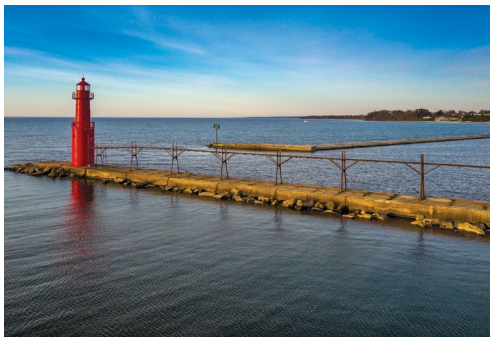
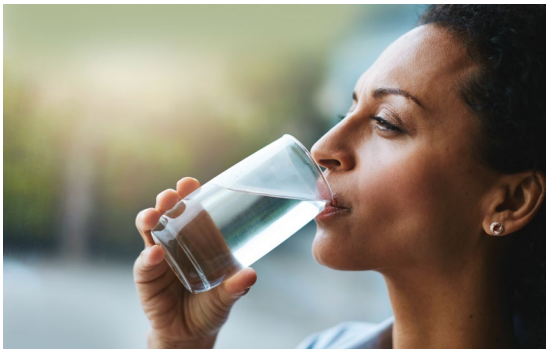
Protecting Drinking Water in the Great Lakes

A Primer on Existing State Policies and Using the Safe Drinking Water Act





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GREAT LAKES
ENVIRONMENTAL LAW CENTER

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Acknowledgements

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About American Rivers

American Rivers believes every community in our country should have clean water and a healthy river. Since 1973, we have been protecting wild rivers, restoring damaged rivers, and conserving clean water for people and nature. With headquarters in Washington, D.C., and offices across the country, we are the most effective river conservation organization in the United States, delivering solutions that will last for generations to come.

About Great Lakes Environmental Law Center

The Great Lakes Environmental Law Center is a Detroit-based nonprofit that offers community education, policy support, and various legal services to address environmental, resource, and energy issues affecting communities in and around Detroit, all over Michigan, and throughout the Great Lakes region.

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Preface

Have you ever wondered about the safety of your drinking water? Are you curious as to what the federal Safe Drinking Water Act (SDWA) says and how to use it in your state advocacy efforts? What does your Great Lakes state do to ensure safe drinking water that might go above and beyond what the federal SDWA requires them to do? How does your state compare with neighboring Great Lakes states? If you have ever thought about any of these questions, then this is the report for you.

The purpose of this report is to provide an overview of the SDWA at the federal level and how it is implemented by the eight Great Lakes states: Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, and Wisconsin. This report describes how all eight Great Lakes states implement the SDWA and the legal baseline in the Great Lakes for regulating drinking water safety. This report is intended for policy advocates, attorneys, legislators, regulators, and others who need a legal baseline in order to evaluate how effectively a state is, in fact, implementing a particular regulation or policy, whether a state's standards should be improved, or how the Great Lakes states compare to each other in protecting drinking water for communities.

After the drinking water crises in Toledo, Ohio and Flint, Michigan, and the growing per- and polyfluoroalkyl substances (PFAS) concerns, we wanted to develop a report that would support our Great Lakes' regional, state, and local partners in their advocacy efforts as well as inform our own. As part of our process, we reached out to representatives of regional and state conservation organizations, environmental and social justice organizations, grassroots activist groups, private foundations, scientists, and other interested persons to participate in listening sessions for each state. At those sessions, we presented topics we thought were important to explore as well as questions we wanted to answer. We asked for feedback on whether or not those were the right questions and topics. We also wanted to learn what we were missing. For example, we didn't fully appreciate the significance of operator certification and private water wells as drinking water issues in the Great Lakes until they were

brought up in the listening sessions. As a result of that process, topics and questions were added and modified.

Moving forward we had to be realistic in what could be researched and included in this report due to limitations on time and scope of the project. There were many applicable topics and questions that were discussed in the listening sessions that the report does not address. This report does describe the drinking water safety laws as they are, not as they were in the past or as they should be in the future. The report does not look behind the legal schemes to evaluate how well states and water systems are implementing them nor does it provide prescriptions or recommendations for how states can and should improve their laws. The report looks at states, but not at tribal jurisdictions within the Great Lakes who have their own drinking water schemes. The report does not address other SDWA topics such as source water protection as a whole (though it does address certain aspects of it), wellhead protection programs, sole source aquifers, analytic methods, and reporting and recordkeeping.

Given that each state is unique, we wanted to give the reader a baseline of information regarding the SDWA and how these laws are interpreted in the Great Lakes states, which could then inform advocacy efforts and policy action plans in each state. Anyone who wishes to understand the deficiencies and

develop recommendations for improvement will need to start with the current laws. This report in intended to act as that starting point.

Given that this is a lengthy, content rich report, we invite you to consider how best to access the information you need. Generally speaking, there are three ways to read this report. First, you may read it cover to cover. Second, you may preview section content in the Executive Summary. If a particular topic is of interest, then go to that section to read more detailed information on the topic. Third, read each section introduction, and then search each section for state headings if you are looking for more information for a particular state.

We would like to thank the many law student interns who helped with the research and writing of this report. We would like to thank all of our Great Lakes partners who participated in the 11 listening sessions. We would like to give special thanks to Elin Betanzo with Safe Water Engineering for technical review and assistance throughout the research and writing processes. We would also like to thank the following individuals who provided written feedback on the draft report: Rob Moore, Meleah Geertsma, and Mae Wu with NRDC; Chris Tavenor with Ohio Environmental Council; James Clift formerly with Michigan Environmental Council; Marya Czech with Junction Coalition; Cheryl Nenn with Milwaukee Riverkeeper; and Crystal Davis with Alliance for the Great Lakes. Finally, we'd like to thank Chris Williams, Jenny Hoffner, and Gary Belan from American Rivers for their support and assistance throughout the production of the report.

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Executive Summary

As is common in environmental law, the regulatory framework that seeks to ensure the safety of drinking water largely consists of a cooperative arrangement between the federal government and state governments. On the federal side, Congress enacted the Safe Drinking Water Act (SDWA) in 1974, and has amended it several times since then. This federal law, which is the proverbial guiding star for drinking water regulation, seeks to ensure the safety of drinking water largely by regulating public water systems, which are systems that have at least 15 service connections, or regularly serve at least 25 individuals. It does this through a number of requirements and programs. However, while the federal SDWA provides a baseline of protection for all people who rely on public water systems for the water they drink, cook, and bathe with, it does not address every drinking water issue that Great Lakes states may be confronting. Congress itself acknowledged this, and expressly included a provision in the SDWA to grant state governments permission to enact more stringent drinking water quality regulations as might be necessary to accomplish the basic goal of ensuring that all people have safe drinking water.

This report provides the federal regulatory framework as created by the SDWA for 10 distinct drinking water topics that are at the front of residents' minds across the Great Lakes region. For many of these drinking water topics, the federal regulatory framework is robust, and it is often rare for states to create significantly different requirements. For example, the Environmental Protection Agency (EPA) regulates the allowable levels of dozens of contaminants in the drinking water provided by any public water system in the country, and requires public water systems to regularly monitor for the presence of these contaminants. These regulations are generally very detailed. For other drinking water topics, the federal regulatory framework only instructs states to develop their own regulations. For instance, while the SDWA requires states to adopt and implement a program for the certification of public water system operators, states have significant discretion in creating this program. Lastly, for some drinking water topics, the federal regulatory framework requires very little to nothing at all.

For example, the SDWA applies to public water systems, but not to private drinking water wells. Thus, any regulations to protect the water quality in private drinking water wells must be developed by states. Another example can be found in emerging contaminants, such as per- and polyfluoroalkyl substances (PFAS) and cyanobacteria blooms. While these contaminants are of increasing concern to many people across the Great Lakes region, the EPA has taken limited regulatory action. Nonetheless, some states are refusing to wait, and are taking their own regulatory action to ensure their residents have safe drinking water.

