State Drinking Water Distribution System Survey

White paper prepared by the Association of State Drinking Water Administrators (ASDWA)

September 2020

Introduction

The drinking water distribution system, or the components of a water system that convey drinking water from the treatment plant to consumers, is a critical control point for maintaining safe drinking water. The proper operation and maintenance of the distribution system helps to ensure optimal water quality and increases public health protection. Distribution systems are a complex structure of pipes, valves, storage tanks, pumps and other appurtenances that move water from the treatment plant to its customers' taps. These complex systems continue to pose regulatory and management challenges across the nation due to the complexity of water quality issues.

The current Safe Drinking Water Act (SDWA) regulations that apply to distribution systems are:

- Surface Water Treatment Rules - the minimum required detectable disinfectant residual and the maximum allowed heterotrophic bacterial plate count and sanitary surveys for surface water systems;
- Stage 1 and 2 Disinfectants and Disinfection Byproducts Rules (DBPR) - the maximum disinfectant residual and concentration of disinfection byproducts like total trihalomethanes, haloacetic acids, chlorine dioxide, and chlorite allowed in distribution systems;
- Ground Water Rule (GWR) - sanitary surveys for groundwater systems;
- Revised Total Coliform Rule (RTCR) - microbial water quality in the distribution system, sanitary defects, and assessments/find & fix; and
- Lead and Copper Rule (LCR) - corrosion control in the distribution system and lead and copper concentrations below action level in tap samples.[1]

Each of these regulations focuses on water quality. The SDWA by-and-large does not address distribution system physical and hydraulic integrity outside of sanitary surveys, nor does it include federal requirements that would address premise plumbing, outside of lead in plumbing materials. In some cases, state and territorial drinking water primacy agencies (herein referred to as "states") have stepped in with required or recommended actions for water systems, such as minimum pressure requirements, flushing requirements, etc., to better ensure a safe and reliable distribution system.

Distribution systems span nearly one million miles in the United States, representing the majority of physical infrastructure for water systems.[2] The American Water Works Association (AWWA) estimates that the national cost of repairing and expanding buried drinking water infrastructure will exceed $1 trillion in the next 25 years, and small systems will be particularly challenged in funding their infrastructure needs.[3] The Environmental Protection Agency's (EPA) estimates, which do not account for system growth, show $312.6 billion for distribution and

[1] AWWA M68 Water Quality in Distribution Systems

[2] US EPA, *Drinking Water Distribution Systems Webpage:* https://www.epa.gov/dwsixyearreview/drinking-water-distribution-systems

[3] AWWA, *Buried No Longer: Confronting America's Water Infrastructure Challenge* (2012): https://www.awwa.org/Portals/0/AWWA/ETS/Resources/BuriedNoLonger2012.pdf?ver=2020-09-21-095318-407

transmission and $47.6 billion for storage is needed to maintain and improve this infrastructure over the next 20 years.[4]

In May 2020, the Association of State Drinking Water Administrators (ASDWA) Regulatory Committee conducted a comprehensive survey on distribution systems with its members.[5] The purpose of the survey was to determine what distribution system issues are most commonly faced by state water programs, gather management practices and policies to share amongst the states, and collect additional information that could be used to inform future regulations. The survey was completed by drinking water program representatives from 41 states and territories. The results of this survey make up the substance of this white paper (note: not every question was answered by every respondent).

Storage Tanks

Finished water storage can provide several beneficial functions for a water system, including maintaining pressure, providing flow during peak demand, providing water for fire flow, reducing surge effects from pumps, and providing or increasing detention time for disinfection contact-time requirements. Additionally, as water sits stagnant the quality can degrade through increased disinfection by-product (DBP) formation and loss of disinfectant residual. Storage tanks should be managed to reduce water age and keep water moving within the system.

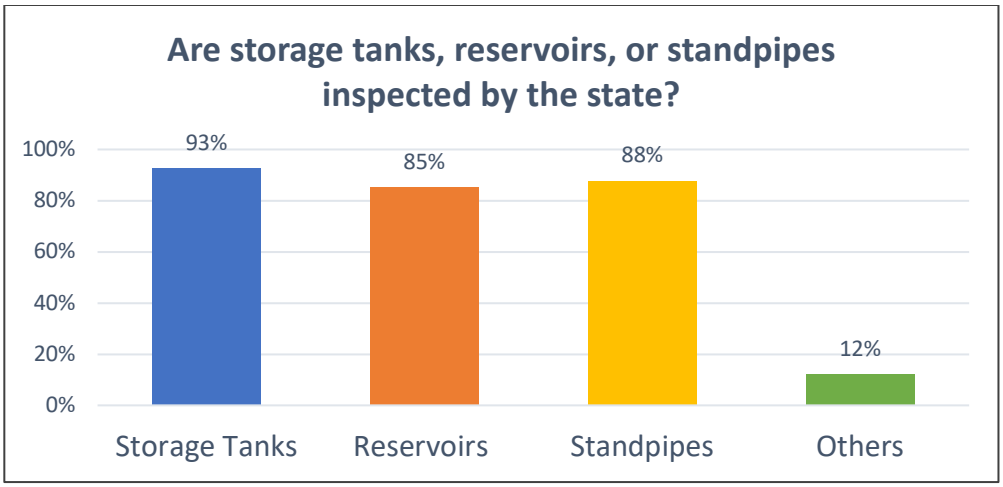
Several types of storage facilities are used by water systems, including underground or below ground reservoirs, ground storage tanks, elevated storage tanks (or standpipes), and hydropneumatic tanks (pressurized). It is widely recognized that storage tanks should be regularly inspected to ensure integrity.[6] Most states inspect water systems' storage tanks during their regular sanitary surveys of water systems:

- 38 states inspect ground storage tanks (95% of respondents),
- 35 states inspect reservoirs (87.5% of respondents), and
- 37 states inspect standpipes or elevated storage tanks (90% of respondents).
- 5 states inspect other tanks such as pressurized tanks and booster station tanks (12% of respondents).

