORMATION

PWS ID #: 9777777

Describe, in the space below, this water system starting from each separate source to the distribution system. The description should be brief, simple and clear, so as to be understandable by one unfamiliar with the system. On a separate sheet attached to this form, prepare a sketch to show sources, all facilities supplied, sewage disposal and potential sources of pollution. Attach a copy of a 7.5 minute, USGS Topographic map showing the facility location, all sources of supply, nearby surface water and known potential sources of pollution.

The system is supplied by one ground water well about 50' from the treatment room. The well's submersible pump moves the water to a treatment room in the basement of the office building. Water flows to a pressure tank to maintain system pressure then to a dual tank ion-exchange nitrate removal unit (Best Model 18-120). The water is then softened with the same model dual tank ion exchange unit filled with cation exchange resin. Next, a chemical injection pump injects sodium hypochlorite from a 30-gallon, translucent PVC day tank. The water is metered before flowing through seven 120-gallon chlorine contact tanks. The treated water then flows to the distribution plumbing.

[Continue the description on the back of this sheet, if more space is needed.]

SUMMARY/ALL SOURCES								
Source ID #	Source Name	Latitude	Longitude	Source Type Code	Year Constructed	Availability Code	Pumping Capacity GPM	Treat-ment Plant ID #
1	Well#1	[redacted]		G	2002			300
		, ,	, ,					
		, ,	, ,					
		, ,	, ,					
						Total		

GROUNDWATER SOURCES														
							Water Level Below Surface		Well Casing					
Source ID #	Source Name	GUDI Y/N	WHPP Y/N	Surface Elev. (Feet)	Total Depth (Feet)	Type of Pump	Static	Pump	Depth (feet)	Diameter (inches)	Single/ Double Casing	San. Seal Y/N	Pitless Adaptor Y/N
1	Well#1	No	No	370	350	S			102	6	D	Yes	Yes

PUBLIC WATER SYSTEM INVENTORY
TREATMENT PLANT, MONITORING, STORAGE

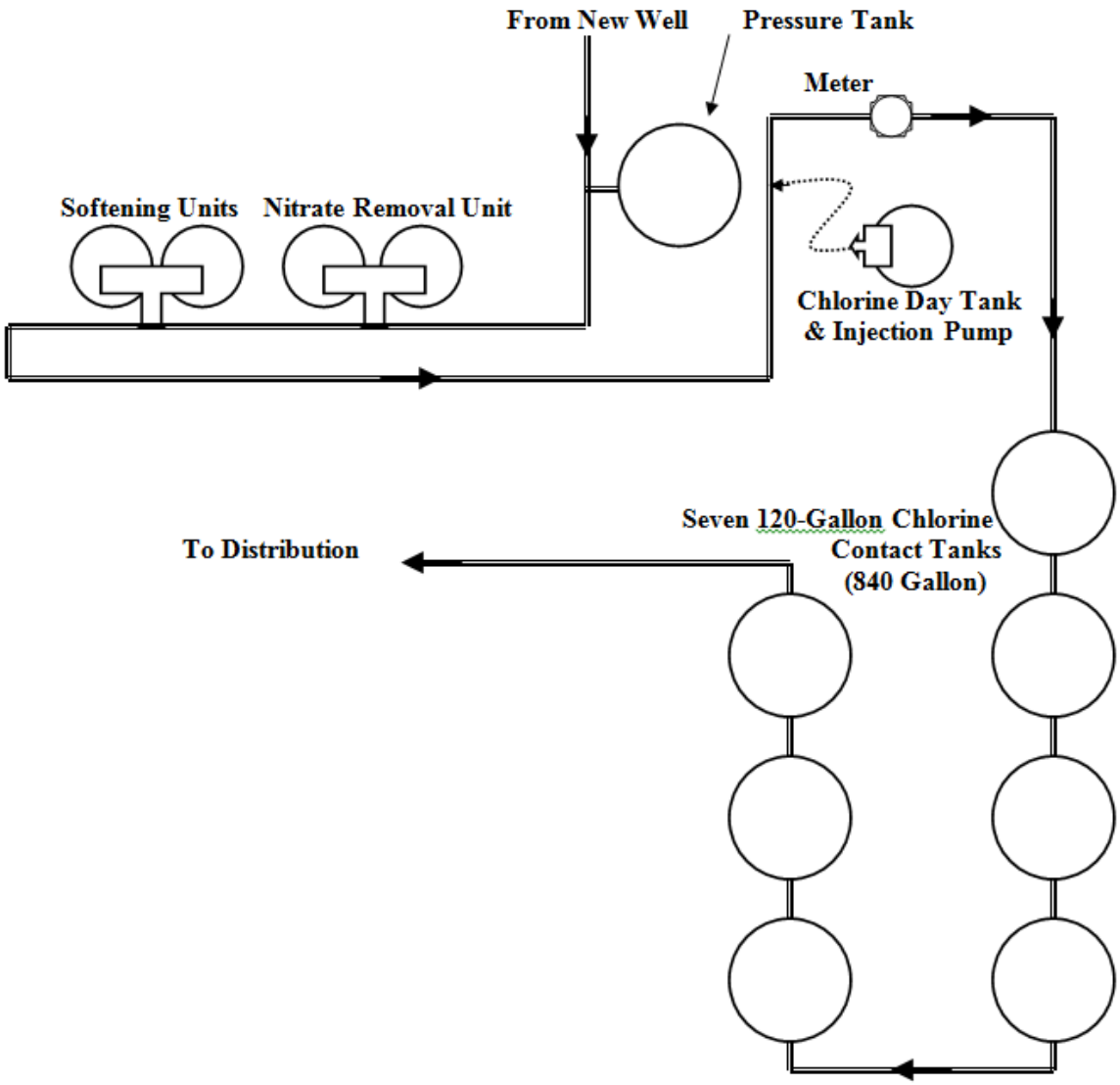
PWS ID #: 9777777

TREATMENT PLANT SUMMARY							
Plant ID #	Entry Point ID #	Treatment		Permit Y or N or N/A	Year Installed or Constructed	Capacity GPM	O & M Plan Y or N
		Objective	Process				
300	100	Nitrate Removal	Ion exchange	Yes	2002	12	Yes
300	100	Softening	Ion exchange	Yes	2002	12	Yes
300	100	Disinfection	Hypochlorination	Yes	2002	12	Yes

MONITORING				
Self-Monitoring		Laboratory		
Test Used	How Often	Parameter	Monitoring Frequency	Sample Location
Digital Colorimeter	Daily	Chlorine		Entry Point
Digital Colorimeter	Tri-weekly	Nitrate		Entry Point
		Bacteria	Quarterly	Distribution
		Chlorine	Quarterly	Distribution
		Nitrate	Quarterly	Entry Point

STORAGE FACILITIES					
ID #	Type	Year Constructed	Material	Capacity (gallons)	Purpose
01		2010	Fiberglass	120	Contact time
02		2010	Fiberglass	120	Contact time
03		2010	Fiberglass	120	Contact time
04		2010	Fiberglass	120	Contact time
05		2010	Fiberglass	120	Contact time
06		2010	Fiberglass	120	Contact time
07		2010	Fiberglass	120	Contact time
			Total		

Lead action level exceeded? _____ (Y or N or N/A)
Public education program completed? _____ (Y or N or N/A)



SYSTEM SCHEMATIC

Key Points

- Preparation is important
- Gather information from the water system and review
- Prepare for assessment sample collection

Lesson 2: Part II. & III. Sampling

Objectives

During this lesson you learn:

- How to complete Parts II. and III. of the Level 2 Assessment Form
- How to determine if a sample tap is appropriate for sample collection
- Proper sample collection protocols for bacteriological samples

Part II: Positive Sample Information

- A separate table should be completed for each positive sample. Four boxes available in Part II. and additional boxes available on page 10 of the form.
- If a system triggers a Level 2 assessment and then has additional positive samples later in the month, they should include **all** of the positive samples on their assessment form.

Positive Sample #1:	Sample Location ID#:	Sample Location:	
Positive Sample Date:	Name of Sample Collector:		
Chlorine Residual: ☐ Free ☐ Total ☐ Not Measured		mg/L	
1. Was the sample collected according to the total coliform sample siting plan?		YES ☐	NO ☐
2. Was the condition of the sample tap appropriate for collection?		YES ☐	NO ☐
3. Were the samples collected in accordance with proper sample collection protocols?		YES ☐	NO ☐

- The first two boxes which are sample location ID# and sample location should be the same as the location ID and location specified in the total coliform sample siting plan that all water systems should have submitted to the Department by April 1, 2016.
- The next set of information, positive sample date, name of sample collector and chlorine residual should be able to be found on the chain of custody form from the lab or the sample log book for the water system if one is maintained.
- The three questions below this basic information are there to determine if there was a defect in any of the sampling practices used to collect the sample.
    - The assessor should speak with the sample collector in order to properly answer these questions. There may be more than one sample collector.
    - The "NO" answer box is grayed out for each of the three questions. The gray boxes mean that there was an issue found with the sampling practices.
    - Sampling issues found are not sanitary defects; however they should still be corrected (discussed more below in regard to Part III).

Q1: Was the sample collected in accordance to the total coliform sample siting plan?

- By April 1, 2016, every water system was required to have a total coliform sample siting plan. Within that plan they should have indicated where samples were to be collected and when the samples were to be collected, this includes check samples.

- The assessor should obtain a copy of this sample siting plan and use it to compare with the sample report to determine if the samples were collected where and when they were supposed to be.

Q2: Was the condition of the sample tap appropriate for collection?

- In order to properly answer this question the assessor must look at each sample tap and determine if there is any reason why it is not an appropriate tap for collecting a coliform sample.

- Bacteriological samples should not be taken from taps that are leaking, corroded or don't have separate handles for hot and cold water.

Q3: Were the samples collected in accordance with proper sample collection protocols?

- Key factors of proper sample collection are, removing the aerator, flushing water through the tap until the temperature has stabilized, and properly handling the sample bottle so as to not touch the inside of the bottle or cap.

- The only way to answer this question is to discuss with the sample collector(s).

Part III: Sampling Issue Descriptions and Corrective Actions

In this part, the assessor explains what sampling issues were found as part of the assessment (from Part II), what corrective actions are going to be taken to correct the issue, and the schedule they are going to follow while correcting it.

Remember, sampling issues are NOT considered sanitary defects; however they should still be corrected.

Example Sampling Issue Description and Corrective Action Box:

Positive Sample #	**1**	**Question #**	**2**
Sampling Issue Description		**Corrective Action and Completion Schedule**	
The sample was collected from a tap that has a hot/cold mixing faucet.		*The owner of the water system is going to change the sink fixtures so that the tap has separate hot and cold faucets. This will be completed within 30 days.*	

Key Points

- The assessor must speak with the sample collector(s) in order to complete Part II.

- All samples must be collected in accordance with an RTCR sample siting plan.

- Samples should not be collected from faucets that are leaking, corroded, have hot/cold mixing faucets.

- It is important to follow proper sample collection protocols when taking bacteriological samples.

- Part III. must be completed for any question that was answered "NO" in Part II.

Lesson 3: Part IV. Sources

Objectives

During this lesson you will be provided with:

- An overview of Part IV. of the Level 2 Assessment Form
- Details on how to complete the four source sections of Part IV. relating to:
    - Well Sources
    - Spring Sources
    - Surface Water Sources
    - Purchased Sources

Part IV: Assessment Questions

The general purpose of this part is to ask questions specific to different portions of the water system that will help the assessor identify sanitary defects within the system.

- Divided into eight sections (A-H)

    (A-D) Source (well, spring, surface, purchased)

    (E) Treatment Process

    (F) Plumbing System (Single Service Connection)

    (G) Distribution System (Multiple Connections)

    (H) Water Storage

- It is acceptable and even encouraged that the Assessor solicits assistance from individuals who may have expertise in different portions of the water system when completing this portion of the assessment.
    - For example, an operator who works primarily in the distribution system may be the most appropriate individual to answer questions about distribution pressures and line breaks.
    - However, an engineer who oversaw the installation of a storage tank may be the most knowledgeable about collecting representative samples from the tank.
    - Other individuals such as hydrogeologists and lab analysts could be useful when answering source or water quality monitoring questions.
    - The purpose of the assessment is to conduct the most in depth evaluation of the system as possible; if consulting with additional personnel from the water system allows the Assessor to accomplish this goal then it is recommended.

- There are three possible answers "YES", "NO", or "N/A" to each question. The "N/A" is blacked out for some of the questions, where "N/A" would not be appropriate. For these questions the answer must be "YES" or "NO".
- Any time the assessor checks an answer that is located in a gray box, it is an issue and a potential sanitary defect, and must be explained in Part V of the form.

Part IV: Section A. Source - Well

Wells are the most common source type for public water systems in Pennsylvania; therefore this section will be used for the majority of Level 2 Assessments conducted in the state.

Q1: Are any of the wells located in a pit?

A well should be considered to be in a pit if it terminates below grade.

On the form the answer to "YES" is shaded gray meaning that it is an issue. If the well pits look dry and have tight fitting lids then it doesn't necessarily need to be listed as a sanitary defect in Part V. of the form. However, if there are signs of surface water infiltration into the pit such as mud and staining on the well casing or pit walls then this should be considered a sanitary defect that needs to be corrected.

Q2: Is the ground graded to prevent surface water from collecting around the well casing?

The assessor should look for depressions around the well where surface water may collect. A properly graded well will be slightly mounded around the casing so that water runs away from the well during storms.

Q3: Do well casings extend at least 18" above the ground?

The DEP design standards specify that a well casing should extend at least 18 inches above grade, this helps to keep the well cap from being damaged, keep the well terminus from being submerged under surface water during storms or wet times and adds an extra layer of protection from dirt and debris entering the well.

That being said, if a well casing extends only 15 or 16 inches above grade but it is on a slope that would not allow surface water to stand or collect around the casing AND it has a sanitary seal well cap the assessor would mark "NO" for this question but then can explain in the corrective action section why it isn't a sanitary defect.

Q4: Are the exposed portions of all well casings in good condition?

In some cases the answer to this question is going to be clear cut and in others, not so much. In a perfect world all well casings will be in excellent condition, no rust, no holes, no cracks, etc. However, there will be times when the assessor will come across some rust on a casing, but as long as there aren't huge pits in it, it isn't peeling badly and there aren't any holes it could still be considered in good condition. The assessor should use their professional judgment to determine if the condition of the casing could be allowing contamination to enter the well or indicative of further issues below grade.

Q5: Do all wells have a secured sanitary seal well cap?

A proper sanitary seal well cap is a completely enclosed entity without any unsealed openings and should have the following:

- There should be a rubber gasket in between two pieces of metal cap.
- Everything must be tightly bolted down and the cap shouldn't be missing any bolts.
- There should be a completely enclosed conduit for the well pump wires. If the conduit is cracked or missing then the answer to this question should be "NO".

Q6: If the sanitary seal well cap is vented, does the vent have an intact screen?

Most sanitary seal well caps will have a well vent and this must be screened. If the screen is missing then the sanitary seal is compromised and the screen must be replaced.

On pancake style sanitary seal well caps the assessor can feel for the vent, it feels like a little indentation in the underside of the cap.

On the mushroom style sanitary seal well cap, it will be more difficult to determine if there is a screen on the vent due to the design of the cap and location of the vent on the top of the cap. If possible verify that the screen is intact, this will be easier to accomplish on a larger cap.

Not all sanitary seal well caps will have a vent, those that are used in pits and wells that don't have pitless adaptors typically do not have a well vent. For this style cap the answer to this question can be "N/A" since there is no vent and therefore no screen.

Q7: Is there an air gap between all well vents and the ground surface?

This question goes hand in hand with question #3, as long the well casing extends 18 inches above grade the answer to this should be "YES".

Q8: Are appropriate backflow prevention devices installed, maintained and tested on all cross connections?

Although cross connections are prevalent in the distribution system, they are not often found at the source.

One of the connections that may be encountered at the source is a fire suppression system for a building. Often times these systems are hooked to the water system prior to treatment and that water just sits in the pipes until the suppression system is used.

In these situations there should always be a backflow prevention device installed and the water system should be able to provide record of it being tested. If backflow prevention is not present or there is no record of it being tested, then the answer this question should be "NO".

Q9: Were raw water turbidity measurements collected as part of this investigation?

In order to analyze a turbidity sample, the assessor will need a portable turbidimeter. This will give instant results which will help to decide how to answer the following questions.

If the assessor is unable to purchase/acquire a portable turbidimeter the other options are:

- a spectrophotometer or benchtop unit to analyze once they return to the office
- turbidity analysis by an accredited laboratory (this is a last resort)

If it is decided not to collect a raw water turbidity then another action must be taken to determine the integrity of the well, so the DEP individual who is reviewing the assessment should expect the answer to question #12 to be "YES" if the answer to this question is "NO".

Q10: If the raw water turbidity measurements were greater than 5 NTU, was the source water tested for iron and manganese?

Question Background:

The reason that 5 NTU is a trigger for additional monitoring is because it is the long standing criteria for the surface water identification protocol (SWIP). If a groundwater source has raw water turbidity greater than 5 NTU it may indicate that surface water is entering the well and the DEP would require the source to be SWIP'ed.

The reason that an iron and manganese sample should be taken if the turbidity is greater than 5 NTU is because it is known that undissolved metals can cause elevated turbidity levels in a well source. Therefore, prior to going through the SWIP process for a well to see if it is under the influence of surface water, it is easier and cheaper to collect an iron and manganese sample to determine if these secondary contaminants are the cause of the elevated turbidity. These samples can either be taken and analyzed in the field using a field test kit or it can be collected and sent to a lab for analysis.

Possible Answers:

If a raw water turbidity measurement is taken and it is less than 5 NTU, then the answer to this question is "N/A".

If a raw water turbidity measurement is taken and it is greater than 5 NTU and an iron and manganese sample is not collected then the answer to this question is "NO" and DEP would expect the answer to #12 to be "YES".

If a raw water turbidity measurement is taken and it is greater than 5 NTU and an iron and manganese sample is collected, then the answer to this question is "YES".

Important Notes for Questions 9 and 10

First, when collecting raw water samples it is very important that they are true raw water samples. A sample pulled from water that has been sitting for an extended period of time in the pressure tank is not indicative of raw water quality.

To ensure that the sample is raw water, flush water from a raw water tap until the well pump kicks on. Once the pump kicks on, then collect the samples. Sometimes the well

won't stay on for a long enough period of time to collect the sample so either wait until it kicks back on (if not a lot of storage) or collect it immediately after it turns off. Just make sure that it has kicked on at least once before taking a sample.