Below is a concise summary of how states have diverged from any existing federal regulatory requirements, if at all, and how the Great Lakes states compare to each other in taking state action to address the 10 drinking water topics.

Maximum Contaminant Levels, Treatment Techniques, and Monitoring Standards

The EPA establishes "maximum contaminant levels" (MCLs) for drinking water contaminants that it determines may have an adverse effect on the health of persons, is known to be present or has the substantial likelihood to be present

in public water systems with a frequency and at levels of public health concern, and for which regulation presents a meaningful opportunity for health risk reduction for people served by public water systems. Every public water system across the country must comply with an MCL promulgated by the EPA, unless a more stringent MCL has been established by the state.

Additionally, the EPA also establishes "secondary maximum contaminant levels" (SMCLs) for drinking water contaminants that may cause drinking water to have a bad taste, color, or odor. However, a SMCL is a nonmandatory standard, and public water systems are not required to comply unless a state specifically adopts the SMCL as an enforceable standard.

In addition to establishing MCLs, the EPA also establishes monitoring requirements for each MCL that every public water system across the country must comply with, unless more stringent monitoring requirements are established by the state.

Maximum Contaminant Levels

Only three Great Lakes states either have adopted a state-specific MCL for a contaminant that is unregulated by the federal SDWA, or have adopted a more stringent, state-specific MCL for a contaminant that is regulated by the SDWA (Table 1). Several Great Lakes states have adopted at least some enforceable standard for SMCL contaminants.

Maximum Contaminant Level Monitoring Requirements

Every Great Lakes state except for Indiana has enacted some monitoring requirement that is more stringent than the federal requirement for at least one group of contaminants. However, deviations from the federal monitoring requirements are generally fairly minor. Four Great Lakes states have enacted more stringent monitoring requirements for microbiological contaminants (Illinois, Minnesota, Pennsylvania, and Wisconsin). Three Great Lakes states have enacted more stringent monitoring requirements for organic contaminants (Michigan, New York, and Pennsylvania). Only Ohio has enacted more stringent monitoring requirements for radionuclides.

TABLE 1: State-Specific Maximum Contaminant Levels

State	State-Only MCL (mg/l)	State MCL That Is More Stringent Than Federal MCL (state MCL on left; federal on right) (mg/l)	
Illinois	• Aldrin: 0.001 • DDT: 0.05 • Dieldrin: 0.001	• Heptachlor: 0.0001 • Heptachlor Epoxide: 0.0001 • 2,4-D: 0.01	• Heptachlor: 0.0004 • Heptachlor Epoxide: 0.0002 • 2,4-D: 0.07
Indiana	None	None	None
Michigan	None	None	None
Minnesota	None	None	None
New York	Several (See Report)	Several (See Report)	
Ohio	None	None	None
Pennsylvania	None	None	None
Wisconsin	None	• Vinyl Chloride: 0.0002	• Vinyl Chloride: 0.002

Lead as a Drinking Water Contaminant

Lead presents unique challenges for public water systems. Unlike other contaminants, it enters drinking water when material in the distribution system that contains lead corrodes. For example, one of the major sources of lead in drinking water is from the corrosion of lead in the service line that runs from the water main to the customer's home. In comparison, most other contaminants enter the public water system through the source water that the system draws from, such as a groundwater aquifer, or a lake or river. This presents a unique challenge because the contamination of drinking water with lead generally occurs after the water has left the treatment plant.

The Lead and Copper Rule

To regulate the presence of lead in drinking water, the EPA has created a "treatment technique." This regulation

generally requires every water system to do the following:

- Treat water to prevent corrosion;
- Monitor the lead concentrations from taps at single- or multi-family residences;
- Monitor for water quality parameters from taps and in finished water;
- Monitor for water quality parameters in finished water leaving the treatment system and at the taps;
- Take specific actions to reduce lead contamination in water if sampling results reveal that the concentration of lead in more than 10% of tap water samples during a given monitoring period is greater than 15 ppb; and
- Deliver public notification and education materials to consumers to inform them of the amount of lead in their water, and what they can do to protect their health.

However, federal regulations have left notable gaps in protection, which recent crises in Flint, Michigan; Galesburg, Illinois; East Chicago, Indiana; Sebring, Ohio; and Pittsburgh, Pennsylvania have illustrated. As a result, each of these states has taken significant steps to strengthen their drinking water regulations regarding lead. The major, state-specific requirements are listed below in Table 2:

TABLE 2: State-Specific Alterations to Requirements in the Federal Lead and Copper Rule

State	State-Specific Drinking Water Regulation Regarding Lead
Illinois	• ***Distribution System Inventory:*** Require all community water systems to submit a comprehensive distribution system material inventory on an annual basis that describes the total number of lead service lines within or connected to the distribution system. • ***Public Notice of Lead Service Line Work:*** Requires community water systems to provide advance written notice of planned work to repair or replace any LSLs to potentially affected residents.
Indiana	• ***Lead Service Line Replacement:*** Expressly allows for public water system to propose plans to replace both the privately-owned and publicly-owned portions of LSLs.
Michigan	• ***Lead Service Line Replacement:*** Requires every public water system to replace both the private and public portions of every LSL by 2041. • ***Lead Action Level:*** Established state-specific lead action level of 12 ppb. • ***Lead Monitoring:*** Revised protocol for selecting sampling locations to place a greater emphasis on sites with lead pipes or a LSL, and require public water systems to take a fifth liter sample in addition to a first liter sample. • ***Distribution System Inventory:*** Require community water systems and nontransient, noncommunity systems to submit a comprehensive distribution system material inventory that describes all materials in all service lines. • ***Public Education Materials:*** Require systems to include additional information in public education materials, and to distribute materials to additional people. • ***Public Notice Regarding Lead Action Level:*** Require systems to deliver public advisory to consumers within three business days after they have been notified by the state that they have exceeded the lead action level.
Minnesota	• No state-specific regulations.
New York	• Minor state-specific regulations.
Ohio	• ***Public Notice of Sample Results:*** Require water systems to deliver results of lead testing from tap samples within two business days, and require water systems to provide information about the availability of health screening and blood lead level testing to residents if their tap samples show lead levels above the federal action level of 15 ppb. • ***Public Notice Regarding Lead Action Level:*** Require systems to deliver public education materials to consumers within 30 business days after receiving lab results showing the lead action level has been exceeded. • ***Distribution System Inventory:*** Require systems to map areas that are known or likely to contain LSLs.
Pennsylvania	• ***Monitoring:*** Require each public water system to submit a sample site location plan prior to conducting lead tap monitoring.
Wisconsin	• No state-specific regulations.

Lead Contamination in School Drinking Water

Children are uniquely vulnerable to lead exposure, and exposure to lead at any level can cause permanent and irreversible health impacts. However, in general, schools are not federally regulated regarding lead in drinking water. Specifically, schools are not required to test for lead contamination nor are they required to limit the concentration of lead in drinking water to any specific level.

In every Great Lakes state, legislation has been introduced to address lead contamination in school drinking water within the past few years. While some of these bills are still pending, and others have already been rejected, numerous Great Lakes states have taken legislative action to address this federal regulatory gap in recent years (Table 3).

Consumer Confidence Reporting

The SDWA requires public water systems to provide each of its consumers with an annual "consumer confidence report." In general, the purpose of this report is to provide consumers with information regarding monitoring results for both regulated and unregulated contaminants, the MCL for each regulated contaminant, and specific educational information about the potential health impacts associated with a variety of drinking water contaminants.

The SDWA does allow states discretion in key areas that may impact the effectiveness of consumer confidence reports as a public educational resource for specific groups of people, including limited-English speakers, customers of small systems, and vulnerable populations.