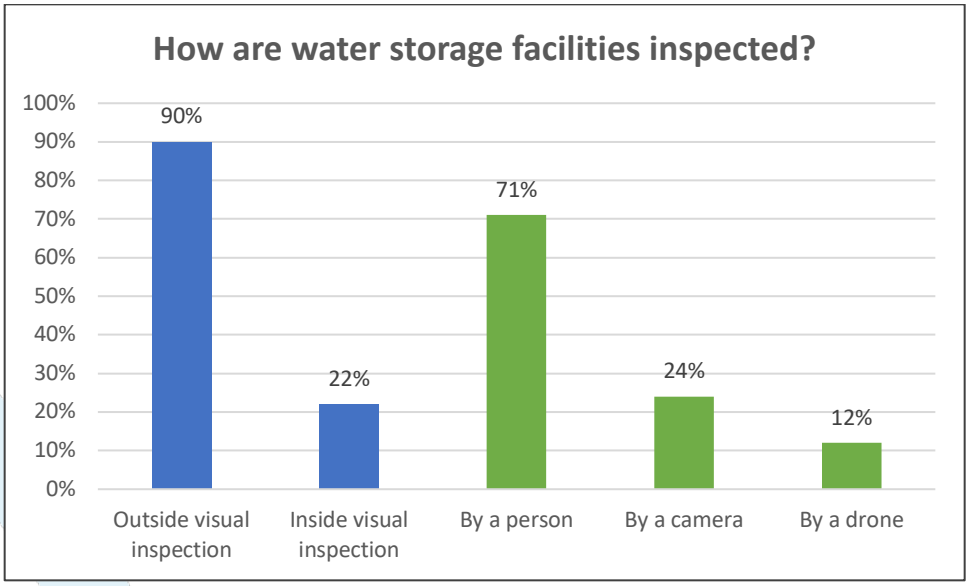
[4] US EPA *Drinking Water Infrastructure Needs Survey and Assessment Sixth Report to Congress* (2018): https://www.epa.gov/sites/production/files/2018-10/documents/corrected_sixth_drinking_water_infrastructure_needs_survey_and_assessment.pdf

[5] Survey questions attached in Appendix A.

[6] AWWA M42 Steel Water Storage Tanks, Revised Edition



For some states, storage tank inspection also includes pressurized tanks, booster station tanks, and smaller ground storage tanks such as atmospheric tanks. Most states complete this inspection through the sanitary survey process, but some hire contractors to inspect storage tanks, and at least one state requires the system to self-inspect storage facilities. Typically, tank inspections occur every three to five years, but some states require an annual inspection, while others have no specific interval requirement. The overwhelming majority of states examine facilities by outside visual inspection, most often with a person, but some states use cameras and drones. It should be noted that safety regulations can make climbing tank ladders for a visual inspection problematic. At least nine states conduct an inside visual inspection when possible and safe. Several states indicated they also look at tank maintenance records in combination with visual inspection to determine storage tank reliability.



Along with regular inspections, water systems should clean and disinfect their storage tanks regularly. Sediment that settles in the tanks may harbor pathogens, or metals that can be released under certain conditions, and this sediment creates the potential for a waterborne disease outbreak. Tank sediment can release these pathogens into the distribution system when the sediment is disturbed by tank hydraulics or a change in operational conditions. However, only eight states require tank cleaning. Another 22 states noted that they recommend tank cleaning for water systems. Some states may require tank cleaning if recommended after a professional inspection or if the tank is associated with a significant deficiency or contamination event. For states that require or recommend tank cleaning, the most common timeframes are every three to five years or five to ten years, with at least five states requiring or recommending annual cleaning.

Disinfection

Drinking water is disinfected to protect public health by killing (inactivating) pathogens. All utilities that use surface water as their source of drinking water are federally required to inactivate and remove 99.99% of viruses through filtration and disinfection, though some surface water systems may obtain waivers for filtration if the water comes from a protected source and the system meets certain other criteria. Surface water systems must also maintain a detectable disinfectant residual throughout the distribution system.

Systems that use ground water as their source are only required to disinfect as necessary and are not federally required to maintain a detectable disinfectant residual. Some states do require groundwater systems to provide disinfection and may require a minimum disinfectant residual. Groundwater systems that use chemical disinfection and serve more than 3,300 people must continuously monitor their disinfectant concentration. Groundwater systems that are found to be influenced by surface water (for example, wells located next to rivers without adequate protection) are federally required to follow the treatment requirements for surface water. The Ground Water Rule (GWR) also allows for use of disinfection for systems using groundwater sources required to treat for viruses/fecal contamination or in lieu of triggered source water monitoring.