Second, all samples that are taken during an assessment and analyzed by an accredited laboratory are special samples and should be reported as an "S" sample type by the lab. No samples taken during an assessment can count as compliance or performance monitoring samples. Field measurements such as chlorine, turbidity, iron and/or manganese do not need to be reported to DEP but may be asked for by the DEP official reviewing the assessment.

Q11: Was iron or manganese measured above the secondary MCLs of 0.30 mg/L for iron or 0.05 mg/L for manganese?

The levels listed in this question are the secondary MCLs for iron and manganese and these are enforceable under PA drinking water regulations. Hopefully, a system that exceeds one or both of these MCLs in their raw water has treatment installed to remove it prior to the entry point.

If treatment is not installed, this is an issue and it is recommended that the assessor inform the water system that they should discuss the high results with the department. However, high iron and manganese are not a sanitary defect unless they are affecting proper function of another treatment process installed at the system. In this case, the sanitary defect would be determined during the treatment section of Part IV.

Note: As the table which was discussed in Lesson 1 indicates, if a system does have treatment then a post treatment iron and manganese sample should also be collected to see if the treatment is functioning properly. This will be discussed in Lesson 4, treatment.

If the iron is greater than the secondary MCL then this could be the cause of the elevated turbidity collected from the raw water and can be used in the issue description for question #12 as to why the well was not scoped.

Q12: Was the well scoped to determine its integrity as part of this investigation?

Scoping a well is a good way to ensure that the integrity of the well is intact and should be done if raw water monitoring collected as part of the investigation indicates that there is a potential issue with well or if no raw water monitoring was conducted. Therefore, the answer to this question should be "YES" if either turbidity or iron and manganese samples were not taken.

It is acceptable for the answer to this question to be "NO" if either the raw water turbidity was below 5 NTU or if the raw water turbidity was high but the iron was also high. If "no" is the answer, it still needs to be explained in Part V. but it won't be a sanitary defect.

Q13: If the well was scoped, were issues with the well identified?

Any issues such as cracks or holes in the casing identified during the well scoping would require a "YES" response to this question.

Q14: Has the source yield changed for any of the wells?

The purpose of this question is to find out if there are issues with source quantity. For example, a couple follow up questions to the water system might be, does the well dry up during periods of drought OR during periods of high demand such as holiday weekends at a campground? Or perhaps something has changed with the surrounding land use where more water is being drawn from the aquifer and causing the source yield to diminish.

Q15: Are there obvious sources of contamination in the vicinity of any of the wells?

Assessments are focused on looking for sources of *microbial* contamination which is important to remember when asking this question. There will be obvious sources of contamination, such as manure running towards the well in a rural area or a well being located directly next to a septic system. However, there are a couple things to look for which are not as obvious.

Old wells that have not been properly abandoned by being filled with concrete or bentonite clay and capped could be a direct conduit for contamination to enter the aquifer in which the well is use is pulling from.

Another source of contamination can be a roof or gutter that drains directly onto or towards a well. This can be a major issue, especially if there is no sanitary seal well cap and/or the well casing is compromised.

Q16: Were any of the well pumps repaired or replaced within the 30 days prior to the assessment being triggered?

The problem with replacing a well pump is that all of the piping from within the well is stretched out on the ground while repairing the pump and could very likely contaminate the well once everything is placed back inside the casing.

Therefore, if the owner of the water system indicates that yes, we did have our well replaced within the 30 days prior to the positive sample, the assessor should ask a follow up question which is, was the well disinfected following repair?

The answer to that question is going to determine what the assessor writes down in Part V. for the issue description. If the owner indicates that yes, the well was disinfected after the work was completed then the issue description in Part V. would not necessarily require a corrective action. However, if the owner indicates that the well has not been disinfected since the work was completed then a sanitary defect exists and there should be a corrective action which includes disinfecting the well.

Q17: Are there signs of vandalism at any of the wells?

Self-explanatory, look for graffiti, cut fences surrounding the well, damaged well casings or caps that the owner has no explanation for, etc.

Q18: Have there been any unusual weather events that may have impacted the wells?

To answer this question the assessor should ask the water system if they recall either drought conditions or storms, something severe, apart from the norm. This question will usually be tied to another issue.

For example, if a well casing is low to the ground, far less than 18", and there is no sanitary seal well cap, then a storm with heavy rains will very likely impact the well.

Q19: Have there been any sewer overflows or spills, chemical spills or other disturbances in the area of the wells?

When asking this question, emphasize to the water system that they should answer with what was happening at the water system within the month or two prior to the assessment being triggered. For example, if a sewer overflow occurred two years ago and they haven't had a positive sample until now, then that is most likely not the cause of the contamination. The largest concern here would be septic system failures or sewer overflows.

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Activity for Section A: Source – Well

Questions	Answer to Question		
	YES	NO	N/A
1. Are any of the wells located in a pit?	☐	☐	
2. Is the ground graded to prevent surface water from collecting around the well casing?	☐	☐	☐
3. Do the well casings extend at least 18" above the ground?	☐	☐	
4. Are the exposed portions of all well casings in good condition?	☐	☐	☐
5. Do all wells have a secured sanitary seal well cap?	☐	☐	
6. If the sanitary seal well cap is vented, does the vent have an intact screen?	☐	☐	☐
7. Is there an air gap between all well vents and the ground surface?	☐	☐	☐
8. Are appropriate backflow prevention devices installed, maintained and tested on all cross connections?	☐	☐	☐
9. Were raw water turbidity measurements collected as part of this investigation?	☐	☐	
10. If the raw water turbidity measurements were greater than 5 NTU, was the source water tested for iron and manganese?	☐	☐	☐
11. Was iron or manganese measured above the secondary MCLs of 0.30 mg/L for iron or 0.05 mg/L for manganese?	☐	☐	☐
12. Was the well scoped to determine its integrity as part of this investigation?	☐	☐	
13. If the well was scoped were issues with the well identified?	☐	☐	☐
14. Has source yield changed for any of the wells?	☐	☐	
15. Are there obvious sources of contamination in the vicinity of any of the wells?	☐	☐	
16. Were any of the well pumps repaired or replaced within the 30 days prior to the assessment being triggered?	☐	☐	
17. Are there signs of vandalism at any of the wells?	☐	☐	
18. Have there been any unusual weather events that may have impacted the wells?	☐	☐	
19. Have there been any sewer overflows or spills, chemical spills or other disturbances in the area of the wells?	☐	☐	

1) You are assessing a water system that has a well source. Using the following observations that you make about the well, complete questions 1-8 of Section A above.

- The well casing extends 16" above ground level.
- There is a sanitary seal well cap which has a bolt missing and the vent screen is torn.
- The ground surrounding the well is mounded so that water should flow away from the well.
- The casing is in good shape, no cracks, holes or rust.
- There are no obvious or known cross connections on the raw water line.

2) How many issues did you find while answering questions 1-8?

_____

3) How many of the issues would you consider a sanitary defect that requires a corrective action and which ones?

_____

4) Using the following observations that you make about the well, complete questions 9-13 of Section A above.

- You collect a raw water turbidity using your portable turbidimeter and the result is 11 NTU.
- You know that the water system doesn't have any iron and manganese treatment but you collect an iron and manganese sample anyway using your portable unit.
- The iron result is 0.54 mg/L and the manganese is 0.04 mg/L.
- Based on the results of these field tests you decide not to scope the well.

5) If the iron and manganese results were both below the secondary MCLs, what would you have done differently?

_____

6) How many issues did you find while answering questions 9-13?

_____

7) How many of the issues would you consider a sanitary defect that requires a corrective action and which ones?

_____

8) Use the following information that you find out during a conversation with the owner to answer questions 14 and 15 in Section A above:

- The owner indicates that they haven't had any issues with the yield in their current well.
- When walking around the building looking for cross connections, you notice what looks like an old well behind the building. You ask the owner about it and he explains that was their old well prior to drilling a new one a few years ago. When you take the cap off of the old well you can see water within the well column.

Note: The owner's responses to the remaining questions don't yield any more issues with the source and the answers to questions 16-19 are "NO".

9) How many issues did you find while answering questions 14-19?

_____

10) How many of the issues would you consider a sanitary defect that requires a corrective action and which ones?

_____

Part IV: Source Sections B., C. & D.

The final three source sections are for spring sources, surface water sources and purchased sources. These are far less common than well sources and these sections will therefore be used much less frequently.

Overview of Section B. Source – Spring

The first several questions under this section relate to the security and construction of the spring box. The assessor should look to ensure that the box is locked and has a tight fitting lid.

Questions 5 and 6 relate to raw water turbidity for spring sources. The assessor should collect a raw water turbidity measurement the same as a well source; however, the follow up actions are slightly different.

The goal is still a turbidity of less than 5 NTU because springs are considered groundwater. For a spring source it should be fairly obvious if there is iron in the water because the spring catchment would be discolored from the oxidized iron. Therefore, it is not required that a raw water iron and manganese sample be collected if the turbidity is high.

Instead, if the turbidity is high, then the assessor should check "YES" for question #6 and the corrective action should be for the water system to consult with the department within 30 days to determine what further testing is required.

Overview of Section C. Source – Surface Water

Several of the questions for the surface water section are regarding the security and maintenance of surface water intakes and pump houses. Other questions will require the assessor to review raw water data from around the time that the positive samples occurred.

Most of the questions are self-explanatory with corrective actions that should be fairly clear.

Overview of Section D. Source – Purchased Sources

The fourth and final source section is for purchased sources. This section must be completed if the water system has any purchased sources, whether it be groundwater or surface water.

In order to answer most of the questions, the assessor must call the selling system to ask questions regarding the water quality within the selling system.

In addition, the assessor is expected to collect additional water quality samples at the interconnection and every interconnection should be assessed, not just the one that was in use at the time of the positive samples.

Key Points

- Four Source Sections:
  - Well Source
  - Spring Source
  - Surface Source
  - Purchased Source
- Most sections require additional monitoring from the source
- Any answer marked in a shaded box is an issue and must be addressed in Part V. of the assessment form.
- Not all issues are sanitary defects but all issues must be described.

Lesson 4: Part IV. Treatment

Objectives

After this lesson, you will be able to:

- Properly investigate all aspects of the treatment process for a Level 2 assessment.

Research Prior to Assessment

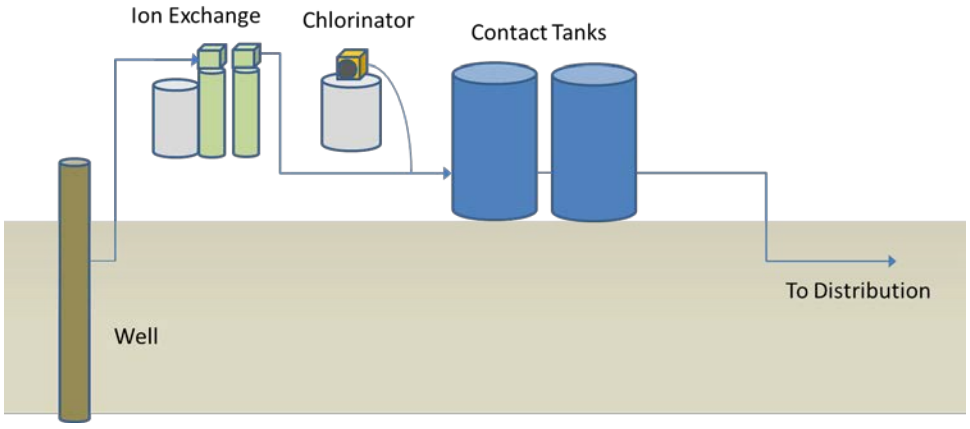
Before you get to the site, you should have reviewed the information regarding the system's treatment (covered in Lesson 1). Also, DEP has created job aids on various types of treatment contained in Appendix C. Use these to freshen up on the treatment type prior to conducting the assessment.

Note: It is important that the individual that maintains the system is available during the assessment. They should be with you to answer questions.

Preliminary Survey

Preliminarily, you should be getting a feel for the treatment system. Find where the source pipe(s) enter the treatment location. Follow the pipes from the source through the treatment process. Figure out the direction of flow and follow it all the way through.

- What types of treatment do they have and does it match what you expected from your research?
- Note any unknown connections and ask about them. Look for any treatment bypasses.
- What is the order of treatment; does it appear correct?



Using the Assessment Form

Q1. Were there interruptions in any treatment processes within the 30 days prior to the assessment being triggered?

This question is asking about the 30 days prior to the trigger date because an interruption in treatment may have caused a positive coliform or *E. coli* result.

- Example: A typical example is a UV light failure prior to the positive result. If a system is lacking the auto shut-off or it isn't working, they may not realize that there bulb has failed until they receive a positive coliform result. You may find that they changed the bulb recently after they realized it had failed.
- Also ask if the day tank ran dry or they simply unplugged the chlorinator while they waited for new chemical.
- Also consider if the softener or a specific iron removal system has been down. If any of these break down, it can negatively impact the disinfection system.

Any interruption that the owner mentions, check "yes".

Q2. Did the treatment plants(s) or finished water pump(s) experience any power interruptions within the 30 days prior to the assessment being triggered?

First, if a treatment system that isn't set-up properly experienced power outages, it is possible that untreated water flowed from pressure tanks. You should review the set-up of treatment and pressure tanks and determine if untreated water could flow to the distribution system without power.

- For example, if the system has a UV light without a solenoid and a pressure tank prior to the UV light, water could flow untreated from the pressure tanks.

This question is also important because a power interruption can cause a loss of pressure in the system, which can introduce contamination.

Q3. Was there any installation or repair of treatment equipment within the 30 days prior to the assessment being triggered?

- Any installation or repair can introduce contamination if parts are not disinfected properly.
- Also, there may have been a new installation that created a cross connection.

Q4. Have there been changes to any treatment processes?

Determine:

- Has there has been a change in treatment in comparison to the DEP inventory/last DEP inspection?
- Did the system completely change disinfection practice?
- Did the system remove a treatment process?

- For example, if a softener was removed, was it completely disconnected from the plumbing?

Cross connections or other contamination may have been introduced (especially if installed/changed by unqualified personnel).

Q5. If the PWS collects only one chlorine measurement per day, were additional chlorine measurements collected as part of this investigation?

This question is for systems that chlorinate for disinfection. Small systems are only required to collect one chlorine measurement per day. In this case, it is expected that the assessor will collect additional Cl_2 measurements to determine proper operation of chlorine system.

Consider running a sufficient amount of water to cause the chlorinator to operator multiple times and take multiple chlorine measurements at the entry point over this time. Not only will you be able to observe operation of the chlorinator but varying chlorine residuals may offer clues to other problems.

Q6. For a water system with multiple service connections, were coliform bacteria samples collected at the entry point as part of this investigation?

If the system you are assessing is a single building, then you check N/A here. But, if there is a distribution system, the assessor should collect coliform samples at the entry point to the distribution.

Coliform data will be used to determine if treatment is effective and therefore may help to isolate the problem to the distribution system. Or perhaps, you will determine that the treatment is not working or is even causing issues (if treatment is only a softener, for example).

Q7. Does water quality data collected from the entry point as part of this investigation indicate inadequate/inappropriate treatment of water?

This question applies to both single service connection and multiple service connection. A single service connection with only a UV light and a softener for softening won't have data. However, there are many circumstances in which you'll have data:

- If a system has multiple service connections, you should have data from question 6 (entry point coliform samples).
- If the system has treatment for a specific contaminant, such as high iron or nitrate, you are expected to collect samples to determine if the treatment is working.

Chlorinating systems:

- If you collected additional chlorine measurements at the EP and found a low result or zero, you know there is an issue with chlorine treatment.
- For systems that have a permit for 4-log treatment, they are required to maintain a minimum free chlorine residual of 0.40-mg/L unless otherwise specified in their permit. These systems are covered in question E.12.

- Most noncommunity water systems do not have a 4-log permit. Noncommunity water systems without a 4-log permit do not have a minimum specified chlorine residual. Rather, they should be providing a residual sufficient to obtain negative coliform results throughout their system.
    - If the entry point coliform samples collected for the assessment are positive, then this question should be checked 'yes'. As part of the corrective action, you should look at their chlorination practices and if they have sufficient contact time.
    - When assessing the distribution system, if you unable to detect a free chlorine residual throughout the distribution system you could return to this question and check 'yes' indicating that the level of disinfection at the entry point is inadequate.

Q8: All treatment processes operational and maintained?

UV light:

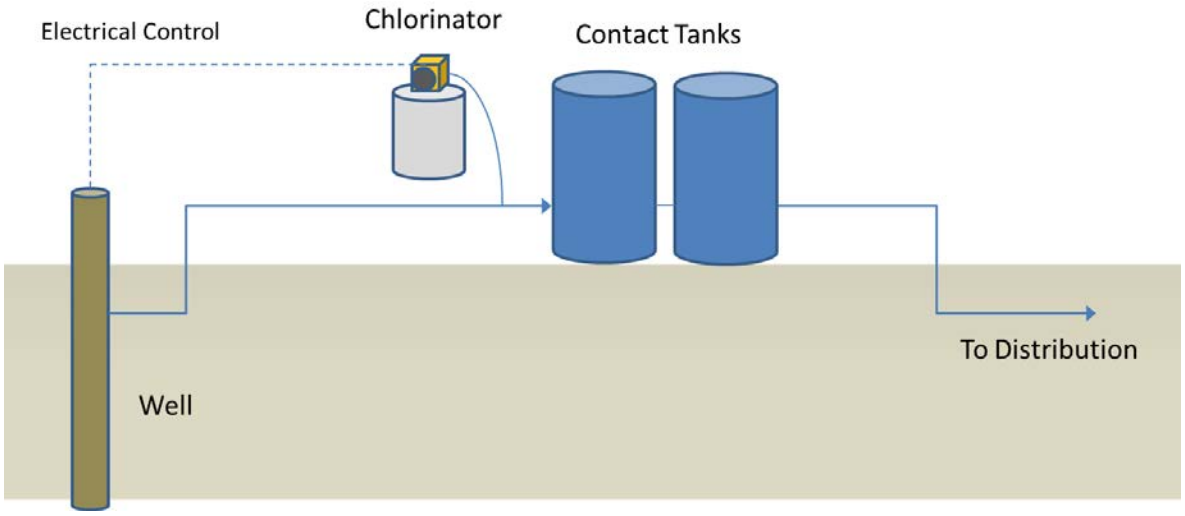
A UV light gradually loses its intensity over time and should be replaced when it falls below a certain intensity level.

- UV Bulb is Operational: Is the UV system working (e.g. does the intensity monitor show a reading to demonstrate the light is operating at an acceptable level?)
- UV bulbs should be replaced annually. Was the UV bulb replaced within the last 12 months?
- UV light systems are required to have an operational solenoid shut-off valve. During an inspection, if you find water still flowing through an in-operable UV light and to the distribution system, the system does not have an operable solenoid shut-off valve. You can have the system verify in front of the assessor that the intensity meter and solenoid are working by unplugging the light.
- The solenoid valve should not be connected directly to an electrical outlet but rather to the UV light's intensity meter, which ensures the light is functioning adequately.