TABLE 3: State Legislative Action Regarding Lead in School Drinking Water

State	Summary of State Action
Illinois	• Require each school district to conduct a single test of each source of potable water in a school building constructed before 2000 that is occupied by more than 10 students, and to provide a notification of the sampling results to legal guardians of enrolled students if any sample exceeds 5 ppb.
Indiana	• No school-specific regulations.
Michigan	• No school-specific regulations.
Minnesota	• Require each school district to test for the presence of lead in water in public school buildings at least every five years, and to make the results of the testing available for public review.
New York	• Require each school district to test for the presence of lead in water in public school buildings every five years. • If lead concentration exceeds 15 ppb at any outlet, the school must prohibit the use of the outlet until a lead remediation plan is implemented, further test results must indicate lead levels are below 15 ppb, and school districts are required to submit test results to the local health department and send notification to all parents.
Ohio	• Created the Lead Plumbing Fixture Replacement Assistance Grant program, which provides funding to public and charter schools for the cost of a drinking water assessment, and for the reimbursement of the cost of the replacement of drinking water fountains, water coolers, plumbing fixtures, and piping that is found as the cause of lead concentrations above 15 ppb.
Pennsylvania	• Allows for schools to test for lead in drinking water, but does not require it.
Wisconsin	• No school-specific regulations.

Limited English Speakers

The SDWA does not require any water system to fully translate a consumer confidence report into any language other than English. However, it does require systems that serve communities with a large proportion of non-English speaking residents to include information in the appropriate language either about the importance of the report, or about how they can contact the system to obtain a translated copy. What constitutes a "large proportion of non-English speaking residents" is left to the states.

Pennsylvania is the only state that requires all consumer confidence reports to contain basic information regarding the importance of the report in Spanish, or contact information where a person may obtain a translated copy. No other state requires information in every consumer confidence report to be in any non-English language.

Instead, most states only require the brief informational statement described above if the public water system serves a community that has a specific percentage of non-English speakers. This percentage ranges from 5% (Wisconsin) to 20% (Indiana). Illinois and New York do not define what constitutes a "large proportion of non-English speaking residents," and instead allow water systems to make the determination as to whether to include translated information for non-English speakers.

Waiver of Delivery Requirement for Small Systems

In general, the SDWA requires public water systems to deliver consumer confidence reports to each consumer either by mail or through direct delivery. However, states are allowed to provide a waiver from this requirement for small systems.

Illinois, Michigan, and Wisconsin all allow small systems to waive their obligation to directly deliver a copy of their consumer confidence report to consumers.

Indiana, New York, Ohio, and Pennsylvania do not allow small systems to waive their obligation to directly deliver their consumer confidence reports.

Vulnerable Populations

Only Michigan requires public water systems to include additional health information that specifically addresses vulnerable populations in their consumer confidence reports.

Loans and Grants

In 1996, the SDWA was amended to create the State Revolving Fund (SRF) program for the purpose of providing financial assistance, primarily in the form of low-interest loans, to public water systems to make capital investments in drinking water infrastructure. Recently, the EPA has estimated that approximately $23.6 billion per year over the next 20 years is needed nationwide to pay for the necessary capital improvements to ensure that public water systems continue to provide safe drinking water. However, different states have different needs, and the SRF program largely allows each state the flexibility to meet their capital improvement needs as they see fit.

Before the EPA issues a capitalization grant, it allots funds to states in accordance with a needs survey that is prepared every four years. The EPA then makes capitalization grants to states, but requires each state to match at least 20% of the capitalization grant. States must also submit an annual Intended Use Plan (IUP) that describes how it plans to utilize the capitalization grant.

Just as the needs of states vary, so does the amount of money states have received through the SRF program. The most recent needs survey conducted by the EPA was completed in March 2018, and it found that the capital

improvement needs of public water systems in the Great Lakes states vary widely (Table 4).

TABLE 4: Summary of DWSRF Funding and Estimated Need by State

State	Total Received through DWSRF Program	2018 Capitalization Grant	Estimate of Average Funding Needed Annually over Next 20 Years
Illinois	$815 Million	$34 Million	$1.04 Billion
Indiana	$321 Million	$13 Million	$376 Million
Michigan	$819 Million	$26 Million	$652 Million
Minnesota	$397 Million	$15 Million	$375 Million
New York	$1.23 Billion	$40 Million	$1.1 Billion
Ohio	$648 Million	$23 Million	$670 Million
Pennsylvania	$691 Million	$26 Million	$838 Million
Wisconsin	$396 Million	$14 Million	$428 Million

In addition to providing loans through the SRF program, a few Great Lakes states have also created state-funded grant programs to either supplement a SRF loan, or to provide stand-alone funding. In Minnesota, the Water Infrastructure Fund (WIF) is used to provide matching grants to communities that meet specified affordability criteria. In general, WIF grants are provided in conjunction with a SRF loan. In 2017, New York enacted the Clean Water Infrastructure Act, which provides grants to local governments to fund drinking water and wastewater treatment infrastructure. In the 2017–2018 budget, $2.5 billion was appropriated for this program. In 2008, Pennsylvania enacted the H20 Act, which provides matching grants to local governments for water infrastructure projects. In 2019, Michigan proposed an additional $120 million in general funds for spending to improve drinking water infrastructure.

Public Participation in Standards, Permits, and Enforcement

The SDWA provides opportunities for the public to provide input into decisions for developing new safe drinking water regulations, and allows citizen enforcement of existing regulations. Likewise, many states expressly provided for processes and procedures by which residents can offer input to the state regarding the creation or amendment of drinking water standards, or regarding the enforcement of existing standards.

Most Great Lakes states rely on their respective Administrative Procedures Act, which generally require state agencies to follow specific public notice and comment procedures before enacting a new drinking water regulation, or modifying an existing drinking water regulation.

Additionally, Great Lakes states have provided the public with the opportunity to be involved in the enforcement of drinking water regulations.

- **Illinois:** Provides citizens with the opportunity to file a complaint with the Pollution Control Board against any person alleged to be in violation of the Illinois Environmental Protection Act. In general, the complaint is heard by a hearing in front of the Illinois Pollution Control Board. If the Board denies relief, the complainant may file a civil suit.
- **New York:** Authorizes any person interested in the protection of the purity of the water supply to maintain an action in a court of record against any person for allegedly violating Department of Health (DOH) water quality rules or regulations, but only if the DOH has issued an order to the local board of health to enforce compliance, and the local board has failed to enforce the order within 10 days.
- **Ohio:** Expressly authorizes the public to make complaints about impure water to the Ohio EPA for agency investigation.
- **Pennsylvania:** Authorizes citizens to bring civil suits to force compliance with any rule, regulation, order, or permit issued pursuant to the Pennsylvania SDWA by any person with an interest that may have been adversely affected.

Operator Certification

The SDWA requires states to develop operator certification programs to ensure that each public water system has staff with adequate technical expertise to operate it properly. While the EPA has developed nine baseline standards for operator certification programs, which each state must meet, states have a significant amount of discretion in developing their respective programs.

Every Great Lakes state requires every water system to have a certified operator on staff. In general, every state also allows a person to obtain an operator's certificate either by passing an exam or by reciprocity. Only New York does not grant reciprocal certification to persons that have received their operator's certificate in another state.

Every Great Lakes state classifies public water systems for the purposes of operator certification. The method of classification varies; some states classify systems based on the treatment methods used (Illinois, Wisconsin) while others are classified based on the amount of water the system serves per day (Pennsylvania). Other states consider multiple factors in determining the classification of a public water system (New York, Minnesota). Still others classify water treatment systems distinctly from water distribution systems (Indiana, Michigan). States generally issue operator certificates that correspond to their public water system classifications.