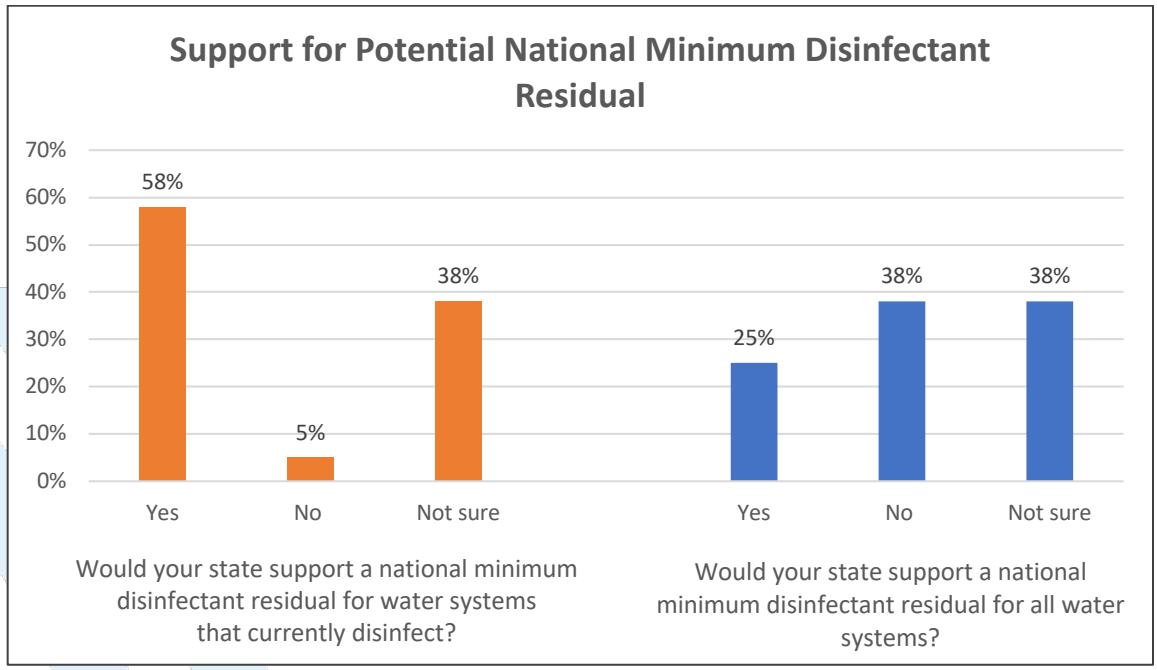
Primary disinfection takes place during the water treatment process and kills or inactivates bacteria, viruses, and other pathogens in the water. Secondary disinfection provides longer-lasting protection in the finished water as it moves through storage and water mains to taps, reducing the regrowth of potentially harmful microorganisms.[7] However, chlorine or other disinfectants interact with contaminants, such as naturally occurring organic matter, in treated water to form disinfection by-products (DBPs), so there's always competing challenges in balancing the acute (short-term) risks from pathogens versus the chronic (long-term) risks from DBPs.

[7] US EPA, *Basic Information About Drinking Water Disinfection* (2009): https://www.epa.gov/sites/production/files/2015-09/documents/q3.pdf

Nearly 50% of state respondents (20 of 41 respondents) require disinfection (primary or secondary) beyond federal requirements. Another 20% of respondents (eight states) indicated they require disinfection beyond federal requirements only under certain circumstances, for example requiring disinfection for systems that have persistent presence of bacteriological contaminants. These additional requirements are most often for both primary and secondary disinfection (about 50% of respondents) or only primary disinfection (33% of respondents).

At least 31 states (76% of respondents) require a minimum disinfection residual for systems that are required to disinfect in their state. However, the minimum residual varies widely, depending on the state, or even within a state depending on water system type. The most common regulated minimum residual is 0.2 mg/L free chlorine or 0.5 mg/L chloramines (as total chlorine) in the distribution system. Some states require a higher residual at the entry point such as 0.5 mg/L or 1.0 mg/L of chlorine. Other states do not have a numerical minimum residual but require a detectable residual throughout the distribution system. At least two states have a minimum residual of 0.3 mg/L free chlorine in the distribution system.

Fifty-eight percent of the states (23 out of 40 respondents) would support a national minimum disinfectant residual level for systems that currently disinfect. About 40% of respondents were not sure, stating that it would depend on the value of the required residual and/or which systems it applied to. Other respondents weren't sure if a national minimum residual is worth the transactional costs and requirements that come along with national regulations, such as violations and the resultant public notices. When asked if their state would support a national minimum disinfectant residual for all systems, not just those that currently disinfect, only 25% responded that they would. Those who would not support it or weren't sure cited impracticability and the need for significant studies and data to support mandatory disinfection for all systems.



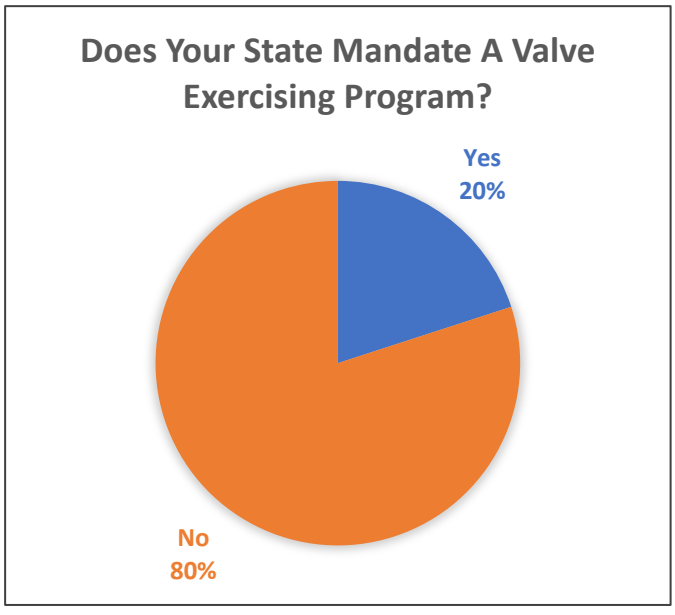
Water systems that use chloramination for secondary disinfection can experience nitrification in the distribution system and water storage facilities. Nitrification is a biological process where nitrifying bacteria grow and persist, resulting in the loss of disinfectant residual, which may then present a health threat to the consumer. Nitrification Action Plans, or water system specific plans to aid in detecting, controlling, and responding to nitrification in chloraminating systems, can help systems reduce nitrification in the distribution system and maintain a residual. At least three states have requirements for nitrification action plans, either for systems using chloramines for disinfection in the distribution system or, in one state's case, for groundwater systems that have naturally occurring ammonia above 1 mg/L and chlorinate.