Q8. Cont'd: Chlorinators:

Chlorinators need to be maintained. There can be problems with the motor or valves and O-rings getting dirty and worn.

- Check the operation by running water to force chlorinator to turn on.
- Check for air bubbles
- Check the age and ask about maintenance and calibration history
- Ask about how the day tank is maintained
- Determine if the chlorinator is coming on when it should (synchronized to well pump). This graphic shows that the electrical control for the chlorinator should be tied to the well pump:



Q8. Cont'd: Other Treatment:

Depending on the system, you will encounter other types of treatment for contaminant removal and basic softening. Generally, these types of treatment should are set-up prior to disinfection. This prevents any contaminants from fouling the UV light or possibly shielding the disinfection effectiveness.

For systems treating for specific contaminants, you are expected to collect samples to determine if the unit is working properly. Samples should be collected before and after the treatment unit.

Treatment for Iron/Mn:

- Collect iron and manganese samples. Field test if you have the correct equipment or send samples to lab (some analyzers can test for iron and manganese in the field)

Nitrate treatment

- Collect nitrate samples and send to lab for analysis or conduct field analysis with approved test kit.

If the system has treatment for VOCs, check the most recent results submitted to DEP.

Q8. Cont'd: Sediment Filters

Check any sediment filters to be sure they are being maintained. These can be a source of bacterial growth. Verify when the last time the filter was changed and the procedure for changing it. Care should be given to avoid touching the sediment filter as well as cleaning the filter housing with a chlorine solution.

Q9. Are appropriate backflow prevention devices installed, maintained, and tested on all cross connections?

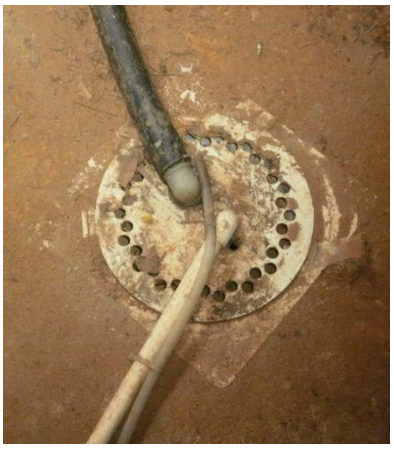
Determine if there are any bypasses around treatment, such as a bypass around a UV light. This is a cross connection from the untreated water to the plumbing system. There cannot be any bypasses around treatment, even if it has valves that are closed.

The only acceptable backflow prevention device for a bypass is to remove the pipe that creates the bypass and cap it off.

Also, make sure there are backflow preventers on ion exchange units.

Q10. Are all treatment drain lines and monitoring equipment waste lines equipped with an air gap?

- This is very important and often not correctly set-up. For example, if you have a softener, there is a waste line for the backwash water. This line goes to the sanitary sewer. Where it connects to the sewer there must be a space between the discharge line and the sewer pipe creating an air gap. The gap prevents water in the sewer from entering the softener discharge, which could otherwise end up in your drinking water system.
- Air gaps must be at least twice the diameter of the supply line. For example, if you have a 1" diameter drain line from the softener, the air gap must be at least 2".



Example of treatment drain lines WITHOUT an air gap

Questions 11-14 deal with treatment permits and if there have been failures to meet the requirements:

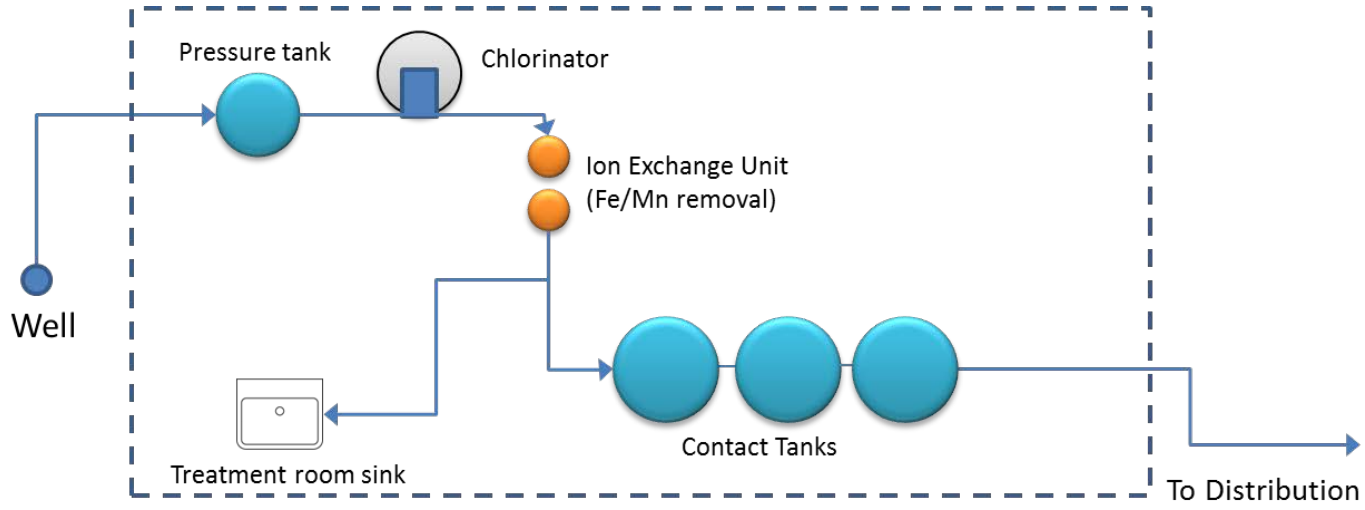
- Q11. deals with surface water CT values
- Q12. deals with groundwater 4-log inactivation
- Q13. deals with permitted treatment plant flows

For all 3, check the permit requirements versus the daily treatment plant logs to determine if any requirements have not been met.

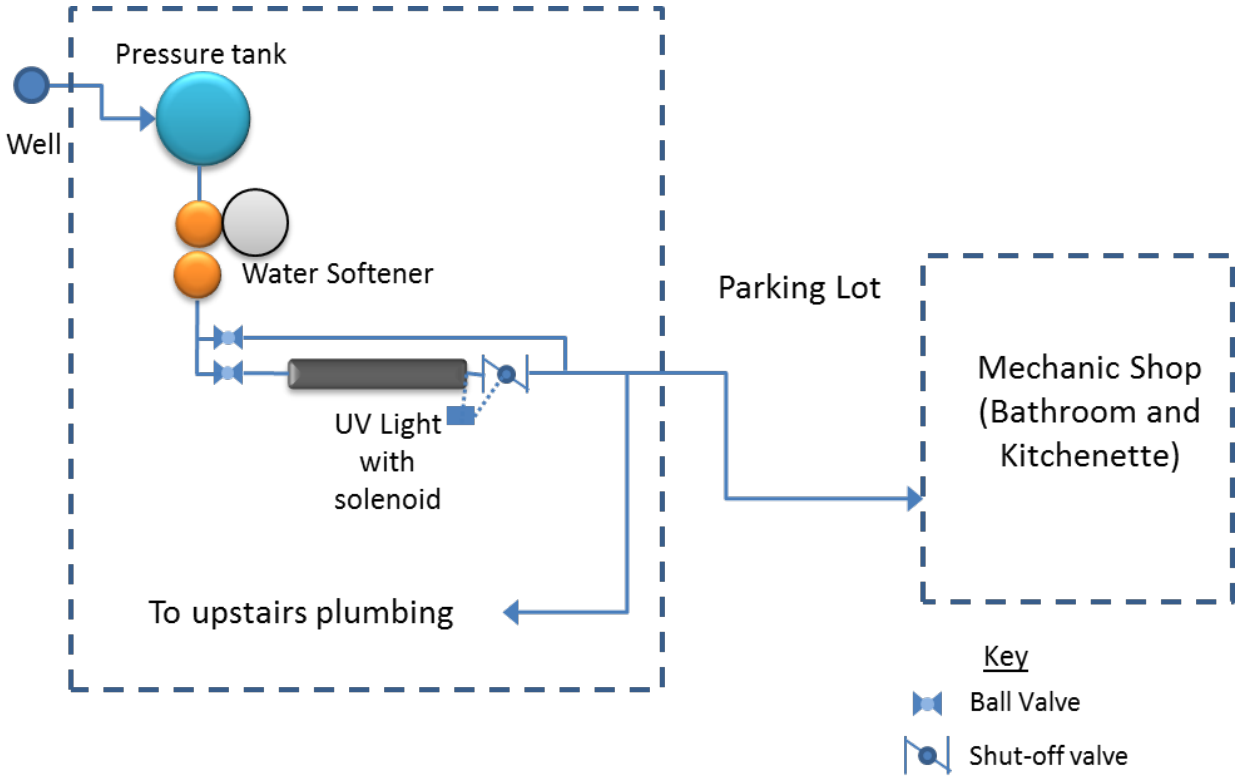
Exercise

Directions: *Using only the information in the treatment schematics below, identify any potential issues. Circle and note the issues on the diagrams.*

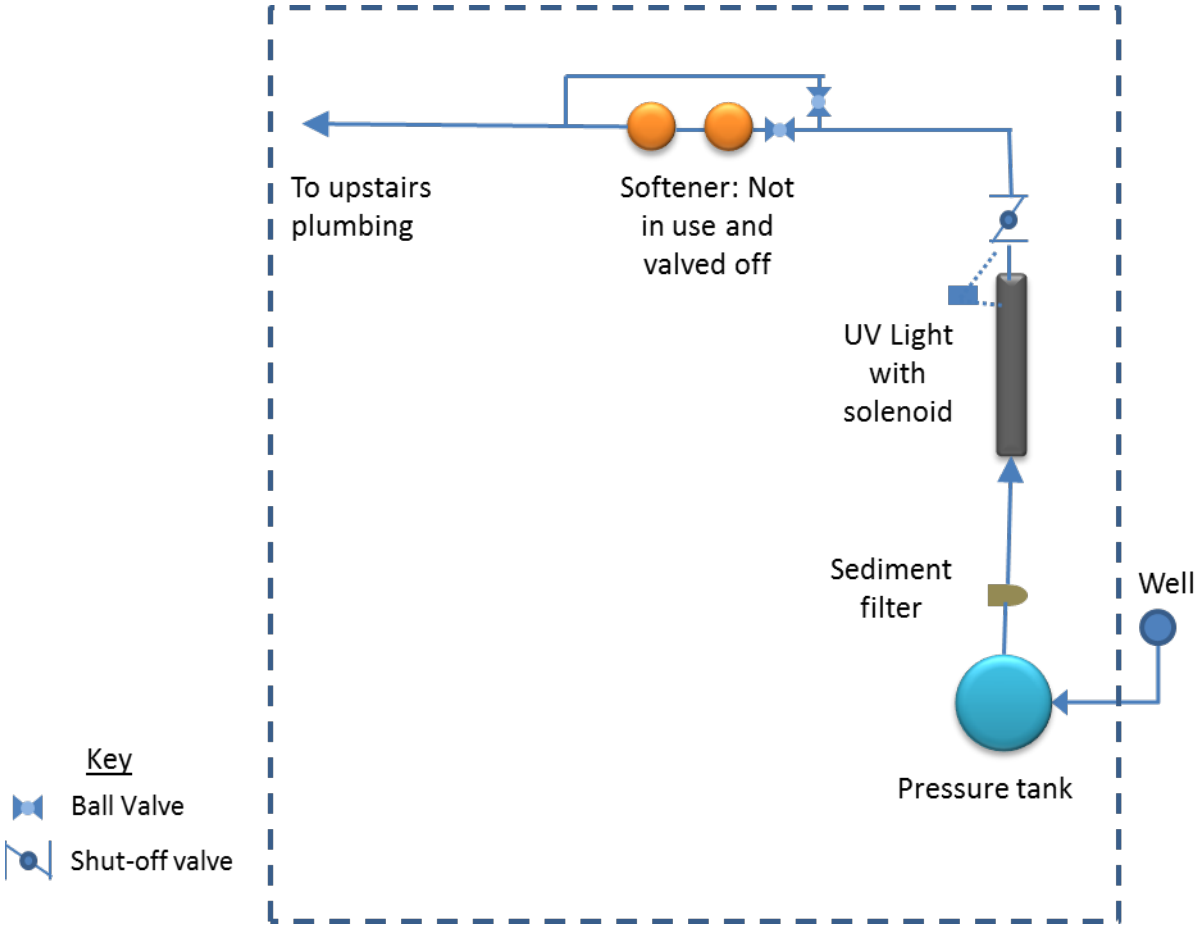
System 1: Hypochlorite, Iron/Manganese Removal



System 2: UV light with softening



System 3: UV light



Follow-Up Bonus Question: For System #1, how can you determine if the chlorinator is operational and maintained?

Key Points

- Do your homework review of treatment type
- Conduct a walk-through (follow the flow) prior to using assessment form
- Verify treatment operation through sampling/testing
- Look out for cross connections within the treatment system

Lesson 5: Part IV. Plumbing & Distribution Systems

Objectives

During this lesson you will be provided with details on how to complete the plumbing and distribution system sections of Part IV. of the Level 2 Assessment Form.

- Part F: Plumbing System
- Part G: Distribution System

Part IV: Section F. Plumbing System

This system should be used for water systems with a single service connection only. Examples of this type of system would be a restaurant, a school, or an apartment building.

At some systems the assessor may need to complete both sections F and G. For example, if the system is a campground that has an all-purpose building with a separate source. The campground which has a distribution would need section G. and the all-purpose building would need section F.

The portion of the system that is being assessed in this section is the plumbing system, which begins following all treatment at the water system or if there is no treatment it would begin after the pressure tank.

Q1: Was there any plumbing work conducted at the site within the 30 days prior to the assessment being triggered?

- Any time the plumbing system is opened up to install or make a repair it becomes vulnerable to contamination.
- If the answer to this question is “YES”, then the assessor should ask the follow up question of “did you disinfect the segments of the plumbing being repaired, replaced or added?” If the answer to that question is “NO” then this is an issue that should be considered a sanitary defect.
- Any time plumbing work is conducted, the components being repaired, replaced or added should be disinfected and the entire system should be flushed.

Q2: Did the system experience low or negative pressure within the 30 days prior to the assessment being triggered?

- If the answer to this question is “YES” it is not necessarily a sanitary defect, it depends on the answer to question #3.
- If the answer to question #2 is “YES” and the answer to question #3 is “NO”, then it is a sanitary defect.

Q3: Are appropriate backflow prevention devices installed, maintained, and tested on all cross connections within the system?

- Cross connections are often prevalent in plumbing and distribution systems. This is where the majority of the issues in these sections will be found.
- Examples of common cross connections are:
    - Hoses that are connected to the system without backflow prevention and lying on the ground, in a slop sink, or in water
    - Hoses connected to the system that are hung but have no backflow prevention and are located at vulnerable locations such as a dump station at a campground
    - Chemical lines used for adding sanitizing liquid to sinks or mop buckets.
- If backflow prevention exists it must be tested and the water system must be able to show record of the equipment being tested or the answer to this question should be "NO".
- Regardless of the answer to question #2, if the answer to question #3 is "NO" then it is a sanitary defect that requires a corrective action.

Q4: Is the plumbing system evaluated for new cross connections each time plumbing work is conducted in the system?

- A good follow up question to ask the owner is who does most of the plumbing work at the system?
    - If the answer is a plumber, then most likely the answer to this question should be "YES" since cross connection control is outlined in the international plumbing codes.
    - If the answer to the question is that they do their own plumbing work or their friend Bob, etc. then the assessor should make sure that the owner is educated about cross connections and the importance of not introducing cross connections in their water system.
- If the assessor answers "NO" for this question, the corrective action for this sanitary defect should be to educate the water system on the importance of cross connections. Three valuable sources of information are:
    - DEP developed cross connection fact sheet for small systems (see appendix C)
    - EPA Cross Connection Control Manual (for larger systems) can be found at: https://www.epa.gov/nscep
    - 2015 International Plumbing Code (section 608: Protection of Potable Water Supply) can be found at: http://codes.iccsafe.org/I-Codes.html

Q5: Were coliform bacteria samples collected from the plumbing system as part of this investigation?

See description under Section G., question #17 on page 5-7 of this participant guide.

Q6: Does water quality data collected in the distribution system as part of this investigation show results indicative of an issue?

See description under Section G., question #18 on page 5-7 of this participant guide.

Q7: Was any water related customer complaints received within the 30 days prior to the assessment being triggered?

See description under Section G., question #1 on page 5-3 of this participant guide.

Part IV: Section G. Distribution System

Section G. is an extended version of section F. and should be used for water systems with multiple service connections. Examples of this type of system would be campgrounds, business campuses, and community water systems with multiple connections.

As with the plumbing system, the distribution system begins following all treatment at the water system or if there is no treatment it would begin after the pressure tank.

A key difference between a plumbing system and a distribution system is that the pipes conveying the drinking water go underground in a distribution system. To capture the vulnerability and complexity of a distribution system, section G. contains more questions with far greater detail than section F.

Q1: Were any water related customer complaints received within the 30 days prior to the assessment being triggered?

- Same as question #7 in section F.
- If the water systems answers "YES", then the assessor should follow up by asking what the complaint was about.
    - If it is a problem that was not identified in another portion of the assessment then the complaint should be considered a sanitary defect and the corrective action should be to investigate the complaint to determine the underlying problem.
    - If it was a problem that has already been identified at some other point in the assessment then the issue should *not* be considered a sanitary defect and the assessor would explain what the underlying issue is in the issue description.

Q2: Has the percent of unaccounted for water increased from historical levels?

- Community water systems should be able to answer this question easily because they are required to track of water use for Chapter 110 reporting to DEP.

- For a small system such as a campground the question may need to be rephrased to ask if they believe they have been using more water than normal without anything else in their system changing.
- The purpose for this question is to help determine the integrity of the distribution system. If water use is going up but there is no logical explanation for it then there is a good chance that the water system has unidentified leaks.

Q3: If line breaks occurred within the 30 days prior to the assessment being triggered, were they repaired in accordance with AWWA Standard C651?

- AWWA Standard C651 is a procedure that describes methods for proper disinfection of water lines any time they are new or taken out of service for repairs or routine maintenance.
- When lines are repaired or replaced, the distribution system becomes susceptible to contamination because it is exposed.
- In order to ensure that any contamination that may have entered the system is eliminated, proper disinfection of the water main should occur and utilizing standard C651 is a way to ensure this is done correctly.
- When dealing with small systems, the primary purpose of the question is to ensure that the water system has a procedure in place for disinfecting and flushing their lines following repair or replacement.
- Often times the answer to this question at a small system will be "NO". The corrective action should then be that they develop a procedure for how to disinfect the portions of the line being repaired or replaced prior to putting that portion of the system back online.