In addition to requiring applicants for an operator's certificate to pass an exam, all Great Lakes states have established basic eligibility requirements that individuals must satisfy before receiving their certificate. These requirements vary based on the operator certificate classification a person is seeking. In general, most states require applicants to have some measure of education and experience working in or operating a public water system. A couple of Great Lakes states have unique requirements in their operator certificate programs. New York requires applicants to undergo water operator specific training, in addition to meeting education and experience requirements. Ohio also expressly requires completion of the Ohio EPA Professional Operator Certification Training course, and to obtain a specific number of experience hours as an operator-in-training after passing the state's certification exam. Comparatively, most Great Lakes states simply allow a person to begin work as a certified operator upon passing an exam, meeting the education and experience requirements, and obtaining their certificate.

Management of Drinking Water Emergencies

The SDWA requires each community water system to prepare an emergency response plan that includes the following: strategies and resources to improve the resilience of the system; plans and procedures that can be implemented; equipment that can be used, in the event of a drinking water emergency that threatens the system's ability to deliver safe drinking water; and strategies that can be used to aid in the detection of an emergency that threatens the security or resilience of the system.

State requirements for the development and implementation of emergency response plans vary in two important respects: the level of detail that states require water systems to provide in their emergency response plans, and requirements to regularly update the emergency response plans. Regarding the level of detail, New York, Ohio, and Pennsylvania have the most specific provisions that clearly describe a water system's obligations regarding the development of an emergency response plan. Additionally, New York is the only state that requires water systems to make their emergency response plans available for public comment. Regarding requirements to update plans, Indiana, Ohio, and Pennsylvania stand out as requiring water systems to annually review and update their emergency response plans. Other states allow water systems to update their plans less frequently (every 10 years in Minnesota; every 5 years in New York), at their discretion (Michigan), or do not require water systems to update their emergency response plans at all (Wisconsin, Illinois).

States also vary regarding the funding they provide to water systems to assist their response to drinking water-related emergencies. In general, most states offer funding from their SRF, and give high priority to projects that seek to correct a public health emergency. Only Ohio has a well-defined financing mechanism that solely exists to aid water systems in responding to emergencies.

Management of Algal Blooms and Their Consequences

Toxic algae blooms are caused by blooms of cyanobacteria in surface water, and commonly occur in lakes and ponds during the late summer. Some species of cyanobacteria produce a variety of toxins, collectively referred to as cyanotoxins, which can pose serious health risks to humans when ingested through drinking water.

Cyanotoxins are an emerging contaminant that is of increasing concern for the public, as toxic algal blooms increase in frequency. While the EPA has created advisory levels for microcystins, which is a common cyanotoxin, and has required certain water systems to monitor for cyanotoxins, it has not developed any enforceable primary drinking water standard for any cyanotoxin.

Of the Great Lakes states, Ohio has taken the most aggressive action to develop regulations specifically aimed at managing the risks that cyanobacteria and cyanotoxins pose for drinking water systems. It is the only state that has developed regulations that require water systems to monitor for cyanobacteria and microcystins, and to respond to contamination events if microcystins exceed action levels.

In general, how Great Lakes states have attempted to address the management of toxic algal blooms is through forming some type of governmental task force to monitor for and investigate suspected cyanobacteria blooms, and to respond to confirmed blooms by issuing public advisories. Some states monitor and investigate suspected cyanobacteria blooms upon receiving a complaint from a local resident. Others are more proactive and regularly monitor water bodies that are known to be prone to toxic algae blooms during summer months when optimal conditions for such blooms exist.

Private Water Supplies: Well Construction and Protection from Pollution

Approximately 90% of people in the United States get their drinking water from a public water system that is subject to requirements of the SDWA. However, the other 10% of the country gets its water from private water supplies, which are commonly private water wells that only serve the residence where it is located. The SDWA does not regulate the construction of private water wells, nor their water quality. As such, any regulations regarding private water wells exist at the state level.

Regulation of Private Well Construction

All Great Lakes states require commercial well drillers to obtain some type of license prior to the construction of any private water wells, and also require any person who drills a water well to first obtain a license. However, the requirements a person must satisfy to obtain a license varies from state to state.

Most states at least require a person wishing to obtain a well driller license to pass an exam. Only Pennsylvania and Ohio allow a person to obtain a license without passing an exam. Additionally, most states, including Illinois, Michigan, Minnesota, and Wisconsin require applicants for a license to have a specific amount of experience to be eligible to receive a license. Wisconsin's experience requirements are particularly detailed; they require applicants to not only have a specific number of years' worth of experience, but also have a minimum number of hours conducting well drilling activities. Most states do allow for a person to drill a water well on their own property without first obtaining a commercial well driller's license.

Some of the Great Lakes states require private water wells to have the water quality tested once construction is completed and before they are put into use. However, the specifics of these initial water quality testing requirements vary greatly (Table 5).

TABLE 5: State Requirements Regarding Water Quality Testing for Private Wells		
State	**Testing Requirement**	**Required Response Activities**
Illinois	Only requires well driller contractors to provide the property owner with information prepared by the Department of Public Health describing the importance of water well sampling.	N/A
Indiana	N/A	N/A
Michigan	Requires developers to test private water wells for chloride, fluoride, hardness, iron, nitrate, sodium, sulfate, and coliform bacteria.	• MDEQ must reject proposed development if the sample detects contaminants in concentrations that exceed a primary MCL. • MDEQ may require the developer to disclose the exceedance of a secondary MCL by a recorded deed restriction.
Minnesota	Requires well driller contractor to test for coliform, nitrate-nitrogen, and arsenic.	• If the sample indicates the presence of total coliform bacteria, the person constructing the well is responsible for eliminating the possible causes, and resampling.
New York	N/A	N/A
Ohio	Requires the DOH to test water for nitrates, E. coli, and coliform.	• If the sample exceeds the MCL for microbiological contaminants, it shall not be used unless effective remediation measures are implemented. • If the sample exceeds the MCL for nitrates, the DOH shall provide information to the well owner regarding the health risks of nitrates.
Pennsylvania	Department of Conservation and Natural Resources may require a well contractor to save samples of cuttings for studies.	N/A
Wisconsin	Requires well driller contractor to test for coliform bacteria and nitrate.	• Must provide the well owner with a copy of the laboratory report.

Oil and Gas

All oil and gas activities have the potential to impact drinking water sources. However, the increasing use of high volume hydraulic fracturing as a method of oil and gas extraction has increased concerns about drinking water quality largely because of the injection of large quantities of fluids into the earth to crack shale rock formations containing oil and gas. There are no federal requirements that specify how states must protect private wells from contamination due to oil and gas extraction activities.

Not all Great Lakes states have significant oil and gas reserves. Minnesota and Wisconsin have very limited, if any, oil and gas reserves. As a result, their regulations regarding oil and gas extraction is very limited. New York is also the only Great Lakes state to ban high-volume hydraulic fracturing.

In general, most Great Lakes states have sought to protect private water wells from oil and gas activities through a combination of setback and water quality sampling requirements. Only Michigan has a general setback requirement for all oil and gas wells, which requires all oil and gas well drillers to identify water wells within 600 feet, and be located at least 300 feet from any water well. Other states only require high-volume hydraulic fracturing (HVHF) operations to comply with setback and sampling

requirements. The specifics of these requirements, including how far HVHF operations must be from private water wells, and what contaminants HVHF operators must sample for in nearby water wells vary:

- Only Illinois requires HVHF operations to be set back specified distances from private wells, requires oil and gas drillers to conduct baseline water quality sampling of nearby private wells before fracturing activities, and require oil and gas drillers to conduct repeat sampling after fracturing activities are complete.
- Indiana and Michigan only require HVHF operations to conduct baseline water samples from nearby private water wells before fracturing activities begin, but do not require repeat sampling.

Ohio and Pennsylvania have taken a different approach. Instead of requiring setbacks and sampling, both states require oil and gas well owners or operators to restore, replace, or compensate persons who have their water supply polluted or diminished by an oil or gas well.