While the Surface Water Treatment Rules require water treatment techniques, such as filtration and disinfection, for surface water systems or ground water sources under the direct influence of surface water to reduce *Giardia* and *Cryptosporidium* contamination, states and EPA have granted waivers from the filtration requirement to a small number of water systems. At least 25 states do not allow for any surface water filtration avoidance. At least five states explicitly allow filtration avoidance; another six states note that although they do have the ability to grant these waivers, they have never been used in their state. At least one state has a process for surface water filtration avoidance but does not use a waiver process.

Valves and Flushing

Valves are used to control pressure and flow in water distribution systems. They are vital when completing repairs, regulating levels in storage tanks, and preventing backflow and vacuums in the distribution lines. Valves should be exercised regularly to ensure they are operating as they are designed to, and operators should maintain records of valve locations, age, and maintenance reports.

Twenty percent of state respondents (eight of 40 respondents) mandate a valve exercise program for PWSs. In some states, this requirement only applies to community water systems or systems serving more than 500 connections. Some states require valves to be exercised on an annual basis, every two to four years, or do not have a required time period. At least one state recommends exercising valves every 90 days. Six of these eight states mandate the valve exercising program through a state regulation. Two states require exercising through state policy or guidance.



Many of the 32 state respondents that do not require a valve exercise program strongly encourage water systems to have a program. Some states recommend PWSs develop a program during the sanitary survey process, other states encourage it through the Capacity Development program. Some require a PWS to have a valve exercise program to be eligible for Drinking Water State Revolving Fund (DWSRF) loans, recognizing the importance of such programs in maintaining water quality and distribution system health.

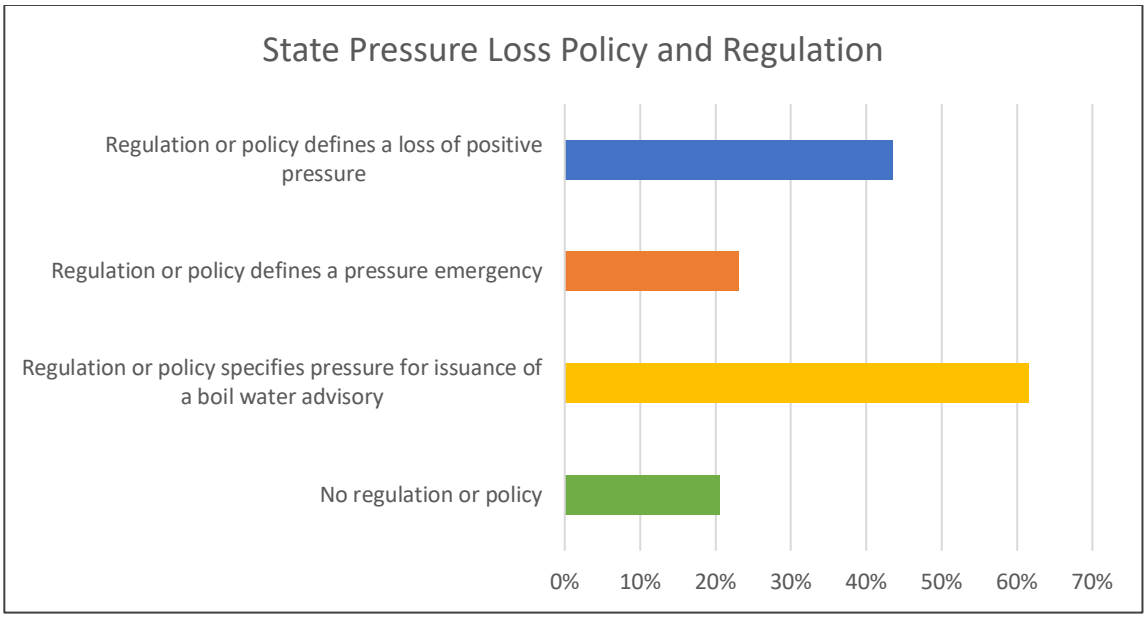
Flushing water mains improves water quality by removing pipe scale and sediment that builds up at the bottom of the water main over time. The sediment can come from internal corrosion of the water mains over many years or other sources. At least 12 states (30% of respondents) have distribution system flushing protocols written in their state regulations. Thirteen states require PWSs to have a program for flushing their distribution system, typically dead-end mains and hydrants. Several states reference using AWWA's applicable C-series standards. At least one state requires monthly flushing of dead-end mains or more frequent flushing if water quality complaints or testing results show deterioration. Many of the 70% of state respondents that do not require a flushing program strongly recommend it, either encouraging it to be a part of the water system's operations and maintenance plan during sanitary surveys or requiring a flushing plan to be eligible for DWSRF funding.

Pressure Maintenance and Main Replacement and Repair

Maintaining adequate pressure is important for sustaining the health and safety of a distribution system. Adequate pressure is determined based on the minimum and maximum design pressure supplied to customers under specific demand conditions, for example, maintaining a minimum pressure under fire flow conditions.[8] Depressurization of a water line can lead to contamination of the water through back siphonage if there is an unprotected cross connection or if there is infiltration through leaking pipes or joints if the ground is saturated with potential contaminants, such as sewage, agricultural runoff, or stormwater.

Thirty-eight states (about 97% of respondents) have a design or operational standard for minimum pressure. Only one state reported not having a standard for minimum pressure (two respondents skipped this question). By and large, 20 pounds per square inch (psi) is the most common minimum pressure. About 30% of state respondents recommend or require pressures between 25 and 40 psi under normal operating flow. At least 17 states (about 44% of the 39 respondents that answered this question) have a regulation or policy that defines a loss of positive pressure and nine states (about 23% of respondents) have a regulation or policy that defines a pressure emergency. Twenty-four states (about 62% of respondents) have a regulation or policy in place that specifies a positive loss of pressure or a level at which there is a pressure emergency or issuance of a boil water advisory. At least eight states (about 21% of respondents) do not have any of these policies or regulations in place.