Q4: If the samples that triggered the assessment 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?

- This question is similar to question #1 in section F. and is pointing to the same issue, that if plumbing work was conducted and the lines within the building were not properly disinfected then the plumbing system could have become contaminated.

Q5: Were any positive samples collected from a location that has supplementary water treatment installed?

- If supplementary treatment is not being properly maintained then bacteriological growth could occur in that treatment. In this case the sample would no longer be representative of the water being provided by the water system.

Q6: Were pressure measurements taken as part of this investigation?

- Assessors should carry a pressure gauge with them to take pressure measurements during the assessment. This can help identify low pressure zones in the water system, which during times of high demand would make these areas more vulnerable to contamination if leaks exist.

- Collecting pressure readings can also help the assessor find leaks.

Q7: Did pressure measurements collected as part of this investigation indicate that the system is experiencing low or negative pressure?

- This is a follow up to the previous question and if an issue was found while taking pressure readings such as a low pressure zone or low pressure in an unexpected area then the assessor should answer this question with a "YES". The assessor should be looking for inconsistent pressure or a pressure less than 20 psi.
- If it is not obvious what the reason for the low pressure is then the corrective action could be to investigate the reason for the low pressure and take follow up actions to correct it once the issue is found.

Q8: 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?

- This question is focusing not on what is going on in the system at the time of the assessment but rather what *was* going on at the time of the positive sample.
- Pressures may be fine currently, but if there was a time of high demand could have caused low pressure in portions of the water system, it may have contributed to the contamination depending on how low pressure dropped and the integrity of the water system.

Q9: Does the water system have a flushing program in place?

- Larger systems should have a flushing program in place in order to keep water moving in their system, which will help with water age and disinfection residuals.
- Smaller systems, such as campgrounds, should have a flushing procedure established as a part of their seasonal start up plan.

Questions 10, 11, 12 & 15 deal with distribution components of larger systems such as fire hydrants, blow offs, air relief valves, and pump stations.

- The primary purpose of these questions is to make sure that these are being properly maintained and protected**.**

Q13: Are appropriate backflow prevention devices installed, maintained and tested on all cross connections?

- This question is the same as question #3 in section F. and the assessor should proceed the same way, by looking for cross connections throughout the distribution system.
- For systems such as campgrounds, common cross connections will be, hoses connected and lying on the ground, hoses at dump stations, etc.
- It will be nearly impossible to identify and assess all cross connections in a large distribution system. In these cases, it would be beneficial to have a conversation

with the system to determine what type of cross connection control they may have implemented in their water system and ask how often backflow prevention devices that they have in place are tested.

Q14: Are new customers evaluated for cross connections prior to being connected to the water system?

- This question is geared towards larger systems. Large systems should have a procedure in place for ensuring that they are not introducing new cross connections into their water system. If not, the assessor should refer them to two of the resources discussed in section F., the EPA Cross Connection Control Manual and the International Plumbing Code.
- When assessing a small community system or a noncommunity system the question can be asked if they plan on expanding, adding additional buildings or campsites and if the water system responds "NO" then the answer to this question should be "N/A".

Q16: Were additional chlorine measurements collected as part of this investigation?

- If a water system does not use chlorine for disinfection then the answer to this question can be "N/A".
- The purpose of this question is to lead the assessor in the direction of conducting a chlorine study while assessing the system. It is expected that additional chlorine measurements will be taken during the assessment to ensure that a healthy residual is being maintained in all portions of the water system.
- An important note when taking chlorine residuals in the distribution system is to ensure that the assessor is sampling for the correct form of chlorine.
    - For systems that use chlorine as their disinfectant, the measurements should be taken for free chlorine. In doing this, the assessor is able to determine how much active chlorine is available in the system to actually disinfect.
    - For systems that use chloramines, the assessor should measure for total chlorine or monochloramines. There are no small systems that use chloramines as a disinfectant in PA, mainly larger CWS use it, and therefore this shouldn't be seen often.

<u>Where to take chlorine samples</u>:

- For systems that chlorinate, at a minimum, a chlorine residual should be collected from each location where a bacteriological sample is collected.
- It is also recommended that chlorine measurements are collected at additional sites on either side of the location that tested positive. These additional chlorine readings may help to identify a problem in the distribution system.
- Additional chlorine residuals should then be taken at locations throughout the distribution system that may have high water age such as tanks, or a history of low chlorine residuals.

- Measurements should taken at as many additional locations needed in order to ensure that all points of the distribution are covered.

What should be considered an issue?

- The assessor should keep an eye out for low residuals in the distribution or residuals in a specific area that are below the average for the rest of the system.
- If the chlorine residual drops dramatically from the where the water enters the distribution system (the entry point) in a short period of time. Or if there is any point in the distribution system where the residual drops dramatically in a short distance.
- If there is no residual found at any point in the distribution system, this is cause for major concern and requires action.

Q17: Were additional coliform bacteria samples collected as part of this investigation?

- Same as question #5 in section F.
- At a minimum, a coliform bacteria sample should be collected from each location that had a positive sample during the monitoring period in which the assessment was triggered.
- It's advised to collect bacteriological samples from any portion of the system in which an issue was identified such as low pressure or cross connections.
- *Reminder*: If the system uses chlorine for disinfection then a chlorine residual should be taken at the same time and location as each bacteriological sample.
- If a system **does not** use chlorine for disinfection, at least one chlorine residual should be collected at a bacteriological site to confirm that the system was not shocked prior to the assessment.

How to handle a shocked water system:

- If a strong chlorine residual exists at a water system that does not chlorinate then the follow up question should be to ask if the system or source had been shocked.
- If the water system confirms that it shocked the system, the answer to this question should be "NO" and the issue description would explain that samples were not collected because the system was shocked.
- If a low chlorine residual exists at a non-chlorinated system and the water supplier claims they did not shock the system, the residual could be interference with manganese and not chlorine. In these cases, a bacteriological sample should be collected.

Q18: Does water quality data collected in the distribution system as part of this investigation show results indicative of an issue?

- To answer this question the assessor is going to use the data that they collected during questions 16 & 17.
- So if chlorine residuals are low out in the distribution or if the bacteriological sample results come back positive for coliform bacteria. Then the answer to this question would be "YES".

Questions 19 and 20 should be able to be answered by utilizing the information gathered previously in this section, specifically, question #20.

Key Points

- Section F. plumbing system is for water systems with a single service connection
  - Pipes don't run underground
- Section G. distribution system is for water systems with multiple service connections
  - Pipes do run underground (typically)
- Section G. is much more detailed than section F.
- Cross connections are one of the most prevalent issues within plumbing and distribution systems.
- Every water system should have bacteriological samples taken as part of the assessment in either the plumbing or distribution system.

Lesson 6: Part IV. Storage

Objectives

After this lesson, you will be able to:

- Assess the storage components of a small water system

Part IV. Section H: Storage Assessment Questions

Q1. Are all pressure tanks maintaining an appropriate minimum pressure?

- Ask the system if they have had any issues with pressure.
- You should also check the pressure yourself by running water and you can also use an inexpensive pressure gauge as described in the last lesson.
- If tank is older, tank should be checked if water-logged.

Q2. Are all vents and overflow pipes screened?

- Vents and overflows can be direct pathway of contamination if they are not protected.
- Even if it is screened, if the screen is compromised, check "No" here.

Q3. Are all tanks maintained and free of rust, holes and leaks?

Pressure tanks:

- In many cases you may find some rust. If it isn't bad and not causing any issues, you can indicate that there is rust, but then explain in the Corrective Actions section (Part V) that the condition is not yet an issue.
- For larger water tanks, look for signs of a lack of maintenance.

Q4. Are there any unsealed openings in the storage facilities such as access doors, vents or joints?

- Unsealed openings are another direct pathway of contamination. We all know how small animals can make their way into very small openings.

Q5. Are signs of vandalism visible?

- If there is evidence, you'll want to look further at protecting the tank from public access and/or making sure that access to the water is completely restricted.

Q6. Are roof hatches and manhole openings tightly covered and locked?

- Hatches and manhole openings should secure tightly with a rubber gasket and be locked. Is the rubber gasket intact or dry rotted?
- Hatches and openings must be observed. This may necessitate climbing tank or another mechanism to view roof hatches.

Q7. Do downspouts and overflow pipes drain water away from structures?

- Rain and overflow water should not drain towards other system structures. Looks for anything that could cause issues with contamination.

Q8. Has the interior of all tanks been inspected in the last five years?

- DEP expects inspection of tanks at least every 5 years.

Q9. Have water quality samples representative of water within the tanks been collected as part of this investigation?

- For single service connection systems, the water quality samples collected at the entry point and within the plumbing system should adequately represent the water quality of your storage/pressure tanks.
- For systems with tanks in the distribution system, there can be water quality issues created by storage tanks. For example, issues can be created by a lack of mixing or long water age within the tank. Samples at the storage tank or shortly after will allow you determine if the tank is causing additional issues.
- Water representative of the tank should at least be analyzed for chlorine residual and coliforms.
- See Appendix C for Tank Sampling Job Aid

Key Points

- Storage tanks can be a source of contamination
- At single service connections, don't overlook pressure tanks: answer all applicable assessment questions

Lesson 7: Corrective Actions and Completion

Objectives

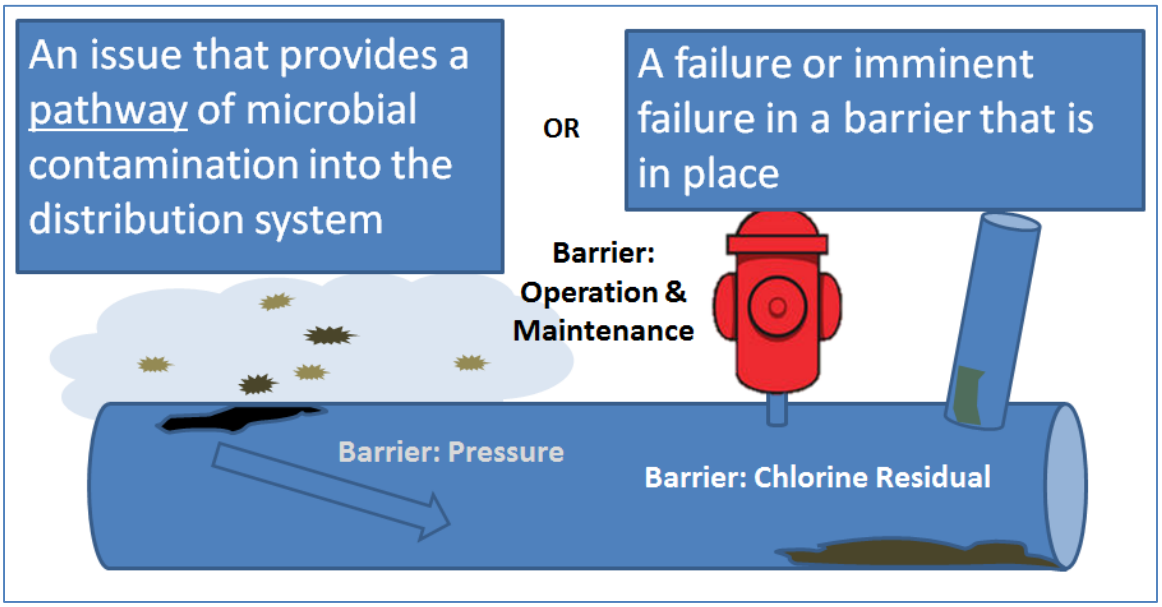
After this lesson, you will be able to:

- Describe the issues found during the assessment
- Determine which issues are sanitary defects
- Create corrective actions for the sanitary defects

Sanitary Defects

A Sanitary Defect is:

- A defect that could provide a **pathway** of entry for microbial contamination into the distribution system **OR**
- A defect that indicates a failure or imminent failure in a **barrier** that is already in place. Barriers include such things as: disinfectant residual, Proper O&M, system pressure, backflow prevention.



Sanitary Defects Activity

Which of the following "issues" would you consider sanitary defects? Circle Yes or No.

Sanitary Defect? (yes/no)		Issue
Y	N	1. Pressure tanks have surface rust, but not pitted.
Y	N	2. A new valve was installed straight out of the box. It was installed in the proper location, but was not disinfected.
Y	N	3. System has ion exchange treatment for iron/manganese removal but the unit is clogged and not working properly.
Y	N	4. Garden hose hanging in treatment room. Hose is only attached to pressure tank when needed, and then disconnected.
Y	N	5. An ion exchange unit's backwash drain line is plumbed directly to the sanitary sewer.
Y	N	6. Two small leaks in a campground distribution system (system has above ground piping)
Y	N	7. Plumbing system lost pressure due to power outage, but backflow prevention exists and is tested on all cross connections
Y	N	8. Wellhead with sanitary seal and vent, but the vent screen is missing
Y	N	9. Well pump replaced; well shock chlorinated after pump installation
Y	N	10. UV light treatment with bypass plumbing around the light; but the valve is closed.

Part V Corrective Actions

Identify all issues from Part IV that were identified in gray boxes.

Example:

Part IV, E.2. was checked "Yes" which is a gray box issue.

E. Treatment Process

**If PWS does not utilize any treatment check here and skip to section F* ☐

Questions	Answer to Question		
	YES	NO	N/A
1. Were there interruptions in any treatment processes within the 30 days prior to the assessment being triggered?	☐	☐	
2. Did the treatment plant(s) or finished water pump(s) experienced any power interruptions within the 30 days prior to the assessment being triggered?	☒	☐	
3. Was there any installation or repair of treatment equipment within the 30 days prior to the assessment being triggered?	☐	☐	
4. Have there been changes to any treatment processes?	☐	☐	
5. If the PWS collects only one chlorine measurement per day, were additional chlorine measurements collected as part of this investigation?	☐	☐	☐
6. For a water system with multiple service connections, were coliform bacteria samples collected at the entry point as part of this investigation?	☐	☐	☐

Then in Part V, if the issue is a sanitary defect, a corrective action and completion schedule must be completed.

Section Letter	E	Question #	2
Issue Description		**Corrective Action and Completion Schedule**	
Three days prior to the positive results, there was a power outage for approximately 10 hours at the facility. The UV light was out and the system does not have a solenoid to stop the flow of water.		*A solenoid shut off valve will be installed to prevent untreated water from entering the system when the power is out. The solenoid will be installed within 90 days (10/1/16).*	
Sanitary Defect: YES: ☒ NO: ☐			

Corrective Actions / Schedule

- You will have to wait for sampling results to answer all of the water quality questions in the assessment.
- Once all issues are determined, the assessor should recommend corrective actions and a schedule to the system owner.
- It is a process of working with the owner to agree on the corrective actions and schedule.

Writing Corrective Actions

Resource: EPA Assessment Guidance Manual (Section 5 covers Corrective Actions)

Download it here: http://tinyurl.com/EPA-assessments

There are 3 elements to corrective actions:

1. **Immediate Need:** What will correct the issue? The form is designed to help you find the cause, so corrective actions should be apparent. Use your judgment based on your professional expertise to determine how to correct the problem.

   Examples:

Issue	Corrective Action
Old well 20' from current well that was never properly abandoned	Properly abandon well (fill and cap)
New well pump installed without any disinfection	Shock well

   NOTE: For actions beyond normal O&M, DEP should be contacted prior to completing the corrective action. Some actions may require a permit

2. **Schedule for Completion**
   - Discuss and agree to a reasonable schedule with the system owner.
   - Reasonable schedule will depend on situation:
     - Is it something that needs to be scheduled with a contractor and are parts needed to be ordered?
       - Owners should start calling contractors/suppliers (if needed) to help determine timeframes
     - Are there many issues identified from Part IV that need corrective actions? If there are, consider how all of the issues will affect the schedule.
     - Is a permit required?
   - The assessment needs to have an actual completion date or deadline. Think of it as "As soon as possible, no later than (a certain date)".
   - DEP enters this date in to the DEP data system, or PADWIS.
   - **If the completion date is not met, the system incurs a Tier 2 treatment technique violation.**
     - Consider the possibility of a violation when you are creating the schedule. You can add a realistic buffer for the completion date to allow for such things as getting the contractor onsite, or getting the correct parts for a repair.

- If you are not sure of establishing a reasonable completion schedule, consult with DEP. Staff have been trained to work with systems on reasonable completion schedules.
- Examples with Schedule for Completion:

Issue	Corrective Action and Schedule for Completion
Old well 20' from current well that was never properly abandoned	Well will be properly abandoned (fill and cap) within 60 days (August 25, 2016).
New well pump installed without any disinfection	Well will be shock chlorinated within 5 days (6/30/2016).
Bypass open around ion exchange unit for Iron/Manganese removal	Bypass closed during assessment and bypass plumbing will be completely removed within 30 days (7/25/16).

3. **Consider going forward:** What, if anything, can be done to prevent the issue in the future. For example, the system may need to adjust O&M practices so that the issue may be better prevented. Example:

Issue	Corrective Action and Schedule for Completion
New well pump installed without any disinfection	Well will be shock chlorinated within 5 days (6/30/2016). *In the future, any installations will include proper disinfection.*

Corrective Actions Requiring Permit

Some corrective actions may require a permit, such as adding ion exchange for iron and manganese removal (treatment beyond simple disinfection).

- When a permit is involved, the corrective action is to submit an administratively complete permit application.
- For the completion schedule, an engineer is required to submit permit application
    - 60 to 90 days should be a reasonable timeframe for submission of permit
- If you're not sure if a corrective action requires a permit or permit amendment, the system should contact their local sanitarian.

Corrective Action Exercise

Write a corrective action and completion schedule for each issue description. You are also given the assessment date.

Assmnt Date		Issue	Corrective Action and Completion Schedule:
8/15/2016	A.2	At Well #1, there is a depression in the ground around the well casing where water can pool	
7/1/2016	A.4	Well vent is unscreened and the electrical conduit is loose, exposing an area on the well casing	
7/1/2016	A.5	Well does not have a sanitary seal well cap	
8/15/2016	A.15	There is an old well at the far end of the system that was never properly decommissioned.	
8/15/2016	E.9	Bypass plumbing is present around the UV system that can allow untreated water to enter the system	
7/1/2016	E.10	Waste line from the water softener runs directly into floor drain	
7/1/2016	F.1	Water meter installed and not disinfected	
8/15/2016	F.3	There is a hose connected to the outside faucet and lying on the ground. During times of low pressure, water could be pulled into the system.	

Examples Issues and Corrective Actions

Dates are shown purely for example purposes. Date of Assessment is not shown.