Agriculture

The principal threats to drinking water wells posed by agriculture are the application of manure, fertilizers, and pesticides on the ground. Contaminants contained within these common agricultural substances may percolate into the earth, through groundwater, and may reach drinking water wells. States have sought to limit the risks that agricultural activities pose to drinking water wells through a variety of methods that mostly center on requiring or incentivizing certain agricultural activities to be a specific distance from drinking water wells.

Michigan generally seeks to protect the natural environment, including groundwater resources, from agricultural activities through its Right to Farm Act. This law encourages farmers to utilize "generally accepted agricultural management practices" (GAAMPS). GAAMPS are informal guidance; however, if implemented, a farmer may be able to defend against nuisance claims. Some of the GAAMPS include locating livestock production facilities and fertilizer storage areas specific distances from drinking water wells.

Other states protect drinking water wells by requiring specific agricultural activities to be at least a specific number of feet from all wells.

Per- and Polyfluoroalkyl Substances (PFAS) and Drinking Water

Per- and polyfluoroalkyls are a group of manufactured chemicals that include perfluorooctanoic acid (PFOA) and perfluorooctane sulfate (PFOS). While these chemicals are no longer manufactured in the United States, they were previously widely used in everyday products such as carpets and clothing, and have been used in firefighting foam as a flame suppressant. PFAS are also very persistent chemicals that do not readily break down in the environment and are highly toxic. Today, states are increasingly finding sites that are contaminated with high levels of PFAS. These sites are commonly industrial sites, or hazardous waste disposal sites where PFAS was improperly disposed of. PFAS contamination is also commonly associated with military bases, where firefighting foam containing the chemicals was commonly used. There is currently no national drinking water regulation for PFAS. In 2016, the EPA lowered its advisory level for both PFOA and PFOS, but this advisory level is a nonbinding guidance.

No Great Lakes states have developed their own MCLs or treatment technique to formally regulate PFAS in public water systems. Michigan, New York, and Wisconsin, have recently revised their hazardous waste cleanup laws to regulate PFAS remediation at contaminated sites by enacting PFOA and PFOS cleanup criteria for drinking water. Minnesota has also developed its own, state-specific advisory levels for PFAS that are more stringent than the EPA's advisory levels. However, Minnesota's advisory levels are also nonbinding guidance for public water systems. Four Great Lakes states (Minnesota, Michigan, New York, and Pennsylvania) have organized some type of interagency task force to coordinate their PFAS response efforts.

Introduction

The principal law that regulates drinking water safety is the Safe Drinking Water Act (SDWA). The SDWA provides a comprehensive set of water quality standards, enforcement authority, and reporting requirements for water systems that provide water to the public. Like other environmental laws that follow the cooperative federalism model, the federal government provides states the opportunity to implement the law themselves. The SDWA provides minimum standards that states can either adopt or improve on. In other words, the SDWA acts as the federal floor; any state that wishes to implement it must do so at least as protectively as the federal government, but can have as high a ceiling as it wishes.

With increased attention on localized public health concerns related to drinking water, it is up to everyone to learn where their drinking water comes from; understand what consumer confident reports tell us; and advocate for improvements in laws, regulations, and policies that directly affect the safety of our drinking water. We also need to better understand where our influence and advocacy efforts are needed. Is our local issue a result of a shortcoming or failure of federal, state, or local government? Or could it be a result of all three? It may be hard to tell before knowing where specific decisions related to concerns are being made and how best to understand complex government provisions that may be spread out in numerous laws, supporting regulations, and guidance documents.

In order to provide a snapshot of information to the reader, we have focused this report on eight aspects of the SDWA: MCLs, treatment techniques, and monitoring standards; regulation of lead as a drinking water contaminant; consumer confidence reporting; loans and grants; public participation in standards development, permits, and enforcement; operator certification; management of drinking water emergencies; and management of algal blooms. While not regulated by the SDWA, as a way to better understand states' overall approach to drinking water, the report also looks at how states regulate private water well protection through private well construction codes and through regulation of other activities that can pollute private wells. It also addresses PFAS, which are not currently regulated by an MCL.

For each topic, the report answers two fundamental questions. First, how does the federal law address the topic? Second, how does each state address the topic differently? The focus is on actual laws. For that reason, it addresses mostly statutes and regulations.

This report is introductory in nature, yet provides a wealth of information. In order to get the most out of the information provided and advance your advocacy efforts, utilize the end notes where you'll find specific laws, documents, and links that will take you further into your journey to better understand the SDWA in general and how your Great Lakes state is implementing the SDWA.

Abbreviations and Acronyms

AFO	animal feeding operations
APA	administrative procedures act
CCL	contaminant candidate list
CCR	consumer confidence reports
DEP	Department of Environmental Protection
DOA	Department of Administration
DOH	Department of Health
DWSRF	Drinking Water State Revolving Fund
EFC	Environmental Facilities Corporation (New York)
EPA	Environmental Protection Agency
ERP	emergency response plan
GAAMPS	Generally accepted agricultural management practices
HAA5	five haloacetic acids
HVHF	high-volume hydraulic fracturing
IDEM	Indiana Department of Environmental Management
IDSE	Initial Distribution System Evaluation
IFA	Indiana Finance Authority
IUP	intended use plan
LCR	lead and copper rule
LSL	lead service line
LSLR	lead service line replacement
MAAs	Mutual Aid Agreements
MCL	maximum contaminant level
MCL	Michigan Consolidated Laws
MCLG	maximum contaminant level goal
MDEQ	Michigan Department of Environmental Quality
mg/l	milligrams per liter
MPART	Michigan PFAS Action Response Team
NPDES	National Pollutant Discharge Elimination System
NREPA	Natural Resources and Environmental Protection Act
OIT	operator-in-training
Ohio EPA	Ohio Environmental Protection Agency
PENNVEST	Pennsylvania Infrastructure Investment Authority
PFAS	polyfluoroalkyl substances
PFBA	perfluorobutanoate
PFBS	perfluorobutane sulfonate
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfate
PLSLR	partial lead service line replacement
Primary agency or responsible agency	EPA or the state, depending on which has primary enforcement responsibility to implement the SDWA in the relevant jurisdiction
PWSS	Public Water System Supervision
SDWA	The federal Safe Drinking Water Act
SRF	State Revolving Fund
State SDWA or state drinking water law	The state's laws and regulations that implement the Safe Drinking Water Act
SWAP	Source Water Assessment and Protection Programs
TOC	total organic carbon
TTHM	trihalomethanes
WARN	Water and Wastewater Agency Response Network
WIF	Water Infrastructure Fund
WIIA	Water Infrastructure Improvement Act
WIIN	Water Infrastructure Improvements for the Nation
Wisconsin DNR	Wisconsin Department of Natural Resources
WHO	World Health Organization

Safe Drinking Water Act Basics

The SDWA, enacted by Congress in 1974, is the principal federal law that regulates public drinking water systems. Major amendments were enacted in 1986, 1996, 2012, 2015, 2016, and 2018. Rather than examine the full history or undertake a comprehensive evaluation of the statute, this section briefly describes an overview and introduction to the more detailed content that follows.[1]

Federal-State Arrangement

The SDWA regulates the delivery of drinking water to the public by limiting the lawful amount of harmful substances that the delivered water may contain.[2] The original SDWA established a cooperative federal-state arrangement whereby states could be delegated the primary authority to implement and enforce the drinking water legal scheme. The Environmental Protection Agency (EPA) retains oversight for any aspect of the SDWA delegated to a state.

Water Systems

The SDWA regulates public water systems, which is defined as any system that has at least fifteen service connections or regularly serves at least twenty-five individuals."[3]

There are two kinds of public water systems: community and noncommunity. Community water systems serve at least 15 service connections used by year-round residents of the area served by the system, or regularly serve at least 25 year-round residents.[4] In total, there are approximately 54,000 such systems. Community water systems are considered small if they serve 3,300 or fewer persons; medium if they serve 3,301 to 50,000 persons; and large if they serve more than 50,000 persons.[5]

Though noncommunity water systems also serve the public, they do not serve the same people all year round. Noncommunity water systems come in two varieties: transient and nontransient. Nontransient noncommunity water systems, such as schools and manufacturing facilities, serve at least 25 of the same persons over 6 months per year.[6] There are nearly 20,000 of them. Transient noncommunity water systems, such as campgrounds and rest areas, regularly serve fewer than 25 of the same persons over 6 months per year. There are nearly 89,000 of them.