[8] The National Academies, *Drinking Water Distribution Systems: Assessing and Reducing Risks* (2006): https://www.nap.edu/read/11728/chapter/1



Several states utilize the SDWA authority under the Public Notification (PN) rule to require a Tier 1 PN, e.g., boil water advisory, when a water system experiences a loss of pressure, which constitutes a situation that puts public health at risk. Other states have additional, specific rules or policies beyond the federal standard for responding to depressurizing events. The majority of states (60% of respondents) do not have an operational standard for maximum water pressure. Of the 15 states that do, the maximum pressure allowable ranges from about 80 psi in some states up to 150 psi (in the main, during maximum demand) in other states. Despite many states having policies and regulations in place for minimum and maximum pressure, only nine states (about 23% of respondents) require monitoring or reporting of pressure data to the state. States that do not require reporting and monitoring of pressure may rely on required construction standards that regulate automatic booster pump shut off below specific pressures or require reporting only if the pressure falls below the minimum pressure. Several states note that they do have the ability to require monitoring and reporting of pressure data on a system-by-system basis, especially when there are significant deficiencies or consent decrees related to pressure maintenance.

At least 14 states have mandatory main replacement or repair protocols. Another 11 states have recommended repair protocols. Four states responded that other state agencies regulate these protocols or that they require it on a case-by-case basis. The most common standards recommended or required are the AWWA standards C-651 and C-600; some states referenced the 10-state standards as well as applicable Water Research Foundation projects. A few states have incorporated their own set of protocols into regulation.

Private Distribution Systems

In this section of the survey, ASDWA collected information on how states implement 40 CFR 141.3 “Coverage” regarding “privately owned” distribution systems connected to a federally

regulated PWS. For the purposes of this survey, "privately owned distribution system" refers to a connection to a PWS that is limited to privately owned water distribution where:

- The distribution system is not owned by the PWS supplying the water;
- The owner of the distribution system does not own a PWS to which 40 CFR Part 141 applies;
- All water distributed is obtained from a federally regulated PWS;
- The owner of the private distribution system does not treat or sell the water; and
- The owner of the private distribution system is not a carrier which conveys passengers in interstate commerce.

Some examples may be some mobile home parks, RV parks, apartment complexes, condominium complexes, medical or college campuses, etc., where the facilities obtain/purchase all their water from a federally regulated PWS, have their own distribution system, and don't re-treat or individually bill for water.

There were 39 states that responded to this portion of the survey. At least 30 states (nearly 77% of respondents) do not consider these systems individual PWSs under the coverage provisions of 40 CFR Part 141.3; at least nine states do consider these to be PWSs. An important consideration is that 30 states do not consider these systems individual PWSs, this is based on two considerations:

- For many states this determination depends on whether the private distribution system re-treats or adds treatment, in which case it will be considered a consecutive PWS.
- Other states consider these private distribution systems to be a service connection to the PWS unless they are re-metering or reselling the water, in which case it would be considered a consecutive PWS.

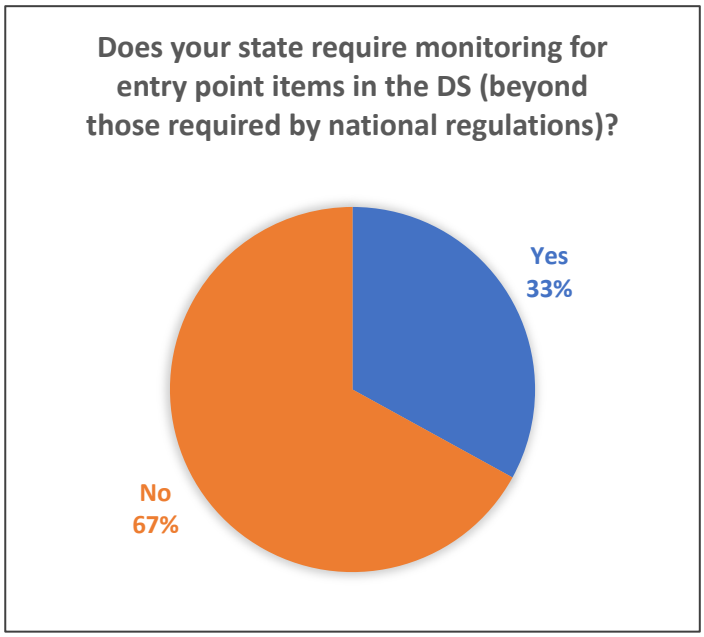
Some states pointed this out as a known gap in the regulations of PWSs and that it can be difficult to identify and properly regulate these systems. Ten states (about 26% of respondents) reported having design standards or requirements for construction or operational approval of private distribution systems. Many states indicated that these systems would still be required to follow any applicable plumbing codes. For the states that regulate these systems as PWSs, the systems would be required to follow all design standards and processes for traditional community water systems. One state uses a monetary threshold and requires plans and specification be approved by the state for any work totaling more than $100,000 to any facility that treats, stores or transports potable water.

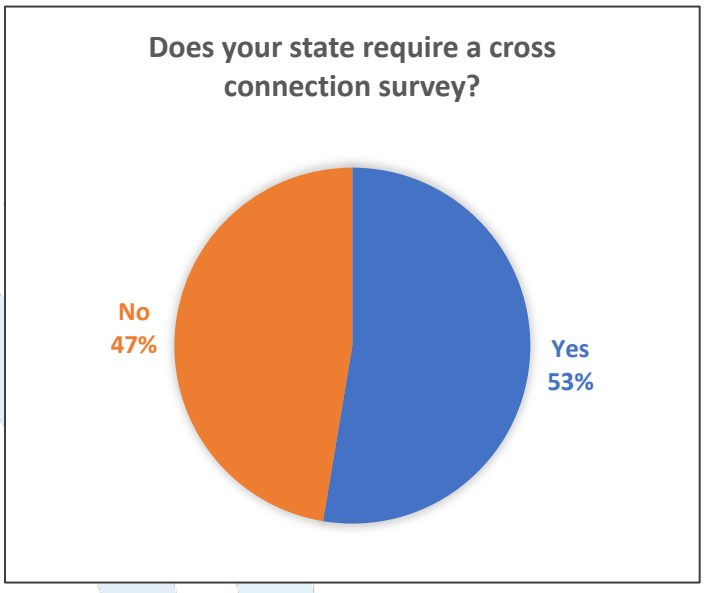
At least eight states (about 21% of respondents) require the regulated PWS to have operation and maintenance control of the privately-owned distribution system. Many states that do not require this recommend or require proper backflow prevention and cross connection control. At least 34 states (87% of the respondents) include the population served by the private distribution system in the population served by the regulated PWS. Twenty-two states, about 56% of respondents, require backflow prevention between the regulated PWS and the private distribution systems. Many states noted this requirement is for non-residential service