Part IV ID	Issue	Corrective Action and Completion Schedule
A.1	The well pit was visibly wet and the casing extends just above the pit floor.	The well casing will be extended to 18" above the pit floor within 60 days (by 12/15/2016)
A.3	Well casing does not extend 18 in above ground level	Casing will be extended to at least 18 in above grade by September 15, 2016 (60 days)
A.4	Well electrical conduit broken and missing near cap, leaving a hole for contaminant entry to the well.	Well conduit will be repaired and hole will be sealed within 30 days (8/15/16)
A.5	The well does not have a sanitary seal well cap.	A sanitary seal well cap with a conduit for the wires that is tightly sealed into it will be installed within 30 days, by September 29, 2016.
A.13	Breaks in the upper casing were found during the well scoping that is allowing stormwater to enter the well.	Well casing will be replaced within 60 days (by 8/31/16).
E.1	At the time of the positive samples, the chlorine day tank had been empty.	The day tank was full and the chlorinator was observed to be operating during the assessment. The owner entered into a service contract with a water treatment company on 6/25/2016.
E.4	Softener installed improperly within the past year	The softener will be reinstalled prior to the UV light and the potential bypass will be removed within 60 days of this assessment (10/20/2016).
G.13	There is a hose connected to a hydrant at the dump station. This is a cross connection and considering that the hose is used to clean sewage tanks this is a cross connection that could lead to E. coli contamination of the water system.	A vacuum breaker will be installed on the hose bib at the dump station within 30 days, by August 24, 2016.
H.6	Access door to the in-ground storage is not sealed to prevent things from entering the finished water.	Tank hatch will be replaced with a hatch that prevents anything from entering the tank. This work will be completed within 60 days (April 7, 2017).

Issue that is Not a Sanitary Defect

There may be situations where the assessor answered a question in a gray shaded box which identifies a potential issue, however, the issue is determined to not be a sanitary defect and therefore does not need a corrective action.

For example, if the assessor answered "YES" to question number16 in section A, which indicates that the water system repaired or replaced a well pump within the 30 days prior to the assessment being triggered, but then writes this explanation…

The pump was properly disinfected and the well was shock chlorinated during installation.

Since the issue is not a sanitary defect a corrective action is not required, however, in most cases, the Department would not argue with a water system that chooses to correct an issue even if it isn't a sanitary defect

Completing the Assessment

Section VI: Verification

The last section of the form is where the assessor and the system owner/responsible official sign the form. Before signing, the assessor and owner/responsible official should meet and review the findings.

- Both parties should agree to the corrective actions and schedule
- Both the assessor and responsible official sign and date the form or it will be considered insufficient.

But, what if the assessor and owner can't agree?

- Assessor can sign form and give it to the system owner
- Owner submits form to DEP without signing. This will be considered incomplete and DEP/system can then agree on timelines.

No Sanitary Defects Found?

- If the assessor conducts the assessment and none of the questions are answered in a gray shaded box OR if the only issues found are determined to not be a sanitary defect, this includes any water system that finds only issues with sampling procedures, then they would check the box in Part VI that says:
    - **"If no sanitary defects were found during the assessment, check this box to certify that the assessment was completed in accordance with the EPA *RTCR Assessments and Corrective Actions Guidance Manual*"**

Owner Responsibilities

It is the responsible official's responsibility to submit the completed assessment to DEP within 30 days after triggering.

- As the assessor, once you have completed the Level 2 Assessment, responsibility shifts to the system responsible official to submit the form and complete any corrective actions.
- Remind owner that DEP must be notified when corrective actions are completed.
- If DEP doesn't know a corrective action was completed by the date in the assessment, violation generated

Key Points

- Issues identified as "Sanitary Defects" must have corrective actions
- Corrective actions require a schedule
    - Date will be entered into DEP data system
- Responsible official (owner) is responsible for making sure corrective actions are completed
    - Remember: DEP must be notified when each action is completed!

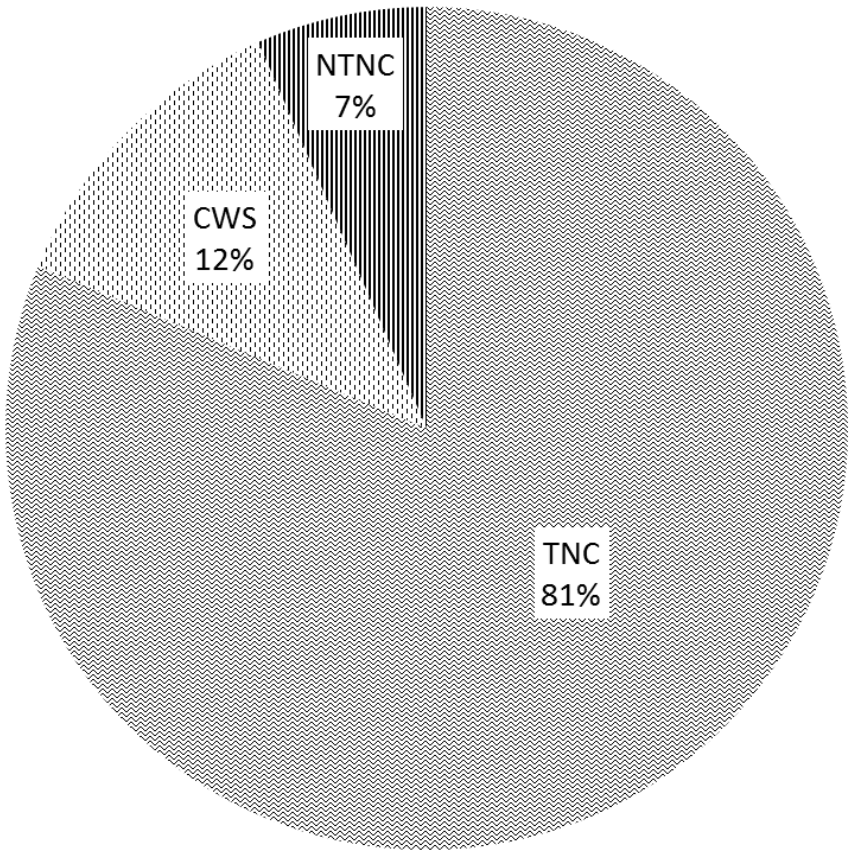
Lesson 8: Final Considerations

Objectives:

- Summary of DEP Assessments
- Time Estimates for conducting assessments
- Operator certification consideration

DEP Conducted Assessments

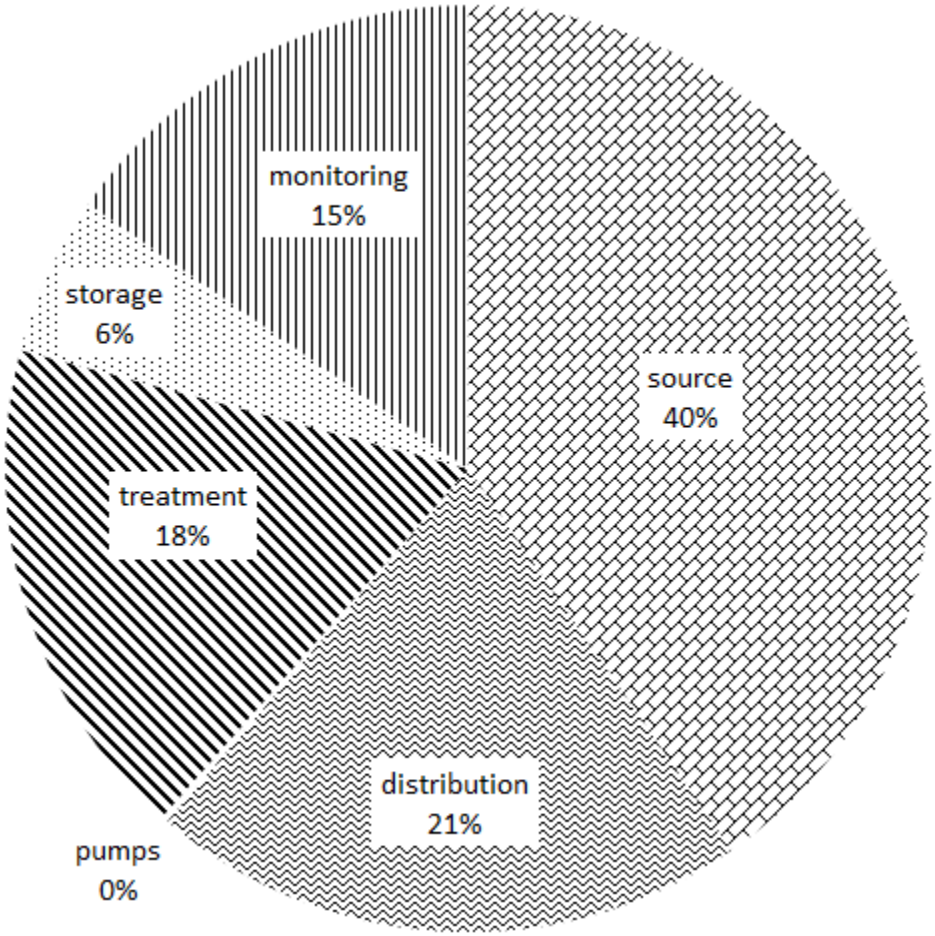
- Between April 1, 2016 and mid-October 2016, DEP staff conducted 107 Level 2 assessments.
- DEP staff were conducting assessments to cover the period of time between the effective date of the federal rule and publication of the state rule.
- As you can see below, the overwhelming majority of Level 2 assessments were triggered at transient noncommunity water systems. This trend is expected to continue.



Corrective Actions:

- 431 Corrective Actions
- Corrective Actions Completed: out of 265 due
  - 9 completed late
  - 41 not completed
- 81% compliance with getting corrective actions completed on time

Corrective Action Category					
S Source	**D** Distribution System	**P** Pumps	**T** Treatment	**F** Finished Water Storage	**R** Monitoring/ Reporting
174	**90**	**1**	**76**	**24**	**66**



Minimum Time Estimates to Complete Assessment:

System Description	Prep Time (hours)	On-site Time (hours)	Post Site Time (hours)	Total Time (hours)
Single Service Connection, One well, Standard Treatment	2	2	0.5	4.5
Multiple Service Connections, One well, Standard Treatment	2	4	0.5	6.5
Multiple Service Connections, Multiple Wells, Multiple Treatment Plants	3	6+	1	10+

- The times displayed represent an estimate of the **minimum** amount of time it will take to complete one. For example, when assessing a community water system with several wells, treatment plants, storage tanks, pump station the 10 hours can quickly become 2 or 3 times that amount.
- The prep time column represents the time you will spend in obtaining the system information, reviewing that information, and completing other preparations such as gathering sample bottles and calibrating equipment.
- The on-site time column represents the time you spend physically inspecting the system and interviewing the system's owner.
- The post site visit time includes the time you spend reviewing the sample results obtained from a lab, completing the assessment form based on those results and then providing the final assessment to the system's owner.
- A second thing to consider is that your time spent driving to and from the assessment is not captured here. That time will obviously vary for each one you complete.
- Finally, please remember that DEP only inspects noncommunity water systems once every 5 years, so expect the unexpected when arriving on site, which may increase time as well.

Operator Certification Considerations

Water operators must be appropriately certified to conduct a Level 2 Assessment at a system.

- Operators may assess a system with the same class of certification as the size for which they are certified AND any lower system classification.
- In addition, their certificate must contain all of the subclasses for the system being assessed.
- See explanation in Appendix A.

If I am hired to conduct an assessment at a system, does this mean I'm hanging my license at the facility?

- The answer is no. Although you are not hanging your license at the facility being assessed, you should remember that as a certified operator, you should report to the system owner known violations or system conditions that may be or are causing violations of Safe Drinking Water regulations.
- In the case of imminent health threats, you can inform the system's owner that they need to notify DEP within one hour.

As an example, you are assessing a system which chlorinates and during your assessment you discover that the chlorine day tank is empty and no chlorine is being added to the water. You would identify Question E8 as a sanitary defect and the corrective action as, "System owner will contact DEP within one hour (by 4 pm). Chorine day tank will be filled by end of the day." Documenting this situation as such on the assessment form protects you under the Chapter 302 Operator Certification regulations.

Key Points

- Expect to find sanitary defects.
- Although you have to be properly certified to conduct an assessment, you're not necessarily the certified operator for the system.
- Document all findings in writing.

Appendices A through C

- Appendix A: Assessment Checklist and Class-Subclass Definitions
- Appendix B: Level 2 Assessment Form
- Appendix C: Assessor Job Aids
  - UV Treatment
  - Hypochlorite Treatment
  - Ion Exchange Treatment
  - Sediment Filter
  - Cross Connections
  - Representative Tank Sampling
  - Level 2 Assessments for System Owners Job Aid

Assessment Supply Checklist for Operators

Information Gathering

Ask the System for the following:

☐ Chain of Custody / Sample Log / Sample Results from Laboratory
☐ Contact Information for Laboratory if Lab Collected the Sample
☐ Raw Water Quality Data
☐ Customer Complaint Logs
☐ Coliform Sample Siting Plan
☐ Permits
☐ Most Recent Sanitary Survey (DEP Inspection)
☐ Most Recent Inventory
☐ All Inspection and Narrative Forms from Partial Inspections/Site Visits conducted since last San. Survey
☐ Level 1 Assessment (when L2 triggered because of two L1 Assessments)

Forms Needed to Conduct Assessment:

☐ Level 2 Assessment Form
☐ Laboratory Sample Submission Sheets

Equipment Needed to Conduct Assessment:

☐ Digital Camera
☐ PPE (Nitrile Gloves, Steel Toed Boots, Safety Glasses)
☐ 100 ft. tape measure
☐ Flash light / Spot Light
☐ Sharpie and Pen
☐ Clip Board
☐ Field Book (sample log book)

Instruments:

☐ Digital Chlorine Analyzer and applicable reagents for free and total chlorine
☐ Pressure Gauge
☐ Portable Turbidimeter (optional)

Sample Collection

☐ Bottles for Micro and Water Quality Sample Collection (see table below)
☐ Preservatives for Sample Collection
☐ Legal Seals
☐ Sample Coolers and Ice

The following table will help you determine which bottles/equipment to bring for a particular assessment.

Parameter	All			Additional for System with Iron/Mn Treatment		Additional for System with Nitrate Treatment	
	Raw Water	Entry Point	Within Distribution/ Plumbing system	Raw	EP	Raw	EP
Turbidity	X						
Iron/ Manganese	X[A]			X	X		
Coliforms		X[B]	X				
Chlorine		X[C]	X				
Nitrate						X	X

[A] Only required if raw water turbidity is >5 NTU
[B] Only required at EP for multiple service connection system.
[C] Only required at EP for chlorinating systems

WATER OPERATOR CLASSIFICATION AND SUBCLASSIFICATION DEFINITIONS FOR LEVEL 2 ASSESSMENTS

Water operators must be appropriately certified to conduct a Level 2 Assessment at a system. Operators may assess a system with the same class of certification as the size for which they are certified AND any lower system classification. In addition, their certificate must contain all of the subclasses for the system.

For example, a class WB operator could assess a B size system or a C, D, Dc, or Dn size system as long as their certificate also holds all of the subclasses for the system.

Class WE is required for any water system with a distribution OR any consecutive water system. However, class WE is not required for an operator that holds a Dc or Dn certificate who is conducting an assessment at a system that meets the Dc or Dn definition.

WATER OPERATOR CLASSIFICATION "CLASS" DEFINITIONS

Class WA – May assess a system serving an average of greater than 5 million gallons per day (gpd).

Class WB – May assess a system serving an average of greater than 1 million gpd but less than or equal to 5 million gpd.

Class WC – May assess a system serving an average of greater than 100,000 gpd but less than or equal to 1 million gpd.

Class WD – May assess a system serving an average of less than or equal to 100,000 gpd.

Class Dc - May assess a system serving no more than 500 individuals or having no more than 150 connections, where the source of water for the system is exclusively groundwater and requires only disinfection (chlorine or ultraviolet light).

Class Dn - May assess a system that meets the same definition as a Dc system except that the water requires no treatment.

Class WE – Required for any water system with a distribution system or for a consecutive water system.