Community water systems continuously provide water to a diverse group of customers. As such, they are generally regulated more stringently than noncommunity water systems, which provide drinking water to consumers on a more limited basis. Notably, the SDWA does not regulate drinking water quality from private wells. Approximately 90% of households get their drinking water from a public water system, while 10% get their drinking water from private wells.

Contaminants

The SDWA establishes national primary drinking water regulations[7] for contaminants that pose risks to public health and that are likely to be found in public water supplies, plus a mechanism for creating new regulations. There are standards for microorganisms, organic and inorganic chemicals, radionuclides, and disinfectants and their byproducts.

For each regulated contaminant, the EPA sets an MCL goal (MCLG) at a level at which no known or anticipated adverse health effects occur while allowing for a margin of safety. As its name suggests, a MCLG is a non-binding goal, and is not an enforceable standard. The EPA then must set an MCL as close to the MCLG as possible, with costs taken into consideration. Typically, the standard takes the form of an MCL, which is the maximum amount of a contaminant allowed in drinking water. When it is too difficult to develop a numeric level, the standard takes the form of a treatment technique the water system must employ to reduce the level of the contaminant.

Systems must establish compliance with contaminant standards through monitoring and reporting. Most monitoring occurs at the treatment plant. Some, such as for lead and copper, mainly occurs at the consumer's residence.

Public Communications

There are two principal kinds of public communication that the SDWA requires: public notifications of violations and consumer confidence reports.

Systems must publicly report violations of the contaminant standards.[8] Depending on the level of risk posed to the public, the form, manner, and frequency of notice will vary. Systems must also report failure to monitor, since failure to monitor can prevent identification of a public health risk.

Systems must also publish annual consumer confidence reports that address among other items source water information, violations of contaminant standards, health risks, and the status of variances and exemptions.[9]

Funding

To help offset the cost of compliance, Congress established a drinking water state revolving fund program that authorizes the EPA to make grants to states to capitalize the funds, which allows the states to make loans to water systems. There is also funding available for emergency assistance and to help small water systems.

Maximum Contaminant Levels, Treatment Techniques, and Monitoring Standards

Overview

Most federal environmental statutes regulate pollution through the use of numeric or narrative limits that function to protect the use of watersheds, ambient air, and other natural features. The Clean Water Act uses technology- and water quality-based effluent limits to restrict how much of any water pollutant a facility can discharge to regulated water bodies. The Clean Air Act uses emissions limits to restrict how much of any air pollutant a facility can emit to the ambient air.

The SDWA principally uses MCLs to restrict how much of any drinking water contaminant a water system can allow into the public water supply. Where the EPA cannot develop an MCL, it requires the system to treat the water supply a certain way, which is called a treatment technique. Just as with the Clean Air Act and Clean Water Act, the SDWA requires monitoring of the water supply to ensure that a system is in compliance with the law.

In this section of the report, the main questions explored are as follows:

- What is the federal process for developing MCLs?
- What MCLs and related monitoring schemes has the EPA developed?
- To what extent have states developed MCLs or monitoring standards that are different or more stringent than the EPA's?
- To what extent have states regulated drinking water contaminants that the EPA has not regulated?

Federal Primary Drinking Water Regulations

The SDWA requires the EPA to promulgate a national primary drinking water regulation for a contaminant that "may have an adverse effect on the health of persons," that is known to occur or has a "substantial likelihood" to occur in public water systems in a manner that causes a public health concern, and where the "regulation of such contaminant presents a meaningful opportunity for health risk reduction for persons served by public water systems."[10] A national primary drinking water regulation must either specify an MCL or, if it is economically or technically infeasible to ascertain an MCL, must require a treatment technique that leads to an equivalent reduction of the contaminant.[11] For example, a treatment technique has been developed for lead because it enters the drinking water system mostly from the corrosion of service lines in a water system's distribution infrastructure. As such, an MCL, which largely regulates the concentration of a contaminant that is allowed in finished water that is distributed from the treatment plant, is technically infeasible.

Regardless of whether a contaminant is regulated by an MCL or treatment technique, it must be accompanied by an MCL goal.[12] An MCL goal must be "set at a level at which no known or anticipated adverse effects on the health of persons occur and which allows for an adequate margin of safety."[13] The maximum contaminant level must be "as close to the maximum contaminant level goal as is feasible" based on the use of the best technology, treatment techniques, and other means which the EPA finds are available taking costs into consideration.[14]

The SDWA also allows for the EPA to create secondary drinking water regulations.[15] These regulations specify the MCLs that are needed to protect the public welfare, and specifically account for aesthetic factors such as odor and appearance of drinking water.[16] Secondary MCLs are not federally enforceable but are meant to serve as guidelines for states and public water systems.[17] Additionally, the SDWA permits the EPA to establish nonbinding health advisories for contaminants not subject to any national primary drinking water regulation.[18]

MCLs promulgated by the EPA are codified in the code of federal regulations.[19] These federal regulations set forth the highest permissible amounts of contaminant levels for certain substances and compounds that are allowable in public water systems and enforceable either by the state or the EPA through an enforcement action, or private person through a citizen suit.[20] While nonbinding, maximum contaminant level goals and secondary drinking water regulations are also codified in the code of federal regulations.[21]

For each MCL, the EPA must also describe monitoring and analytical procedures to insure compliance with the standard.[22] The EPA may permit a state to employ an alternate analytical method other than those prescribed by the EPA, but only if the alternate analytical method is "substantially similar in both precision and accuracy" and the state receives written permission from the EPA.[23] Laboratories that are certified to use the prescribed method must be used for sample analysis.

The SDWA requires the EPA to review each national primary drinking water regulation at least every six years and to revise the regulation as may be appropriate.[24] Revisions to any national primary drinking water regulation must be at least as protective of public health as the existing standard.[25] The purpose of this review, commonly referred to as the Six-Year Review, is to identify the national primary drinking water standards for which current health effects assessments, changes in technology, or other factors provide a health or technical basis to support a regulatory revision that will improve or strengthen public health protection.[26] The EPA's Six-Year Reviews are conducted in accordance with a specified protocol that was largely established prior to the first Six-Year Review and which was subject to public notice and comment.[27] For its 2017 Six-Year Review, the EPA's protocol consisted of a number of principles to narrow down national primary drinking water standards that are appropriate candidates for revision.[28] To date, the EPA has conducted three Six-Year Reviews, the results of which are published in the Federal Register.[29] In its first Six-Year Review, the EPA decided to amend only the total coliform rule. In its second Six-Year Review, the EPA decided that the national primary drinking water standards for acrylamide, epichlorohydrin, tetrachloroethylene, and trichloroethylene were candidates for review.[30] In the most recent Six-Year Review, the EPA decided that eight national primary drinking water standards were candidates for regulatory revision.[31]

It is important to note that while a national primary drinking water standard may be selected as a candidate for review in accordance with the EPA's Six-Year Review, such a designation will not always result in immediate amendments to the standard. The 2003 Six-Year Review resulted in the revisions to the Total Coliform Rule in 2013, which included the establishment of an MCL for E. coli and the replacement of the total coliform maximum contaminant level with treatment technique regulations.[32] However, the 2010 Six-Year Review has yet to result in any changes to the national primary drinking water standards regarding the four candidates identified for review.