connections. Several states that cited not requiring backflow prevention between the systems explained they can and do require it if deemed necessary and evaluate this on a case-by-case basis.

Distribution System Monitoring and Other Issues

Compliance monitoring for most chemical contaminants (IOCs, VOCs, SOCs, RADs) is conducted at entry points to the distribution system (EPDS). Only a handful of regulations require monitoring within the distribution system (RTCR, DBPR, LCR). For example, the Revised Total Coliform Rule also requires monitoring for total coliforms and *E. coli* according to a sample siting plan and schedule specific to the PWS. Additional monitoring of water quality throughout the distribution system, however, is regulated by individual states and is considered best practice to maintain safe drinking water at the tap. At least 13 states, (33% of the 39 respondents for this question) require water systems to monitor the distribution system beyond federally mandated requirements. Much of the additional monitoring required is related to disinfectant residual, with requirements to monitor at representative sites in the distribution system daily or multiple times during a week. Some states require the additional disinfectant residual monitoring to be done at the point of maximum residence time in the distribution system.





There are many potential health risks associated with cross connections, or where a PWS is connected directly or indirectly to a non-potable or unapproved system. If there is a reduction of pressure in the PWS, contamination can occur through backflow. At least 20 states (about 53% of the 38 respondents for this question) require a cross-connection survey. About half of those 20 states that require a cross-connection survey include all water use equipment (i.e. cooling towers, pools, spas, spray misters) as a part of the survey.

When there are disruptions in the distribution system and pressure is not maintained, contamination or intrusion of pathogens and viruses can occur, including *Legionella*, as discussed in the next paragraph. This can happen during distribution system pipe repair or replacement, or other routine work. At least 22 states require notification to the primacy agency for distribution system disruption, and at least 27 states require notification to the primacy agency in the event of a disruption of service due to an emergency (such as a natural disaster). Several states that do not require these notifications strongly recommend them.

Legionella is a group of bacteria found in freshwater environments at generally low levels but can become a health problem when amplified in distribution systems or building water systems, especially large, complex water systems such as hotels, hospitals, and office buildings. When *Legionella* grow in the biofilm of premise plumbing and are aerosolized through devices such as showers, cooling towers, hot tubs, misters, or fountains, people can breathe in small, contaminated water droplets. Inhalation of *Legionella* may result in a severe form of pneumonia known as Legionnaires' Disease, or in milder Pontiac fever. Currently, *Legionella* is the leading cause of waterborne disease outbreaks in the United States and is an increasing concern for PWSs and building water systems.[9] The vast majority of state drinking water programs - 90% of respondents, or at least 35 states - do not require testing for *Legionella* bacteria in PWSs. The four states that do have some requirement for *Legionella* testing in a PWS distribution system cite that this is only done in coordination with the health department, typically in response to a Legionnaires' Disease outbreak, or they have requirements for specific PWSs that may also be health care facilities or hospitals, or those systems that have installed treatment specific for *Legionella*.

Residence time refers to the time it takes water to travel from the treatment facility to the customer's tap. The maximum residence time is the longest period of time water remains in the distribution system. Often, this is the water consumed by the customer that is located in the most remote section of the distribution system. Maximum residence time is important because it can affect water quality, and high water age can lead to increased disinfection byproducts and increased bacterial growth. At least 27 states (73% of the 37 respondents for this question) do not have requirements or standards with regard to maximum residence time in the system or stagnation. However, several states do have recommendations regarding maximum residence time or include considerations in design criteria.

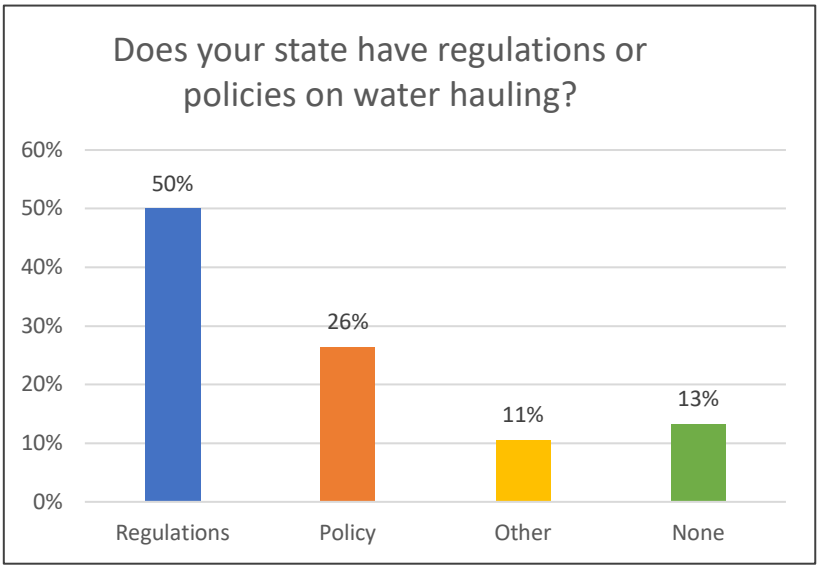
In many water distribution systems, a significant percentage of water is lost during transmission to customers. Unaccounted for water can be caused by leakage, meter errors, unmetered water use, main breaks, and theft, but leakage is the leading contributor to water loss in the U.S. Water audits and leak detection surveys can inform utilities of their water loss and help reduce unaccounted for water. At least 10 states (about 25% of respondents) have state