- Distribution system – Pipelines, appurtenances, devices and facilities that convey potable water under pressure to customers. *If treatment is provided, an operator must also hold the appropriate subclass for the type of treatment utilized.*
- Consecutive water system – A public water system that obtains all of its water from another public water system and resells the water to a person, provides treatment to meet a primary maximum contaminant level or provides drinking water to an interstate carrier. The term does not include bottled water and bulk water systems. *If treatment is provided, an operator must also hold the appropriate subclass for the type of treatment utilized.*

WATER OPERATOR SUBCLASSIFICATION "SUBCLASS" DEFINITIONS

Subclassification 1 - Conventional Filtration

Subclassification 2 - Direct Filtration

Subclassification 3 - Diatomaceous Earth Filtration

Subclassification 4 - Slow Sand Filtration

Subclassification 5 - Cartridge or Bag Filtration

Subclassification 6 - Membrane Filtration

Subclassification 7 - Corrosion Control & Sequestering

Subclassification 8 - Chemical Addition

Subclassification 9 - Ion Exchange & Green Sand

Subclassification 10 - Aeration & Activated Carbon Adsorption

Subclassification 11 - Gaseous Chlorine Disinfection

Subclassification 12 - Nongaseous Chemical Disinfection

Subclassification 13 - Ultraviolet Disinfection

Subclassification 14 - Ozonation

EXAMPLE TRANSIENT NONCOMMUNITY WATER SYSTEMS AND REQUIRED CERTIFICATIONS

Example 1: A transient noncommunity water system (such as a restaurant) that serves less than 500 individuals per day and has no treatment other than a water softener (no distribution system) must hire a certified operator that holds any of the following classifications:

WA
WB
WC
WD
WDc
WDn

**In this example, there are no applicable subclasses because the system does not have treatment.*

Example 2: A transient noncommunity water system (such as a restaurant) that serves less than 500 individuals per day and has a UV light for disinfection (no distribution system) must hire a certified operator that holds any of the following combinations of classifications:

WA and W13
WB and W13
WC and W13
WD and W13
WDc

Example 3: A transient noncommunity water system that is a campground with 200 campsites and has chlorine disinfection (with a distribution system) must hire a certified operator that holds any of the following combinations of classifications:

WA, WE, and W12
WB, WE, and W12
WC, WE, and W12
WD, WE, and W12

Example 4: A transient noncommunity water system (such as a restaurant) that uses less than or equal to 100,000 gallons per day of water, has chlorine for disinfection and ion exchange for iron and manganese removal must hire a certified operator that holds any of the following combinations of classifications:

WA, W9 and W12
WB, W9 and W12
WC, W9 and W12
WD, W9 and W12

Note: If you are unsure of what certification an operator would be required to hold to assess your water system, contact your local district office for additional guidance.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

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

LEVEL 2 ASSESSMENT AND CORRECTIVE ACTION FORM

I. General Information

PWS Name:		**PWSID #:**
Name of Responsible Official:		**Phone #:**
PWS Address:		**E-mail:**
Name of Assessor:		**Date Completed:**
Assessor's DEP Client ID:		**Classes & Subclasses:**
Assessor Affiliation (check one):	**Water System** ☐	**Third Party** ☐ **State** ☐
Level 2 Trigger	***E. Coli* MCL Violation:** YES ☐ NO ☐	**If yes, which sample(s) from part II?**
	2nd Level 1 triggered in rolling 12 months: YES ☐ NO ☐	

II. Positive Sample Information. **Use page 10 to report additional positive monthly samples.*

Positive Sample #1:	Sample Location ID#:	Sample Location:	
Positive Sample Date:	Name of Sample Collector:		
Chlorine Residual: ☐ Free ☐ Total ☐ Not Measured		mg/L	
1. Was the sample collected according to the total coliform sample siting plan?		YES ☐	NO ☐
2. Was the condition of the sample tap appropriate for collection?		YES ☐	NO ☐
3. Were the samples collected in accordance with proper sample collection protocols?		YES ☐	NO ☐

Positive Sample #2:	Sample Location ID#:	Sample Location:	
Positive Sample Date:	Name of Sample Collector:		
Chlorine Residual: ☐ Free ☐ Total ☐ Not Measured		mg/L	
1. Was the sample collected according to the total coliform sample siting plan?		YES ☐	NO ☐
2. Was the condition of the sample tap appropriate for collection?		YES ☐	NO ☐
3. Were the samples collected in accordance with proper sample collection protocols?		YES ☐	NO ☐

Positive Sample #3:	Sample Location ID#:	Sample Location:	
Positive Sample Date:	Name of Sample Collector:		
Chlorine Residual: ☐ Free ☐ Total ☐ Not Measured		mg/L	
1. Was the sample collected according to the total coliform sample siting plan?		YES ☐	NO ☐
2. Was the condition of the sample tap appropriate for collection?		YES ☐	NO ☐
3. Were the samples collected in accordance with proper sample collection protocols?		YES ☐	NO ☐

Positive Sample #4:	Sample Location ID#:	Sample Location:	
Positive Sample Date:	Name of Sample Collector:		
Chlorine Residual: ☐ Free ☐ Total ☐ Not Measured		mg/L	
1. Was the sample collected according to the total coliform sample siting plan?		YES ☐	NO ☐
2. Was the condition of the sample tap appropriate for collection?		YES ☐	NO ☐
3. Were the samples collected in accordance with proper sample collection protocols?		YES ☐	NO ☐

Note: If source water samples collected under the groundwater rule are positive for E. coli, the water system must work with the local district office to address source water contamination.

III. Sampling Issue Descriptions and Corrective Actions

Note: A separate table should be completed for every question from Part II. that is answered in a shaded box. If more than four issues are identified, use page 11 to report additional sampling issues and corrective actions.

Positive Sample #		Question #	
Sampling Issue Description		**Corrective Action and Completion Schedule**	

Positive Sample #		Question #	
Sampling Issue Description		**Corrective Action and Completion Schedule**	

Positive Sample #		Question #	
Sampling Issue Description		**Corrective Action and Completion Schedule**	

Positive Sample #		Question #	
Sampling Issue Description		**Corrective Action and Completion Schedule**	

IV. Assessment Questions

A. Source – Well

**If PWS does not have a well source check here and skip to section B* ☐.

Questions	Answer to Question		
	YES	NO	N/A
1. Are any of the wells located in a pit?	☐	☐	
2. Is the ground graded to prevent surface water from collecting around the well casing?	☐	☐	☐
3. Do the well casings extend at least 18" above the ground?	☐	☐	
4. Are the exposed portions of all well casings in good condition?	☐	☐	☐
5. Do all wells have a secured sanitary seal well cap?	☐	☐	
6. If the sanitary seal well cap is vented, does the vent have an intact screen?	☐	☐	☐
7. Is there an air gap between all well vents and the ground surface?	☐	☐	☐
8. Are appropriate backflow prevention devices installed, maintained and tested on all cross connections?	☐	☐	☐
9. Were raw water turbidity measurements collected as part of this investigation?	☐	☐	
10. If the raw water turbidity measurements were greater than 5 NTU, was the source water tested for iron and manganese?	☐	☐	☐
11. Was iron or manganese measured above the secondary MCLs of 0.30 mg/L for iron or 0.05 mg/L for manganese?	☐	☐	☐
12. Was the well scoped to determine its integrity as part of this investigation?	☐	☐	
13. If the well was scoped were issues with the well identified?	☐	☐	☐
14. Has source yield changed for any of the wells?	☐	☐	
15. Are there obvious sources of contamination in the vicinity of any of the wells?	☐	☐	
16. Were any of the well pumps repaired or replaced within the 30 days prior to the assessment being triggered?	☐	☐	
17. Are there signs of vandalism at any of the wells?	☐	☐	
18. Have there been any unusual weather events that may have impacted the wells?	☐	☐	
19. Have there been any sewer overflows or spills, chemical spills or other disturbances in the area of the wells?	☐	☐	

B. Source – Spring

**If PWS does not have a spring source check here and skip to section C* ☐.

Questions	Answer to Question		
	YES	NO	N/A
1. Are all of the spring boxes locked?	☐	☐	
2. Are drainage ditches and surface flow diverted away from the springs?	☐	☐	
3. Are the spring boxes maintained?	☐	☐	
4. Are overflow vents and drain pipes screened?	☐	☐	☐
5. Were raw water turbidity measurements collected as part of this investigation?	☐	☐	
6. Does raw water quality data collected from any of the springs as part of this investigation indicate changes to the source water quality?	☐	☐	☐
7. Has the source yield changed for any of the springs?	☐	☐	
8. Are there obvious sources of contamination in the vicinity of any of the springs?	☐	☐	
9. Are there signs of vandalism at any of the springs?	☐	☐	
10. Have there been unusual weather events that may have impacted the springs?	☐	☐	
11. Have there been any sewer overflows or spills, chemical spills or other disturbances in the area of the springs?	☐	☐	

C. Source – Surface Water

**If PWS does not have a surface water source check here and skip to section D* ☐.

Questions	Answer to Question		
	YES	NO	N/A
1. Are all surface water intakes screened and maintained?	☐	☐	
2. Are the intake pump houses protected from unauthorized personnel?	☐	☐	☐
3. Does raw water quality data collected at the time of the positive sample indicate an issue with the water quality of any surface water source?	☐	☐	
4. Are there obvious sources of contamination within the watershed(s)?	☐	☐	
5. Are there signs of vandalism at any surface water intake?	☐	☐	
6. Did severe weather events such as heavy rainfall, rapid snowmelt, or drought occur within the 30 days prior to the assessment being triggered?	☐	☐	
7. Did seasonal turnover occur in any reservoir within the 30 days prior to the assessment being triggered?	☐	☐	☐
8. Have there been any sewer overflows or spills, chemical spills or other disturbances in the area of any of the surface water sources?	☐	☐	

D. Source – Purchased (Surface Water or Groundwater)

**If PWS does not have a purchased source check here and skip to section E* ☐.

The selling PWS should be contacted prior to answering these questions.

Questions	Answer to Question		
	YES	NO	N/A
1. Was the selling PWS contacted in order to accurately answer the questions in this section?	☐	☐	
2. Did the selling system have any positive sample results within two months of the assessment being triggered?	☐	☐	
3. Does water quality data collected *within the selling system* within two months of the assessment being triggered show results indicative of an issue?	☐	☐	☐
4. Were additional coliform bacteria samples collected at the interconnection as part of this investigation?	☐	☐	
5. Were additional chlorine measurements collected at the interconnection as part of this investigation?	☐	☐	
6. Does water quality data collected *at any interconnection* as part of this investigation show results indicative of an issue?	☐	☐	
7. Are all interconnections free of leaks?	☐	☐	
8. Did line breaks and repairs, or large firefighting events occur within the selling system within two months of the assessment being triggered?	☐	☐	
9. Is the distribution system pressure maintained within the selling system?	☐	☐	
10. Did the selling system receive any water related customer complaints within the two months prior to the assessment being triggered?	☐	☐	

E. Treatment Process

**If PWS does not utilize any treatment check here and skip to section F* ☐*.*

Questions	Answer to Question		
	YES	NO	N/A
1. Were there interruptions in any treatment processes within the 30 days prior to the assessment being triggered?	☐	☐	
2. Did the treatment plant(s) or finished water pump(s) experienced any power interruptions within the 30 days prior to the assessment being triggered?	☐	☐	
3. Was there any installation or repair of treatment equipment within the 30 days prior to the assessment being triggered?	☐	☐	
4. Have there been changes to any treatment processes?	☐	☐	
5. If the PWS collects only one chlorine measurement per day, were additional chlorine measurements collected as part of this investigation?	☐	☐	☐
6. For a water system with multiple service connections, were coliform bacteria samples collected at the entry point as part of this investigation?	☐	☐	☐
7. Does water quality data collected from the entry point as part of this investigation indicate inadequate/inappropriate treatment of water?	☐	☐	☐
8. Are all treatment processes operational and maintained?	☐	☐	
9. Are appropriate backflow prevention devices installed, maintained, and tested on all cross connections?	☐	☐	☐
10. Are all treatment drain lines and monitoring equipment waste lines equipped with an air gap?	☐	☐	☐
11. Did any permitted surface water treatment plant fail to meet required CT values for any length of time?	☐	☐	☐
12. Did any permitted groundwater treatment plant fail to meet 4-log inactivation of viruses for any length of time during the 30 days prior to the assessment being triggered?	☐	☐	☐
13. Did treatment plant flow rates exceed the permitted capacity at any time during the 30 days prior to the assessment being triggered?	☐	☐	☐
14. Is the PWS meeting all permit special conditions?	☐	☐	☐
15. Did a review of the turbidity data reveal any anomalies?	☐	☐	☐

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

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

Questions	Answer to Question		
	YES	NO	N/A
1. Was there any plumbing work conducted at the site within the 30 days prior to the assessment being triggered?	☐	☐	
2. Did the system experience low or negative pressure within the 30 days prior to the assessment being triggered?	☐	☐	
3. Are appropriate backflow prevention devices installed, maintained, and tested on all cross connections within the system?	☐	☐	☐
4. Is the plumbing system evaluated for new cross connections each time plumbing work is conducted in the system?	☐	☐	
5. Were coliform bacteria samples collected from the plumbing/distribution system as part of this investigation?	☐	☐	
6. Does water quality data collected in the plumbing system as part of this investigation show results indicative of an issue?	☐	☐	☐
7. Was any water related customer complaints received within the 30 days prior to the assessment being triggered?	☐	☐	

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

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

Questions	Answer to Question		
	YES	NO	N/A
1. Were any water related customer complaints received within the 30 days prior to the assessment being triggered?	☐	☐	
2. Has the percent of unaccounted for water increased from historical levels?	☐	☐	☐
3. If line breaks occurred within the 30 days prior to the assessment being triggered, were they repaired in accordance with AWWA Standard C651?	☐	☐	☐
4. If the samples that triggered the assessment 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?	☐	☐	☐
5. Were any positive samples collected from a location that has supplementary water treatment installed?	☐	☐	☐
6. Were pressure measurements taken as part of this investigation?	☐	☐	
7. Did pressure measurements collected as part of this investigation indicate that the system is experiencing low or negative pressure?	☐	☐	☐
8. 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?	☐	☐	
9. Does the water system have a flushing program in place?	☐	☐	☐
10. Are fire hydrants and blow offs maintained and operational without leaks?	☐	☐	☐
11. Are pump stations protected from unauthorized personnel?	☐	☐	☐
12. Are pump stations maintained and equipment operational?	☐	☐	☐
13. Are appropriate backflow prevention devices installed, maintained, and tested on all cross connections?	☐	☐	☐
14. Are new customers evaluated for cross connections prior to being connected to the water system?	☐	☐	☐
15. Are air relief valves maintained and operational without leaks?	☐	☐	☐
16. Were additional chlorine measurements collected as part of this investigation?	☐	☐	☐
17. Were additional coliform bacteria samples collected as part of this investigation?	☐	☐	
18. Does water quality data collected in the distribution system as part of this investigation show results indicative of an issue?	☐	☐	☐
19. Is there any evidence of intentional contamination in the distribution system?	☐	☐	
20. Were any leaks discovered during the course of this investigation?	☐	☐	

H. Water Storage

**If PWS has no water storage, check here and skip to Part V.* ☐.

Questions	Answer to Question		
	YES	NO	N/A
1. Are all pressure tanks maintaining an appropriate minimum pressure?	☐	☐	☐
2. Are all vents and overflow pipes screened?	☐	☐	☐
3. Are all tanks maintained and free of rust, holes and leaks?	☐	☐	
4. Are there any unsealed openings in the storage facilities such as access doors, vents or joints?	☐	☐	☐
5. Are signs of vandalism visible?	☐	☐	
6. Are roof hatches and manhole openings tightly covered and locked?	☐	☐	☐
7. Do downspouts and overflow pipes drain water away from structures?	☐	☐	☐
8. Has the interior of all tanks been inspected in the last five years?	☐	☐	☐
9. Have water quality samples representative of water within the tanks been collected as part of this investigation?	☐	☐	☐

V. Issue Descriptions and Corrective Actions

Note: A separate table should be completed for every question from Part IV. that is answered in a shaded box. If more than eight issues are identified, use page 12 to report additional issues and corrective actions.

Section Letter		**Question #**	
Issue Description		**Corrective Action and Completion Schedule**	
Sanitary Defect: YES ☐ NO ☐			

Section Letter		**Question #**	
Issue Description		**Corrective Action and Completion Schedule**	
Sanitary Defect: YES ☐ NO ☐			

Section Letter		**Question #**	
Issue Description		**Corrective Action and Completion Schedule**	
Sanitary Defect: YES ☐ NO ☐			

Section Letter		**Question #**	
Issue Description		**Corrective Action and Completion Schedule**	
Sanitary Defect: YES ☐ NO ☐			

Section Letter		**Question #**	
Issue Description		**Corrective Action and Completion Schedule**	
Sanitary Defect: YES ☐ NO ☐			

Section Letter		**Question #**	
Issue Description		**Corrective Action and Completion Schedule**	
Sanitary Defect: YES ☐ NO ☐			

Section Letter		**Question #**	
Issue Description		**Corrective Action and Completion Schedule**	
Sanitary Defect: YES ☐ NO ☐			

Section Letter		**Question #**	
Issue Description		**Corrective Action and Completion Schedule**	
Sanitary Defect: YES ☐ NO ☐			

VI. Verification

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

If no sanitary defects were found during the assessment, check this box to certify that the assessment was completed in accordance with the EPA *RTCR Assessments and Corrective Actions Guidance Manual: ☐

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

NOTES:

- The completed form must be submitted to DEP within 30 days of a public water system triggering a Level 2 Assessment.
- The completed form is to be addressed to: PA DEP – Safe Drinking Water, at the address from the list on pages 13-15 of the appropriate district office having jurisdiction over the public water system. For counties marked with an asterisk (*), address to the appropriate County Health Department (CHD), which is an agent of DEP for the Safe Drinking Water Program.
- ***The public water supplier must consult with DEP within 14 days of receiving notification of an insufficient assessment.***

VII. State Review

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

Name of Reviewer:	**Date Reviewed:**
Assessment Sufficient: YES ☐ NO ☐ *If no, consultation required within 14 days of notification	
Signature of Reviewer:	
Signature of Supervisor:	**Date:**

***Note:** If consultation with the water system occurs, the DEP reviewer should complete an *Assessment Consultation Form* 3930-FM-BSDW0540 and attach it to the back of the assessment.

Reporting for Additional Positive Samples (continued from Part II., page 1)

Positive Sample # :	Sample Location ID#:	Sample Location:	
Positive Sample Date:	Name of Sample Collector:		
Chlorine Residual: ☐ Free ☐ Total ☐ Not Measured		mg/L	
1. Was the sample collected according to the total coliform sample siting plan?		YES ☐	NO ☐
2. Was the condition of the sample tap appropriate for collection?		YES ☐	NO ☐
3. Were the samples collected in accordance with proper sample collection protocols?		YES ☐	NO ☐

Positive Sample # :	Sample Location ID#:	Sample Location:	
Positive Sample Date:	Name of Sample Collector:		
Chlorine Residual: ☐ Free ☐ Total ☐ Not Measured		mg/L	
1. Was the sample collected according to the total coliform sample siting plan?		YES ☐	NO ☐
2. Was the condition of the sample tap appropriate for collection?		YES ☐	NO ☐
3. Were the samples collected in accordance with proper sample collection protocols?		YES ☐	NO ☐

Positive Sample # :	Sample Location ID#:	Sample Location:	
Positive Sample Date:	Name of Sample Collector:		
Chlorine Residual: ☐ Free ☐ Total ☐ Not Measured		mg/L	
1. Was the sample collected according to the total coliform sample siting plan?		YES ☐	NO ☐
2. Was the condition of the sample tap appropriate for collection?		YES ☐	NO ☐
3. Were the samples collected in accordance with proper sample collection protocols?		YES ☐	NO ☐

Positive Sample # :	Sample Location ID#:	Sample Location:	
Positive Sample Date:	Name of Sample Collector:		
Chlorine Residual: ☐ Free ☐ Total ☐ Not Measured		mg/L	
1. Was the sample collected according to the total coliform sample siting plan?		YES ☐	NO ☐
2. Was the condition of the sample tap appropriate for collection?		YES ☐	NO ☐
3. Were the samples collected in accordance with proper sample collection protocols?		YES ☐	NO ☐

Positive Sample # :	Sample Location ID#:	Sample Location:	
Positive Sample Date:	Name of Sample Collector:		
Chlorine Residual: ☐ Free ☐ Total ☐ Not Measured		mg/L	
1. Was the sample collected according to the total coliform sample siting plan?		YES ☐	NO ☐
2. Was the condition of the sample tap appropriate for collection?		YES ☐	NO ☐
3. Were the samples collected in accordance with proper sample collection protocols?		YES ☐	NO ☐

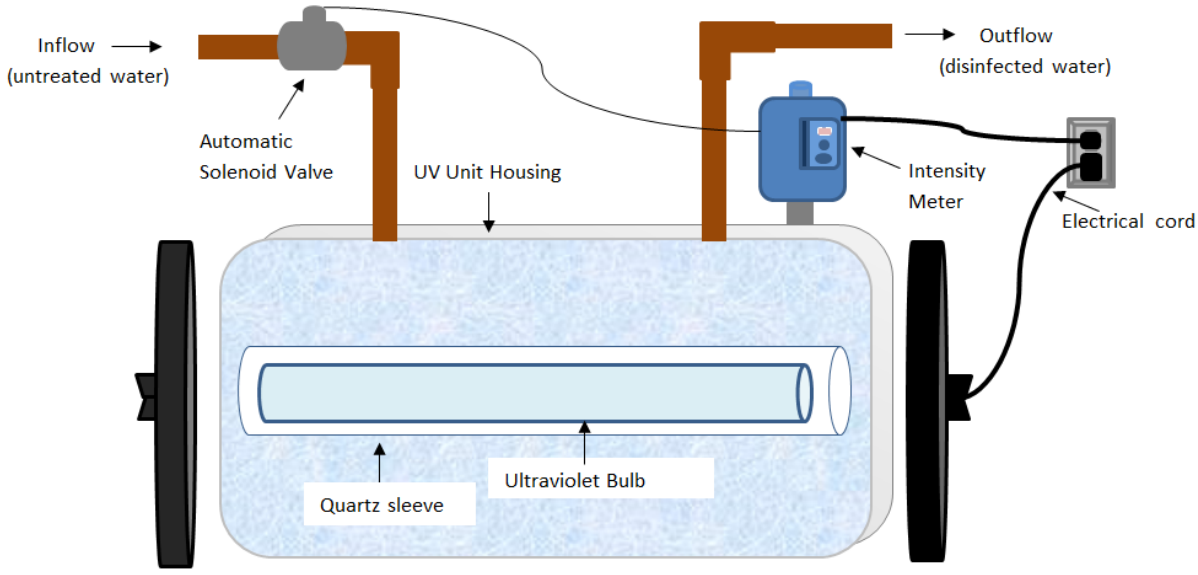
Positive Sample # :	Sample Location ID#:	Sample Location:	
Positive Sample Date:	Name of Sample Collector:		
Chlorine Residual: ☐ Free ☐ Total ☐ Not Measured		mg/L	
1. Was the sample collected according to the total coliform sample siting plan?		YES ☐	NO ☐
2. Was the condition of the sample tap appropriate for collection?		YES ☐	NO ☐
3. Were the samples collected in accordance with proper sample collection protocols?		YES ☐	NO ☐

Ultraviolet Light Disinfection

This job aid provides information about ultraviolet light (UV) disinfection for regulated public non-community water system (NCWS) operators and Revised Total Coliform Rule (RTCR) Level 2 Assessors. To assist in proper completion of a Level 2 Assessment, a checklist for what should be investigated when assessing a UV light system at a NCWS has been provided on the second page of this document.