According to the SDWA, a state may be granted the primary enforcement responsibility for public water systems upon application to and approval by the EPA.[33] In order to be granted primary enforcement responsibility by the EPA, the state must have adopted drinking water regulations that are no less stringent than the national primary drinking water regulations; adequate procedures for the enforcement of such regulations, including monitoring and inspections as required by EPA regulations; the establishment and maintenance of a state program for the certification of laboratories conducting analytical measurements of drinking water contaminants; the statutory and regulatory authority adequate to compel compliance with state primary drinking water regulations; and recordkeeping and reporting requirements in compliance with federal regulations.[34] States are not required to adopt secondary primary drinking water regulations as a condition to being granted primary enforcement responsibility regarding its public water systems.

State Safe Drinking Water Regulations

Pursuant to federal regulations, states and their political subdivisions are free to adopt and enforce any law or regulation respecting drinking water or public water systems.[35] While no state law or regulation can relieve a person of any requirements created pursuant to the SDWA, thus restricting states from enacting more lenient requirements, this grant of authority does allow states to create MCLs that are stricter than federal standards.

Illinois

Illinois has not adopted any MCL that is more stringent than the federal MCL for any inorganic contaminants,[36] disinfection byproducts,[37] residual disinfectants,[38] microbiological contaminants,[39] and radionuclides.[40]

Illinois has adopted MCLs for three contaminants that do not have a corresponding MCL under the federal SDWA: 0.001 mg/l for aldrin; 0.05 mg/l for DDT; and 0.001 mg/l for dieldrin.[41] Notably, the EPA has expressly decided to not regulate either aldrin or dieldrin. It has not made any regulatory determination regarding DDT, nor has it been listed on any of the EPA's contaminant candidate lists. Additionally, Illinois has adopted MCLs that are more stringent than existing federal MCLs for three contaminants: 0.0001 mg/l for heptachlor; 0.0001 mg/l for heptachlor epoxide; and 0.01 mg/l for 2,4-D.[42]

While Illinois has not adopted each federal secondary MCL, it has adopted secondary MCLs that are less stringent than federal guidelines, as shown in Table 6.

TABLE 6: Comparison of Illinois Maximum Contaminant Levels to Corresponding Federal Secondary Maximum Contaminant Levels

Contaminant	Illinois Maximum Contaminant Level (milligrams per liter)	Federal Secondary Maximum Contaminant Level (milligrams per liter)
Iron	1.0	0.3
Manganese	0.15	0.05
Zinc	5	5

Illinois' MCLs for iron, manganese, and zinc only apply to community water systems.[43] Some community water systems may be exempt based on the population served, or the experimental use of sequestration.[44]

Indiana

Indiana has not adopted any MCL that is more stringent than the federal MCL for any organic contaminants,[45] inorganic contaminants,[46] microbiological contaminants,[47] disinfection byproducts,[48] residual disinfectants,[49] and radionuclides.[50] Indiana has also not established its own MCL for any contaminant that is not currently regulated by the SDWA.

Regarding secondary drinking water standards, Indiana requires a community water system that exceeds the federal secondary MCL for fluoride, which is 2.0 mg/l, to provide a public notice.[51] Indiana has not formally adopted any other federal secondary MCL.

Michigan

Michigan has not adopted any MCL that is more stringent than the federal MCL for any microbiological contaminants,[52] organic contaminants,[53] inorganic contaminants,[54] disinfection byproducts,[55] residual disinfectants,[56] or radionuclides.[57] Michigan has also not established its own MCL for any contaminant that is not currently regulated by the SDWA.

Michigan has adopted secondary MCLs that are more stringent than federal secondary MCLs and has adopted secondary MCLs for additional contaminants that lack a corresponding federal standard, as described in Table 7.[58]

TABLE 7: Comparison of Michigan Secondary Maximum Contaminant Levels to Corresponding Federal Secondary Maximum Contaminant Levels[59]

Contaminant	Michigan Secondary Maximum Contaminant Level (milligrams per liter)	Federal Secondary Maximum Contaminant Level (milligrams per liter)
Chloride	2	250
Calcium Carbonate	250	N/A
Iron	0	0.3
Sodium	2	N/A
Sulfate	2	250
Corrosivity	Noncorrosive	Noncorrosive

Unlike other states where secondary MCLs are used for aesthetics, Michigan's secondary MCLs apply in the context of wells used to provide onsite water supply for developments less than 1 acre in size or subdivisions that are not served by the public water system.[60] This is discussed in greater detail in the "Private Water Supplies" section of this report.

Minnesota

Minnesota has adopted the federal national primary drinking water regulations by reference.[61] Except for fluoride, Minnesota has not adopted any MCL that is more stringent than any federal MCL. It also has not adopted an MCL for a contaminant that is not regulated by the federal SDWA.

Minnesota has adopted a maximum fluoride concentration limit of 1.5 mg/l, which is lower than the federal secondary MCL of 2.0 mg/l.[62]

New York

Regarding organic contaminants, New York has taken a unique regulatory approach. While it has adopted the federal MCLs for organic contaminants,[63] it has also adopted a generic MCL of 0.05 mg/l for any "unspecified organic contaminant."[64] An unspecified organic contaminant is defined as "...any organic chemical compound not otherwise specified..."[65] Additionally, New York has created a generic MCL of 0.005 mg/l for any "principal organic contaminant."[66] A principal organic contaminant is defined to include any organic chemical compound belonging to specified chemical classes.[67] Functionally, this means that New York's MCLs are more stringent than the federal MCLs for several volatile organic contaminants (Table 8).

TABLE 8: Comparing New York Maximum Contaminant Levels for Organic Contaminants to Federal Maximum Contaminant Levels[68]

Contaminant	New York Maximum Contaminant Level (milligrams per liter)	Federal Maximum Contaminant Level (milligrams per liter)
Para-Dichlorobenzene	0.005	0.075
1,1-Dichloroethylene	0.005	0.007
1,1,1-Trichloroethane	0.005	0.2
cis-1,2-Dichloroethylene	0.005	0.07
Ethylbenzene	0.005	0.7
Monochlorobenzene	0.005	0.1
o-Dichlorobenzene	0.005	0.6
Styrene	0.005	0.1
Toulene	0.005	0.1
1,2,4-Trichlorobenzene	0.005	0.07

Regarding synthetic organic contaminants, New York has adopted two MCLs for specific chemicals that are more stringent than the federal MCLs, as shown in Table 9.

TABLE 9: Comparing New York Maximum Contaminant Levels for Organic Contaminants to Federal Maximum Contaminant Levels[69]

Contaminant	New York Maximum Contaminant Level (milligrams per liter)	Federal Maximum Contaminant Level (milligrams per liter)
2,4-D	0.05	0.07
2,4,5-TP	0.01	0.05

New York regulates several organic contaminants that are not regulated under the federal SDWA. Some of these contaminants have a specified MCL, such as methyl-tertiary-butyl-ether (MTBE), which has an MCL of 0.01 mg/l.[70] Others are regarded as "principal organic contaminants" and thus are subject to a generic MCL of 0.005 mg/l. Additionally, others are regarded as unspecified organic contaminants, and are subject to the generic MCL of 0.05 mg/l.