[9] CDC Article, *Surveillance for Waterborne Disease Outbreaks* (2017): https://www.cdc.gov/mmwr/volumes/66/wr/mm6644a3.htm?s_cid=mm6644a3_w

standards for non-revenue or unaccounted for water. Many states that do not have specific regulations strongly recommend systems complete water loss audits; some states encourage this through their DWSRF, at the time of the sanitary survey, or through asset management plan requirements. Several states noted that they do have targets or goals for water systems, such as less than 15% water loss by volume. At least one state is working on a new rule to address this.

A hydraulic model is a mathematical model of a water or sewer system that is used to analyze the system's hydraulic behavior and help make informed decisions about the distribution system. At least eight states (about 20% of respondents) require the use of distribution system hydraulic models, and another eight states strongly recommend using hydraulic modeling or can require it on a case-by-case basis.

A consecutive system is a PWS that receives some or all of its finished water from one or more wholesale systems.[10] A consecutive system's water quality can best be guaranteed through the use of regular monitoring and sampling to identify problems in water supplied by the wholesaler as well as distribution system deficiencies in the consecutive system. At least 30 states (77% of respondents) do not require monitoring at interconnections for consecutive systems, while at least nine states do require such monitoring. Of these nine states, most require monitoring for DBPs (HAA5 and TTHMs). Other monitoring parameters include acute contaminants, nitrate, nitrite, fluoride, iron, lead and copper, asbestos, alkalinity, hardness, disinfectant residual, and pH. At least one state that does not require monitoring at the interconnection strongly recommends it.



Water hauling is a method of providing water by hauling water in tanks and transporting it with specialized trucks, typically used only for water hauling. At least 19 states (nearly 50% of respondents for this question) have regulations on water hauling. Another 11 states have guidance or policy on water hauling. Most of these regulations and policies require additional monitoring, typically for coliform and/or disinfectant residual At least 19 states allow water hauling up to a permanent basis (including emergencies), nine states allow water hauling up to a temporary basis (including emergencies), and nine states only allow

[10] 40 CFR § 141.2

emergency water hauling. At least four states either have unrestricted water hauling or reevaluate the permit on an annual basis.

Conclusion

With nearly a million miles of drinking water pipes, the distribution system represents a vast amount of infrastructure, and public health protection can be compromised if the operation and management of the distribution system is sub-optimal. Because of this, distribution systems continue to pose regulatory and implementation challenges for EPA, the states, and water systems. At least 21 states (about 55% of respondents) believe there are gaps in the current regulations for distribution systems. Another 14 states (about 35% of respondents) responded they are not sure if there are gaps. Only four states (about 10% of respondents) believe there are no gaps in existing distribution system regulation.

When asked what the top issues are in the distribution system that their state is facing (that are not currently regulated), the most common response was issues with consecutive systems and private systems. Ten states listed these two as their top issues, citing the coordination of responsibility for delivered water quality between wholesale and purchased water systems, the lack of consecutive system regulations for monitoring and maintenance, and the need for clarity or expansion in the definition of a PWS to include large distribution systems that are not currently regulated. Disinfectant residual and storage tank issues were each named by seven states as top issues. For storage tanks, the lack of authority to require storage tank maintenance, including interior cleaning, flushing and monitoring was cited most often. Many states also have no regulatory requirement for periodic inspection (internal and external) and cleaning (of the interior) of distribution water storage structures. For disinfectant residual, the lack of numerical residual, lack of required disinfection, lack of authority to require voluntary chlorination to maintain a disinfection residual, and no definition of intermittent disinfection continue to be a challenge for state primacy agencies. Six states cited non-revenue water or water loss as top unregulated issues in their state, in particular the lack of a water loss audit requirement for water systems.

Other distribution system challenges listed by states include:

- Deterioration of the physical infrastructure: poor condition of distribution systems, substantially past their working life; lack of planning for infrastructure replacement (5 states)
- Lack of requirements for asset management (4 states)
- Disinfection by-products (DBPs), particularly DBP levels for consecutive systems and the point of interconnection to the water provider (3 states)
- *Legionella* and other unregulated pathogens (3 states)
- Flushing techniques and use of flushing to maintain water quality (3 states)
- Backflow prevention (2 states)

Additional research and guidance are needed, as well as increased sharing of best practices to overcome these challenges. Several states mentioned that there needs to be increased sharing

of state successes through webinars and conferences hosted by both EPA and ASDWA. Many states are facing the same challenges and can learn from each other on how they are addressing distribution system issues and why states or EPA should regulate certain things. Presentations and case histories from states would be helpful, in addition to formats that promote discussion and action. At least a few states requested additional training (webinars) on these topics for both state staff and water system owners and operators.

Twelve states identified a need for additional distribution system guidance on the following topics: water age, addressing *Legionella* (preventing and managing), updated guidances on membrane and ultraviolet light (UV) treatment, and on critical control points in the distribution system. By guidance, states are referring to official, written EPA documents as opposed to verbal conversations. Several states qualified this request with the idea that guidance documents must be simple enough for small and very small systems to understand and use.

Lastly, states need assistance on communication templates and best practices. Specifically, states identified four areas where additional communications support and/or materials are needed:

- Communication from utilities to homeowners, specifically for premise plumbing issues and the roles and responsibilities of the homeowner or building owner;
- Risk communication for contaminants like *Legionella* and per- and polyfluoroalkyl substances (PFAS), and assistance in contextualizing contaminants of concern;
- Communication from states to water systems to improve implementation of distribution system regulations and best practices; and
- Public Notification and Lead and Copper Rule public education and outreach materials need to be updated and modernized, particularly now that the Lead and Copper Rule Revisions are close to being finalized and published.