How it works: A UV light disinfects water by inactivating microorganisms so they cannot replicate and infect a host.

What it looks like:



Example Ultraviolet Light Schematic Diagram (not to scale)

Main system components:

- A UV reactor: This is the vessel or chamber where exposure to UV light takes place and it contains a mercury arc lamp, a quartz sleeve, a UV sensor, and a quartz sleeve cleaning system, such as a mechanical wiper.
- A UV transmittance monitor: This is located in the UV reactor and monitors UV dose delivery.
- A UV light intensity meter: This is required for PWS systems; since lights are often enclosed in stainless steel housing, this meter gives a visual verification that the UV light is operational.
- A solenoid valve: This is required for PWS systems; it is an electrically-activated mechanical valve that automatically shuts down the flow of water when the UV intensity drops below a certain level.

Assessment Checklist Items:

- ☐ **UV Light Operational:** Does the UV light intensity meter demonstrate that the light is operating at an acceptable level?
- ☐ **Sediment Filter Maintenance:** If sediment filters are present prior to the UV light, are they cleaned at a frequency that prevents sediment filter clogging? Is there a written procedure for replacing the sediment filter without touching the filter and for disinfecting the filter and filter housing after replacement?
- ☐ **UV Bulb Replacement:** Was the UV bulb replaced within the last 12 months?
- ☐ **No UV light Bypass:** Does the system have any bypasses that need to be removed? Bypasses around the system are not allowed, since all water must be treated. When present a sanitary defect exists and the bypass line should be severed and capped.
- ☐ **An automatic solenoid shut-off valve is present:** UV light systems are required to have an operational solenoid shut-off valve. If water continues to flow through an in-operable UV light and to the distribution system, the system does not have an operable solenoid shut-off valve.
- ☐ **An automatic solenoid shut-off valve is connected to the intensity meter:** The solenoid valve should not be connected directly to an electrical outlet but rather to the UV light's intensity meter, which ensures the light is functioning adequately.
- ☐ **The solenoid shut-off valve is free of a by-pass switch:** Is there any type of a manual switch on the body of the solenoid? If so, this is probably a manual over-ride. Solenoids equipped with this switch do not meet design standards and should be replaced.

References for more information:

PA-DEP Public Water Manual Part IV - Noncommunity System Design Standards; pp. IV-16, IV-21-23: http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-107193/383-2128-108.pdf

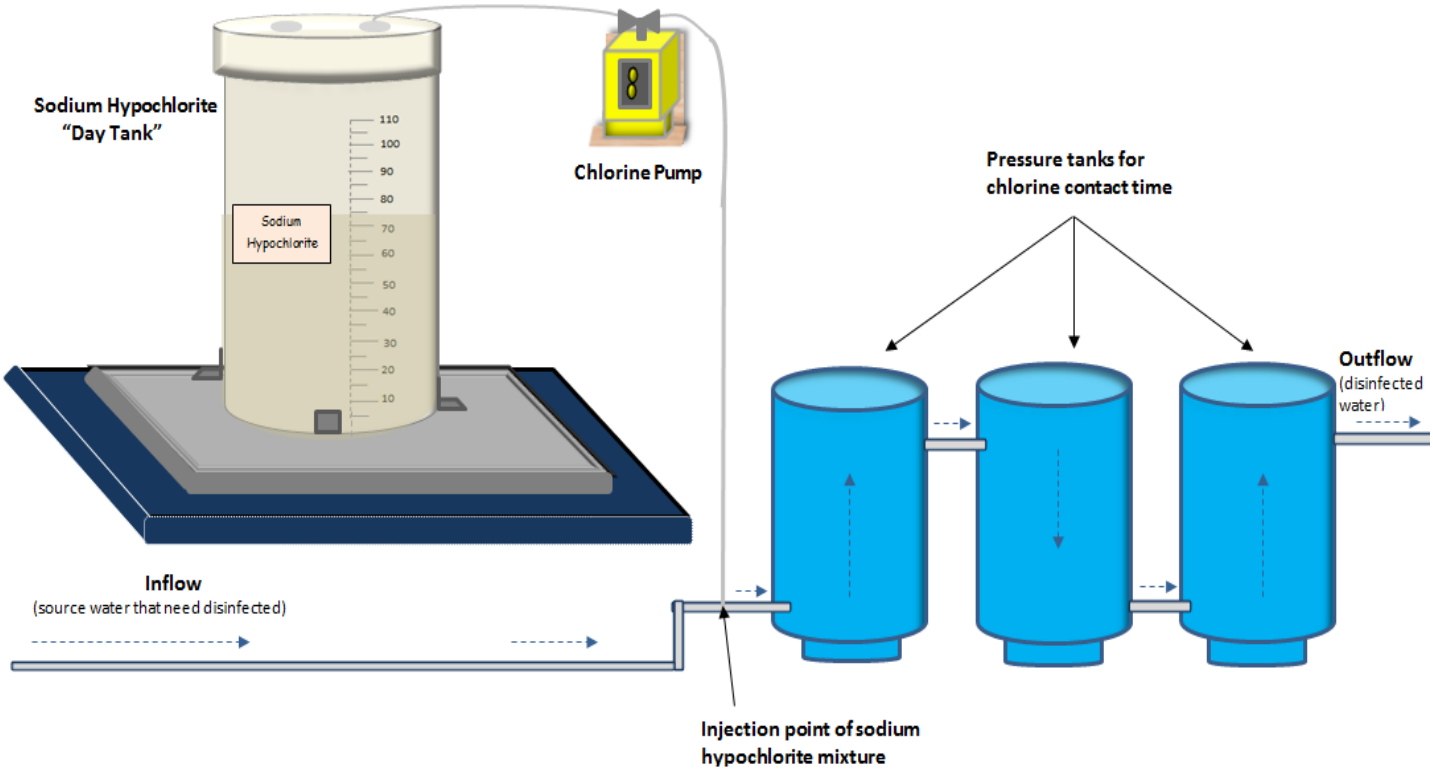
Sodium Hypochlorite Disinfection

This job aid provides information about chlorine disinfection of drinking water through the addition of liquid sodium hypochlorite. This document is targeted at regulated public non-community water system (NCWS) operators and RTCR Level 2 assessors. To assist in proper completion of a Level 2 Assessment, a checklist for what should be investigated when assessing a chlorine disinfection system at a NCWS has been provided on the second page of this document.

Note: This job aid discusses the use of commercial grade liquid sodium hypochlorite, which is sometimes called "liquid chlorine". It does not discuss the chlorination methods of on-site generated sodium hypochlorite, gas chlorination or calcium hypochlorite – which occurs in granular powder or tablet form - since these disinfectant methods are uncommon in PA's NCWS facilities.

How it works:

At NCWS, the concentrated liquid sodium hypochlorite is usually diluted by mixing it with treated (finished) water in a "day tank". The diluted liquid is then pumped from the day tank and injected into the water line. Following chlorine injection, the required 20 minutes of contact time is obtained by ensuring that water flows through additional storage prior to the first tap. Acceptable forms of storage for contact time include: one or more pressure tanks plumbed in the bottom and out of the top of each tank; serpentine contact piping within the facility (e.g. on the wall); or a non-pressurized storage tank with a separate inlet and outlet. Disinfected water is then distributed to the facility.



Example Sodium Hypochlorite Disinfection Treatment System (not to scale)

Assessment Checklist Items:

- ☐ **Completed chlorine system repairs:** Have any chlorination system repairs that were documented on the Level 1 assessment been completed? Has there been any recent repair of the chlorination system that may have resulted in the Level 2 assessment?
- ☐ **4-Log Chlorine residual (if required) at the entry to the distribution system:** If the pre-assessment file review showed the system has a permit for 4-log treatment, is the water system maintaining the minimum free chlorine residual specified in the permit at the entry point (EP) to the distribution system? If no residual is specified in the 4-log permit, is the system maintaining at least a 0.40 mg/L residual at the EP?
- ☐ **Non 4-Log Chlorine residual at the entry to the distribution system:** If the system does not have a 4-Log permit, is there a detectable free chlorine residual at the entry point to the distribution system? If there is a detectable residual, is it greater than 4.0 mg/L which indicates improper treatment of the system?
- ☐ **Filling of Day Tank:** Is finished distribution system water (not raw water) used for day tank mixing? If a hose is used for this purpose, is it removed when not in use? The hose should not be left hanging in the day tank causing a potential cross connection or back-flow situation.
- ☐ **Day Tank Measurement:** Is the day tank either graduated with measurements on the side or sitting on a scale to allow for measuring the amount of liquid sodium hypochlorite and water added to the day tank for mixing?
- ☐ **Chlorine Contact Time:** Is the hypochlorite injection point **before** any pressure and/or retention tanks to allow for adequate contact time?
- ☐ **Other treatment:** If a softener or sediment filter is used, is the hypochlorite injection point **after** the softener or sediment filter.
- ☐ **Chlorine residual at the end of the distribution system:** Is there a detectable free chlorine residual at the last sample tap at the end of the distribution or plumbing system?
- ☐ **Test kit:** Does the chlorine residual test kit on-site have reagents that are not expired? Does it have reagents to measure free chlorine residual?
- ☐ **Chlorine residual records:** Were the entry point and distribution chlorine residual records from the 30 days prior to the assessment being triggered to the time of the assessment examined? Did any records indicate an issue with or breakdown in treatment?

References for more information:

PA-DEP Drinking Water Operator Certification Training Module 25 – Hypochlorite p. 2-8:
http://www.dep.pa.gov/Business/Water/BureauSafeDrinkingWater/OperatorCertification/Training/Pages/DepartmentTraining.aspx

PA-DEP PWS Manual Part IV - Noncommunity System Design Standards; pp. IV-7, IV-16, IV-26:
http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-107193/383-2128-108.pdf

Ion Exchange Treatment

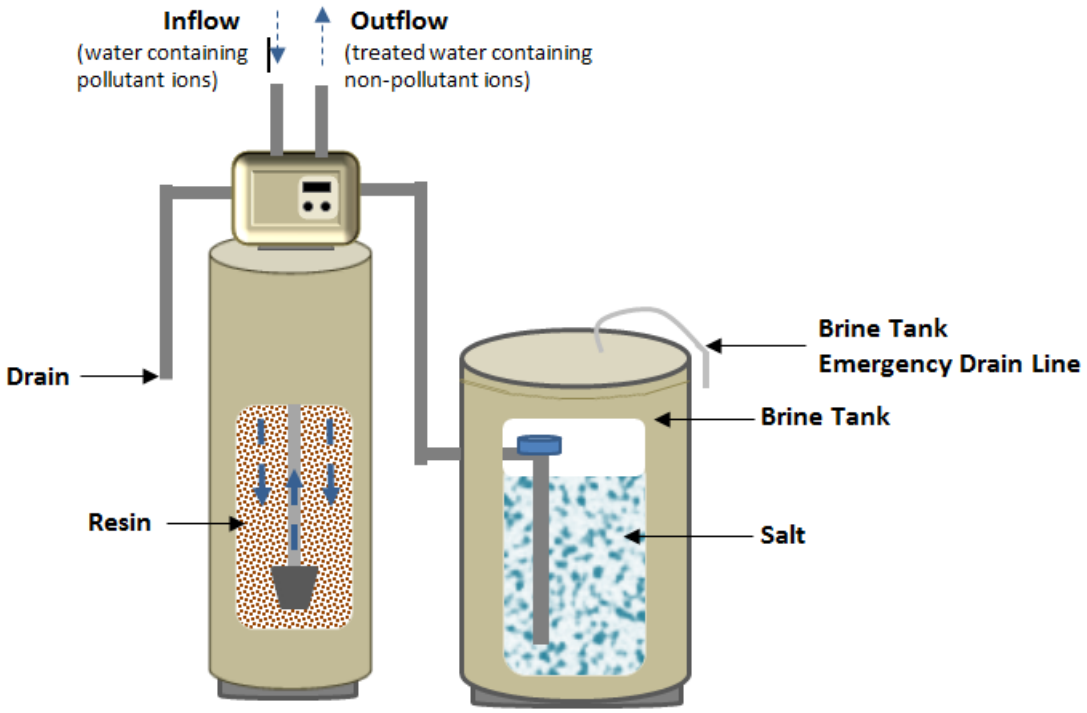
This job aid provides information about ion exchange treatment for regulated public non-community water system (NCWS) operators and RTCR Level 2 assessors. To assist in proper completion of a Level 2 Assessment, a checklist for what should be investigated when assessing an ion exchange system at a NCWS has been provided on the second page of this document.

What it removes: Depending on the system design, type of resin, and form of ion attached to the resin, ion exchange units can be set up to remove one or more of the following: iron, manganese, nitrate, chloride, sulfate, calcium and magnesium. The most common type of ion exchange is a softener used for water softening.

How it works: A resin that contains non-pollutant ions is housed in a cylinder. Water that contains a contaminant (i.e. iron) flows through the resin, and an exchange of ions takes place. As the contaminant ions become attached to the resin, a chemical "ion exchange" occurs as the non-pollutant ions are released.

Eventually, ion exchange resin beds become saturated with the contaminant ions they are removing and need to be "recharged." This recharge is set to occur automatically and involves backwashing, brine introduction, and rinsing. After recharge, the unit is then again ready for treatment.

What it looks like:



Example Small Ion Exchange Unit Schematic Diagram with accompanying Recharge Brine Tank (not to scale)

Assessment Checklist Items:

☐ **Ion Exchange Unit Drain Line:**

- Does the ion exchange unit drain line have an air gap between the drain line and the waste/sewer line?
- Does the drain line, which carries the ion exchange unit backwash water and brine recharge water, drain into a location of concern, such as a well pit?

☐ **Ion Exchange Unit Brine Tank (lift the top off and look inside):**

- Does the brine tank contain salt?
- Is the inside of the brine tank clean?

☐ **Ion Exchange Unit Brine Tank Emergency Overflow Line:**

- Does the ion exchange unit's brine tank overflow line have an air gap between the overflow line and the waste/sewer line?

☐ **Sediment Filters:**

- If a sediment filter is present prior to the ion exchange unit, is it cleaned at a frequency that prevents sediment filter clogging?
- Is there a written procedure for replacing the sediment filter without touching the filter and for disinfecting the filter and filter housing after replacement?
- Does the procedure verify amounts of chlorine that are allowable to not negatively impact the ion exchange resin?

☐ **Location of the Ion Exchange Unit:**

- Is the ion exchange unit set up prior to any disinfection system?
  - In chlorination systems, ion exchange should be set up prior to disinfection to avoid impact on the resin.
  - In UV systems, ion exchange should be set up prior to disinfection so that the ion exchange unit will remove possible contaminants which could have a shielding effect that decreases the UV light effectiveness.

References for more information:

PA-DEP PWS Manual Part II - Community System Design Standards this document can be located at:
http://www.elibrary.dep.state.pa.us/dsweb/View/Collection-8280
(Note: These CWS standards do not apply to NCWS systems, but some of this information is helpful in designing a successful ion-exchange system.)

PA-DEP Drinking Water Operator Certification Training Module 22 – Inorganic Removal Basics:
http://www.dep.pa.gov/Business/Water/BureauSafeDrinkingWater/OperatorCertification/Training/Pages/DepartmentTraining.aspx

Sediment Filter Treatment

This job aid provides information about cartridge filters used for the mechanical removal of sediment. The target audience is regulated public non-community water system (NCWS) operators and RTCR Level 2 Assessors. To assist in proper completion of a Level 2 Assessment, a checklist for what should be investigated when assessing a sediment filter at a NCWS has been provided on the second page of this document.

Note: This document does not discuss the use of cartridge filtration for the pathogenic removal of *Cryptosporidium* oocysts and/or *Giardia* cyst removal; the use of carbon cartridge filters for the removal of organic material, radon, or chlorine; or greensand filters used for iron, manganese, and hydrogen sulfide removal.

Sediment filters are applicable for low flow systems (e.g. NCWS with flows under 100,000 gpd) that have source water with less than 1 NTU of turbidity. Source waters containing even low levels of fine colloids or clays are not suitable for mechanical sediment filtration.[1] Sediment filters are disposable and easily replaced.

What it removes:

Sediment filters are used in NCWS systems to remove particles ranging in size from 0.2 microns up to 10 microns. These filters may be used to remove turbidity as a stand-alone treatment or as pre-treatment prior to other treatment processes.

How it works:

- A sediment cartridge – consisting of a membrane, fabric, or string filter medium - is affixed to a central core; both are housed inside a pressure vessel. [2]
- Sediment filter cartridges can be made of a variety of materials. However, the two general styles are as follows: the “wound’ style consists of a fabric thread wound around a central core; the “pleated” style consists of a fabric with pleats, which involves the pleated section of the material being attached to the central core.
- Sediment filter housings are made of plastic or stainless steel.
- These filters may be used individually for an extremely small system. There are also arrangements that involve a pre- and post-filter where feed water initially passes through a pre-filter with a larger pore size and then a post-filter with a finer pore size.

What it looks like:

Picture of “wound” style of sediment filter in plastic filter housing

Filter Replacement Frequency:

fouled filter

Dirty filters can cause an increase of bacteria in the water. At a minimum, Pa. DEP recommends NCWS systems replace sediment filter cartridges quarterly. If the filter housing is made of a clear plastic, and the filter inside appears to be fouling before 3 months have passed, then the filter should be replaced as soon as fouling is visible.

Disinfection Steps:

For systems without chlorine disinfection, during sediment filter cartridge replacement it is important to disinfect the new filter and housing. Below are recommended disinfection steps. Be sure to follow any manufacturer's instructions.

- Open the filter housing and change out the old sediment filter cartridge with a new filter cartridge. It is important that the new cartridge is not handled with bare hands while being replaced.
- Pour a cup of NSF-approved bleach into the filter housing that contains the new affixed filter cartridge. If possible, perform this activity so that the bleach mixture can be in contact with the sediment filter cartridge and housing undisturbed for several hours (e.g. overnight.)
- DO NOT serve any chlorinated water to the public. Run distribution taps in the facility until the smell of bleach disappears. Once the smell of bleach disappears, you can once again serve water to the public.
- Note: If you have an ion exchange unit, such as a softener, on-line after the sediment filter, check with the softener or resin manufacturer to verify that the chlorine will not negatively affect the softener resin.

Systems should have their filter replacement steps in writing for facility workers to follow.

Assessment Checklist Items:

- ☐ **Proper Maintenance:** Are filters replaced frequently enough to prevent the filter from becoming dirty and clogged? If filter appears overly dirty and clogged this is a sanitary defect.
- ☐ **Written Procedure:** Is there a written procedure for replacing the sediment filter cartridge without touching the filter* and for disinfecting the filter cartridge and filter housing after replacement?

  *Use the wrapper the filter came in to make contact with the filter

References for more information:

[1]PA-DEP Drinking Water Operator Certification Training Module 18 – Bag and Cartridge Filtration; pp. 1-4 through 1-6; 2-4:
http://www.dep.pa.gov/Business/Water/BureauSafeDrinkingWater/OperatorCertification/Training/Pages/DepartmentTraining.aspx

[2]PA-DEP Public Water Manual Part IV - Noncommunity System Design Standards; pp. IV-23 through IV-25:
http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-107193/383-2128-108.pdf

Avoiding Cross Connections: At TNCWSs with a Single Service Connection

This job aid covers a few facts about cross connections and how to avoid creating them. This information may be useful for all regulated water systems, but this document is targeted at owners and operators of transient non-community water systems (TNCWS) with a single service connection.

A single service connection means that the water is only connected to or serves one building. In addition, these systems serve a transient population; examples would be restaurants, shopping centers, churches, hotels, and highway rest areas.

What is a Cross Connection?
Points at which a potable water system connects or can connect with non-potable sources that could make the water unsafe to drink are known as "cross-connections."

Cross-connections are susceptible to backflow of non-potable water as a result of backpressure and backsiphonage. Backpressure occurs at a plumbing fixture or other cross-connection when the pressure in the fixture is greater than the pressure in the potable water system. Backsiphonage occurs when a lack of pressure occurs in the potable water system.

How is a Cross Connection Created?
Common cross-connections at TNCWSs with a single service connection are:

- **Waste drain lines** from treatment systems (e.g. softeners) that are connected to a sewer drain pipe or submerged in a floor drain.

- **Submerged hoses** with one end attached to the water supply and the other end submerged in a chemical tank, vat, bucket, sink, pool or pond. Any hose bib and associated garden hose represent a potential cross-connection.

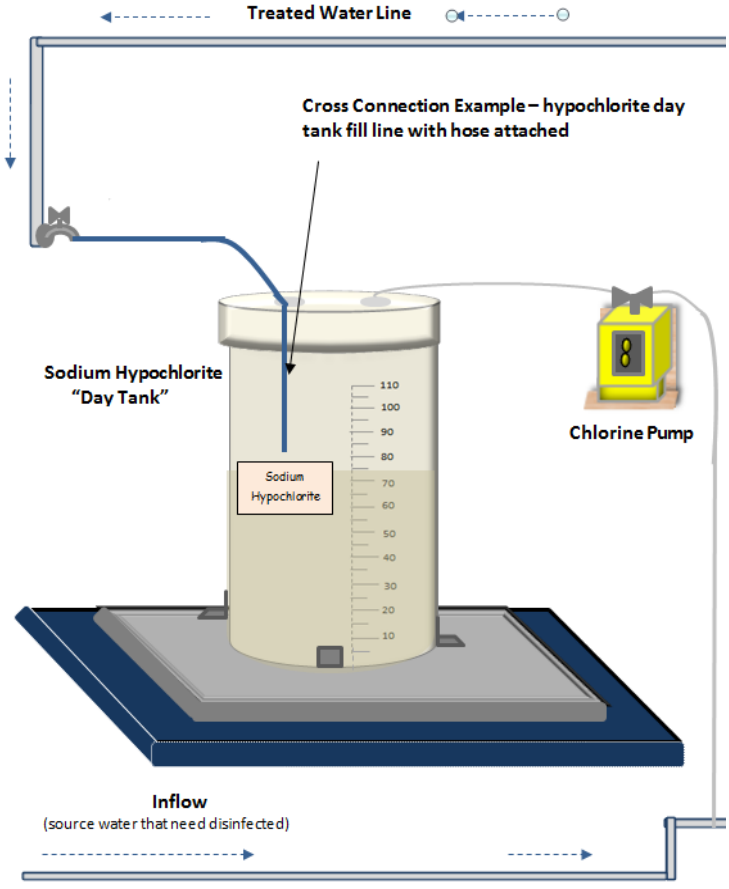
A cross connection created by a hose: one end connects to the water line and the other end is submerged in a trough

Other common cross-connections occur with: Irrigation systems, boilers, heat exchanging equipment, power washing equipment, fire sprinklers, and pumps in the water distribution system.

In addition, a partial list of plumbing hazards is listed in EPA's Cross Connection Control Manual (see link for this list in the References at the end of this document.)

What does a Cross Connection look like?

An example of a cross connection is shown on the next page where a hose is connected from the treated water line and left dangling in the sodium hypochlorite "day tank" where sodium hypochlorite is diluted with water from the plumbing system.



How is a Cross Connection Prevented or Controlled?

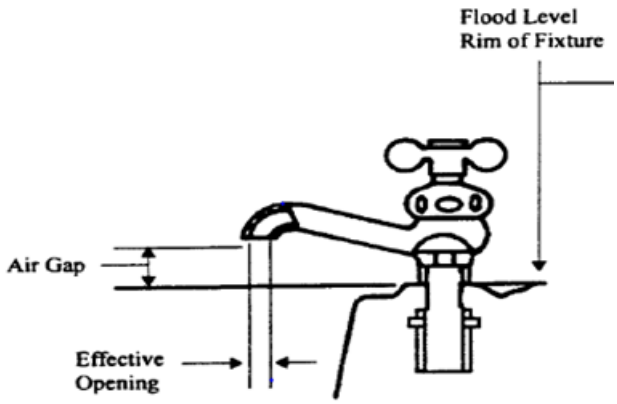
- **Air Gap:**

  The simplest way to prevent a cross-connection is to provide an "air gap." An air gap is an open vertical space between any device that connects to the water system (like a valve or faucet) and the source of contaminated fluids (like waste pipes, chemicals, sinks, pooled dirty water, etc.)

  A common example of an air gap is the vertical space between a faucet and the sink rim; the vertical space is the air gap (see diagram below).

  If a hose is then attached to the faucet and left dangling into the sink below the rim, a cross-connection has now been created. Under circumstances where water fills the sink and the water supply pressure is not sufficient (e.g. a nearby line break), dirty sink water could be drawn back up through the hose into the drinking water system.

Air Gap Diagram from Pa. DEP PWS Manual VII: Cross Connection/Backflow p. VII-12:



**AIR GAP AND
EFFECTIVE OPENING**

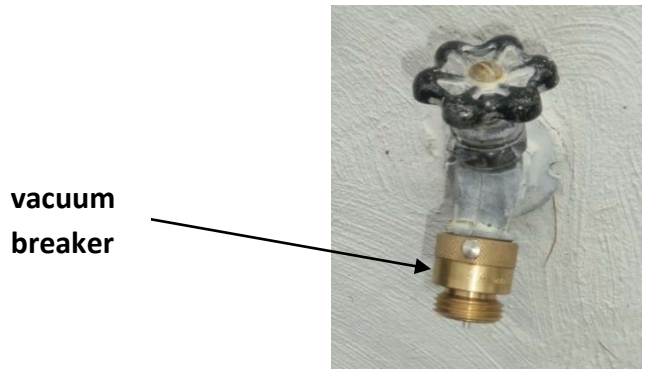
- **Backflow Prevention Device:**

  When an air gap is not feasible, cross-connections need to be controlled by installing a specialized backflow preventer valve. Mechanical backflow prevention assembly devices are used in circumstances where there is not sufficient physical space to provide a vertical air gap or where pressurized operations do not allow for an air gap.

  There are various types of backflow prevention devices. The decision on which backflow prevention device to use in a situation is dependent on the degree of hazard present (see one of the manuals referenced at the end of this document for more information).

It also is important to understand the limitations of types of backflow prevention devices since the degree of protection provided will depend on the type of backflow prevention device and the maintenance program employed.

Important Note: One of the most common and most easily fixed cross-connections at single service connection TNCWSs occurs at hose bibs. Installation of vacuum breakers at the hose bib like the one pictured below can be completed for very little cost and effort.



References for more information:

PA-DEP PWS Manual Part VII – Cross-Connection Control and Backflow Prevention (document 383-3100-111) at http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-47501/383-3100-111.pdf p. VII-2

EPA Cross Connection Control Manual: Appendix A – Partial List of Plumbing Hazards

COLLECTING A REPRESENTATIVE SAMPLE FROM DRINKING WATER STORAGE TANKS – CHECKLIST FOR RTCR ASSESSORS

Collection of a representative sample from a tank can be challenging but is essential to be able to determine the quality of the water that is being distributed from the tank. The following steps should be taken to help assure representative sample collection from tanks:

BEFORE TRAVELING TO SITE:

1. Water systems may have multiple storage tanks, sometimes in close proximity:
   - ☐ a. Verify the exact location and name of the specific tank or tanks and ensure that you document proper sample location on all forms and labels.
   - ☐ b. In order to assure adequate supplies are available for unforeseen circumstances, it is advisable to take one complete *extra* set of sampling supplies with you.
2. Ensure that knowledgeable water system personnel are on site during tank sample collection, this may be the same individual who is assisting with the assessment or it may be another individual such as a distribution system operator. Specify that you are requesting someone who:
   - ☐ a. Is most familiar with the design and operation of the storage tank(s).
   - ☐ b. Can provide access (open locks) to storage tank ladder, hatches, valve pits, etc.
   - ☐ c. Can explain the internal and external tank piping and identify the most representative sample tap for sampling water exiting the storage tank(s).

   Note: Water system personnel may need the help of their engineer and should ensure that they are available for consultation via phone or on-site.

ON-SITE:

Important Note: If the best sample location is located in a confined space or requires climbing the tank, all proper protocols and safety equipment should be utilized. It is not mandatory that the assessor collect the sample. Another individual such as someone from the water system or a third party who is trained in the safety protocol may collect the sample instead.

3. Once you arrive on-site, ask the water system personnel to identify the specific valve they feel will provide the most representative sample of water exiting the storage tank of concern.
4. Once they have verified the specific valve, ask water system personnel:
   - ☐ a. "*Is the tank filling (water entering) or drawing (water leaving) now?*" Samples should be collected during a draw cycle for an accurate representation of water quality within the tank.
   - ☐ b. "*How many feet of what diameter pipe must be flushed before the suggested sample tap would yield water drawn from the tank itself?*"

☐ c. "*What flush time does the operator/owner suggest to collect a representative sample?"*

☐ d. Use the Calculated Flush Time chart below to compare the operator's estimate with the chart estimate; use whichever flush time is greater.

Number of Minutes needed to Flush Hydrant at 20 gpm						
Length of Pipe	Diameter of Pipe (inches)					
	2	4	6	8	12	16
5	0.0	0.2	0.4	0.7	1.5	2.6
10	0.1	0.3	0.7	1.3	2.9	5.2
15	0.1	0.5	1.1	2.0	4.4	7.8
20	0.2	0.7	1.5	2.6	5.9	10.4
25	0.2	0.8	1.8	3.3	7.3	13.1
30	0.2	1.0	2.2	3.9	8.8	15.7
35	0.3	1.1	2.6	4.6	10.3	18.3
40	0.3	1.3	2.9	5.2	11.8	20.9
45	0.4	1.5	3.3	5.9	13.2	23.5
50	0.4	1.6	3.7	6.5	14.7	26.1
55	0.4	1.8	4.0	7.2	16.2	28.7
60	0.5	2.0	4.4	7.8	17.6	31.3
65	0.5	2.1	4.8	8.5	19.1	33.9
70	0.6	2.3	5.1	9.1	20.6	36.6
75	0.6	2.4	5.5	9.8	22.0	39.2
80	0.7	2.6	5.9	10.4	23.5	41.8
85	0.7	2.8	6.2	11.1	25.0	44.4
90	0.7	2.9	6.6	11.8	26.4	47.0
95	0.8	3.1	7.0	12.4	27.9	49.6
100	0.8	3.3	7.3	13.1	29.4	52.2

5. Evaluate safety and options to sample directly from the tank. Sampling directly from the tank (via a hatch) *may* be the better option if:

   ☐ a. Confined space entry issues prevent collection of a representative sample of water exiting the tank.

   ☐ b. The assessor/operator/owner indicates a sample can be safely collected directly from the tank using available safety gear.

   ☐ c. A large volume of water must be flushed (answer to question #4b indicates many feet of large diameter pipe) in order to obtain a representative sample.

6. Flushing (when collecting from a pipe).

   ☐ a. Use the estimated flush time as a guide for how long to flush.

   ☐ b. Verify adequate flushing occurred by using a digital thermometer before collecting the first sample. The temperature should be stable.

7. Begin sample collection following proper sample collection protocols.

Revised Total Coliform Rule (RTCR) Level 2 Assessment
Information for Transient Noncommunity Water System Owners

The following information is intended to assist transient noncommunity public water system owners with the Revised Total Coliform Rule (RTCR) Level 2 assessment process. Level 2 assessments are unique in that an appropriately certified operator must complete the assessment.

Time is of the Essence: Note that the system owner, or responsible official, is required to submit a completed Level 2 assessment to DEP within 30 days of triggering the assessment.

Obtaining an Assessor:

- Level 2 assessments must be conducted by a licensed operator appropriately certified for the system being assessed (class and subclasses).
- Systems that do not regularly employ a certified operator can find available Level 2 assessors on the RTCR web page at http://tinyurl.com/PaRTCR2

Preparation:

Prior to arriving on-site, the certified operator conducting the assessment will need to review critical information about your system.

Please provide the assessor with the following:

- Coliform sample siting plan
- Contact information for the person or company responsible for collecting coliform samples
- Lab sample results for the positive sample that triggered the Level 2 assessment
- Most recent DEP inspection
- DEP PWS Brief Description Form and Inventory
- Any raw (source) water quality data
- Level 1 assessment (if applicable)
- Permits (if applicable)

Preparatory Sampling:

The Level 2 assessment requires sampling for certain parameters, depending on your system characteristics. Your assessor may want you to collect and send samples to your lab for analysis prior to the on-site assessment. You should discuss sampling as soon as you contract with an assessor.

On-Site Assessment:

During the on-site assessment, the assessor will investigate all the elements of the water system using the DEP Level 2 Assessment form. The individual that maintains the water system should accompany the assessor to answer questions.

Corrective Actions and Completion Schedules:

Once the on-site work is done, the assessor and system owner should review the findings. Any issue that is identified as a sanitary defect requires a corrective action and completion schedule. A sanitary defect is defined as:

- A potential pathway for entry of microbial contamination into the distribution system. Examples of pathways for microbial contamination include cross connections, pipe leaks, broken meters, leaking pipe joints, line break repairs or new installations.
- A failure or imminent failure in a barrier that is already in place. Examples of barriers include disinfection, system pressure, and backflow prevention.

The assessor should recommend corrective actions based on best professional judgment. The assessor makes recommendations, but the system owner must agree to each corrective action and the schedules for completion. Some corrective actions may require additional contractors to complete the work and/or materials that must be ordered. These factors should be considered when creating the schedule for completion.

Please note that the full assessment cannot be completed until the assessor obtains the results of water quality samples collected as part of the investigation. For example, it may take 2 to 3 days to receive results of bacteriological samples. Once these results are factored into the investigation and any additional corrective actions and schedules are determined, the owner and assessor must sign the Level 2 Assessment form. **The system owner is responsible for submitting the form to DEP within 30 days of triggering the assessment; failure to do so will result in a violation requiring Tier 2 public notice.**

Once the assessment is submitted to DEP, it is the owner's responsibility to ensure that each corrective action is completed by the established date. **The system owner is required to inform their local DEP office after each corrective action is completed.** The system will incur a violation requiring Tier 2 public notice if corrective actions are not completed by the date identified in the assessment. By correcting issues as soon as possible, you are protecting public health and lessening the chance of additional positive coliform samples during the next routine sampling event.

What if the owner and assessor can't agree on corrective actions or the schedule?

As the owner, you are responsible for submitting the Level 2 Assessment form to DEP within 30 days of triggering. If you disagree with the assessor's recommendations, you can submit the form to DEP with only the assessor's signature and not your own. DEP will contact you to determine why the assessment was not signed. You can then agree upon corrective actions and completion schedules with DEP.

What if DEP determines that the assessment is insufficient?

If the assessment is determined to be insufficient, DEP will notify the water system and request that the owner contact DEP within 14 days for a consultation. If during the consultation it is determined that a revised assessment is required, the water system has 30 days from the date of consultation to submit a revised assessment.