Appendix A
Survey Questions
May 2020

ASDWA Distribution System Survey

Storage tank inspection

Are storage tanks, reservoirs or standpipes inspected by the state?

Yes No Explanation (optional)

If yes, how are they inspected?

outside visual inspection
inside visual inspection
by a person
by camera
by drone
Explanation (optional)

If yes, how often are they inspected?

Open ended

Does your state require storage tank cleaning? If so, at what frequency?

Yes No Explanation (optional)

Mandatory Disinfection

Does your state require disinfection beyond federal requirements?

Yes No Explanation (optional)

If yes, is this required disinfection for primary disinfection, secondary disinfection, or both?

Primary Secondary Both

Minimum/maximum chlorine (or other disinfectant) residual

Does your state require a minimum disinfection residual for systems that your state requires to disinfect?

Yes No Explanation (optional)

If yes, what is the minimum residual and what systems does it apply to? (please include for all secondary disinfectant types)

Open ended

If yes, when did your minimum residual disinfectant policy take affect?

Open ended

Would your state support a national minimum disinfectant residual for systems that currently disinfect?

Yes No Explanation (optional)

Would your state support a national minimum disinfectant residual for all systems?

Yes No Explanation (optional)

Valve exercising

Do you mandate a valve exercising program?

Yes No Explanation (optional)

Is this a state regulation, by guidance, or by some other means?

Yes No Explanation (optional)

What does the valve exercising program entail?

Open ended

Flushing protocols

Are there distribution system flushing protocols in your state regulations?

Yes No Explanation (optional)

Are systems in your state required to have a flushing plan?

Yes No Explanation (optional)

Pressure maintenance

Does your state have a design or operational standard for minimum pressure? If yes, what is the minimum pressure?

Yes No Explanation (optional)

Does your state have a policy or regulation that defines a loss of positive pressure or a point where there is a pressure emergency or issuance of a boil water notice?

Yes No Explanation (optional)

Does your state have a design or operational standard for maximum pressure? If so, what is the maximum pressure?

Yes No Explanation (optional)

Does your state require any monitoring or reporting of pressure?

Yes No Explanation (optional)

Main replacement and repair protocols

Does your state have mandatory or recommended main replacement and repair protocols? If yes, what standard is used?

Mandatory Recommended Other Explanation (optional)

Private Distribution Systems

Alaska is looking for information on how other states implement 40 CFR 141.3 "Coverage" regarding "privately owned" distribution systems connected to a federally regulated public water system (PWS).

By "privately owned distribution system" we mean a connection to a PWS that is limited to privately owned water distribution.

- The distribution system is not owned by the PWS supplying the water;
- The owner of the distribution system does not own a PWS to which 40 CFR 141 applies;
- All water distributed is obtained from a federally regulated PWS;
- The owner of the private distribution system does not treat or sell the water; and
- The owner of the private distribution system is not a carrier which conveys passengers in interstate commerce.

Some examples may be trailer parks, RV parks, apartment complexes, condo complexes, medical or college campuses, etc., where the facilities obtain/purchase all their water from a federally regulated public water system, have their own distribution system, and don't retreat or individually bill for water.

Does your state consider these privately owned distribution systems to be PWSs under the coverage provisions of 40 CFR 141.3?

Yes No Explanation (optional)

Does your state have any design standards or requirements for construction or operational approval of private distribution systems?

Yes No Explanation (optional)

Does your state require the regulated PWS to have operation and maintenance control of the privately owned distribution system?

Yes No Explanation (optional)

Is the population served by the private distribution system included in the population served by the regulated PWS?

Yes No Explanation (optional)

Does your state require backflow prevention between the regulated PWS and the private distribution systems?

Yes No Explanation (optional)

Distribution system monitoring

Does your state require monitoring for entry point items in the DS (beyond those required by national regulations)? If yes, where do you require disinfectant residual monitoring (other than the RTCR sampling sites)?

Yes No Explanation (optional)

Does your state require a cross connection survey? If yes, does this include all water use equipment (i.e. cooling towers, pools, spas, misters)?

Yes No Explanation (optional)

Does your state require notification to Primacy agency for distribution system disruption? Are there emergency notification requirements?

Yes No Explanation (optional)

Does your state have requirements or standards for Maximum Residence Time/stagnation in the system?

Yes No Explanation (optional)

Does your state have standards for non-revenue or unaccounted for water?

Yes No Explanation (optional)

Does your state have a requirement for Nitrification Action Plan (NAPs) for distribution systems?

Yes No Explanation (optional)

Does your state require the use of distribution system hydraulic models?

Yes No Explanation (optional)

Does your state have a requirement for testing of Legionella bacteria in public water systems?

Yes No Explanation (optional)

Does your state's SDWA Program allow for any surface water filtration waivers?

Yes No Explanation (optional)

Does your state require monitoring at interconnections for consecutive systems (i.e. the connection between wholesale systems and receiving systems)? If yes, what is monitored?

Yes No Explanation (optional)

Additional Questions

Does your state have regulations or policies on water hauling?

Regulations Policy None Other

If yes, do these policies or regulations include additional monitoring requirements?

Yes No Explanation

Under what conditions does your state allow the use of water hauling?

Permanent Temporary Emergency Only Other

Are there gaps in the current regulations in regard to distribution systems?

Yes No Explanation

What are the top issues in the distribution system that your state is facing that is not currently regulated?

Open ended

Are there practices or programs in your state that you have developed to address some of these issues that may be helpful to other states?

Open ended

Are there new technical documents or communication materials that could most help you and your utilities improve distribution system management?

Yes No If yes, what would be most helpful?