New York has adopted many, but not all, of the federal secondary MCLs as inorganic contaminant MCLs.[71] New York has adopted an MCL for fluoride of 2.2 mg/l that is more stringent than the federal MCL of 4.0 mg/l.[72]

New York has not adopted any MCL that is more stringent than the federal MCL for microbiological contaminants,[73] disinfection byproducts,[74] residual disinfectants,[75] and radionuclides.[76]

Ohio

Ohio has not adopted any state MCL that is more stringent than the federal MCL for organic contaminants,[77] residual disinfectants,[78] microbiological contaminants,[79] radionuclides,[80] or disinfection byproducts.[81] Ohio has not developed an MCL for any contaminant that is not currently regulated by the SDWA. However, Ohio has created an action level for microcystins based on a health advisory promulgated by the EPA pursuant to the SDWA.[82]

Ohio's secondary MCLs are mostly the same as the standards established by the EPA.[83] However, the pH secondary MCL established by Ohio is less stringent than the federal secondary MCL.[84] Similar to the EPA, Ohio expressly states that its secondary MCLs are advisable maximum levels of contaminants in water that are delivered to the free-flowing outlet of the ultimate user of the public water system.[85] A public water system must monitor for parameters associated with secondary MCLs.[86] The response or operational requirements for exceedances of a secondary MCL vary depending on the contaminant. If the fluoride secondary MCL is exceeded, the public water system must notify the people it serves.[87] New community water systems or existing community water systems that develop a new source or change a source must develop treatment systems for the removal of iron and manganese to meet the secondary MCL.[88]

According to the Ohio Agency Rule Development Act, existing rules are subject to a regular review by the adopting agency.[89] The promulgating agency is required to assign a review date to new or amended rules that is not later than five years from the rule's effective date.[90] During this review process agencies, including the Ohio EPA, are required to "consider the continued need for the rule, the nature of any complaints or comments received concerning the rule, and any relevant factors that have changed in the subject matter area affected by the rule."[91] On the basis of the review, the reviewing agency must determine whether the rule needs to be amended or rescinded.[92]

Ohio's analytical requirements largely mirror the regulations promulgated by the EPA.[93]

Pennsylvania

Pennsylvania incorporates federal primary MCLs by reference, and it has not established an MCL for any contaminant not currently regulated by the federal SDWA, nor has it enacted any MCL that is more stringent than a corresponding federal MCL.[94] Notably, the Pennsylvania DEP not only has the authority to establish state-specific MCLs through regulation, but also has the authority to establish an MCL on a case-by-case basis by administrative order for any unregulated contaminant that creates a health risk.[95] However, it appears that Pennsylvania has never adopted a state-specific MCL.[96]

Pennsylvania has largely adopted federal secondary MCLs as state MCLs.[97] However, Pennsylvania has not adopted the federal secondary MCL for copper.[98]

Wisconsin

Nearly all of Wisconsin's MCLs are the same as the federal MCLs for organic contaminants,[99] microbiological contaminants,[100] residual disinfectants,[101] radionuclides,[102] and disinfection byproducts.[103] The one exception is that Wisconsin has established an MCL of 0.0002 mg/l for vinyl chloride, which is more stringent than the corresponding federal MCL of 0.002 mg/l.[104] The Wisconsin DOH Services does regularly publish health advisory levels for contaminants that are not regulated in public water supplies.[105] However, advisory levels are guidelines for water systems and are not enforceable.[106]

Wisconsin's secondary MCLs are identical to the federal secondary MCLs except that it has not adopted the federal secondary MCL for pH.[107] Additionally, Wisconsin has established a secondary MCL for hydrogen sulfide.[108] Similar to other states, Wisconsin's secondary standards are guidelines established to address cosmetic and aesthetic effects of substances present in drinking water. If a community water supply exceeds the secondary MCL for fluoride, it must provide notice to its users.[109]

Federal Requirements Regarding Monitoring Compliance with Maximum Contaminant Levels

The SDWA requires each primary drinking water regulation to contain criteria and procedures to assure a supply of drinking water that dependably complies with such MCLs, including accepted methods for quality control and testing procedures for compliance with such levels.[110] The specific monitoring requirements, which ensure each MCL is dependably complied with, are described in the code of federal regulations and vary by the type of contaminant.

Microbiological Contaminant Monitoring

Microbiological contaminants consist of a variety of bacteria that are generally part of the coliform group. Coliform bacteria are abundant in the feces of warm-blooded animals, including humans and livestock.[111] Of specific concern is E. coli, which is a more restricted group of coliform bacteria that almost always originates in the human or animal gut.[112] While there are hundreds of strains of E. coli and most of them are harmless, approximately 10 percent of E. coli strains are pathogenic to humans.[113] These strains generally cause gastrointestinal illness, with symptoms including diarrhea and vomiting.[114] These waterborne pathogens may enter water distribution systems as fecal contamination from humans or animals.[115] Fecal contamination in distribution systems commonly occurs because untreated sewage is released into source waters or manure runoff seeps into the source water of a distribution system during periods of heavy precipitation. Additionally, fecal contamination in distribution systems can occur when sanitary and stormwater pipes leak and contaminate drinking water supplies.

Under the revised total coliform rule, the MCL for E. coli is an indicator of fecal contamination.[116] However, the monitoring scheme under the revised total coliform rule relies on routine total coliform monitoring, which may trigger repeat monitoring requirements and E. coli analytical requirements. The specific monitoring requirements vary depending on the source water of the system and the number of people it serves (Table 10).

TABLE 10: Standard Monitoring Requirements—Microbiological Contaminants

System	Monitoring Requirements
Noncommunity groundwater system that serves 1,000 or fewer people	Must monitor for total coliforms each calendar quarter[117]
Community groundwater system that serves 1,000 or fewer people	Must monitor for total coliforms once per month[118]
All surface water systems that serve 1,000 or fewer people	Must monitor for total coliforms once per month[119]
All public water systems that serve 1,000 or more people	Collect between 2 and 480 samples per month depending on the number of samples based on the population served[120]

Under certain circumstances, federal regulations allow for reduced monitoring frequency for well-operated water systems (Table 11).

TABLE 11: Reduced Monitoring Eligibility and Requirements—Microbiological Contaminants		
System	**Eligibility Requirements**	**Monitoring Requirements**
Noncommunity groundwater system that serves 1,000 or fewer people[121]	Must have clean compliance history for at least 12 months. Most recent sanitary survey shows that the system is free of sanitary defects, or has corrected all identified sanitary defects; has a protected water source; and meets approved constructions standards. The state has conducted an annual site visit within the last 12 months and the system has corrected all identified sanitary defects.	May reduce monitoring frequency from quarterly to annually.[122]
Community groundwater system that serves 1,000 or fewer people	Must have clean compliance history for at least 12 months. The most recent sanitary survey must show the system is free of sanitary defects, has a protected water source, and meets approved construction standards. The system had an annual site visit by the state, has state-approved cross connection control, has continuous disinfection entering the distribution system and a residual in the distribution system, has demonstrated maintenance of at least 4-log removal or inactivation of viruses, or other equivalent water enhancements approved by the State.	May reduce monitoring frequency from monthly to quarterly.[123]
All surface water systems that serve 1,000 or fewer people	May not reduce monitoring frequency.	N/A[124]
All public water systems that serve 1,000 or more people	Must be noncommunity water systems using only groundwater that serve 1,000 or fewer people in some months, and more than 1,000 people in other months.	May reduce monitoring frequency from monthly to annually in months when 1,000 or fewer people are served.[125]

Water sampling must be conducted in accordance with a written sample siting plan that identifies sampling sites, including repeat sampling sites, and a sample collection schedule that is representative of water throughout the distribution system.[126] These plans are subject to state review and revision and were required to have been submitted by March 31, 2016.[127]

If any of the routine total coliform samples taken for any of the systems described above is total coliform-positive, then the system must take additional monitoring steps. First, the water system must collect a set of three repeat samples within 24 hours for each total coliform-positive sample.[128] The water system must continue to conduct repeat sampling until either total coliforms are not detected in one complete set of repeat samples or the system determines that the coliform treatment technique trigger has been exceeded.[129] Additionally, if any routine or repeat sample is total coliform-positive, the system must analyze that total coliform-positive sample to determine whether E. coli is present.[130]

The revised total coliform rule includes different response requirements for a variety of events that indicate that the public water system has experienced coliform contamination. Based on the severity of the indicator, the public water system may be required to conduct either a Level 1 assessment or a Level 2 assessment.[131] A system must perform a Level 1 assessment if any of the following occur: for systems that take 40 or more samples per month, the system exceeds 5% total coliform-positive samples for the month, for systems that take less than 40 samples per month, the system has two or more total coliform-positive samples in the same month, or the system fails to take every required repeat sample after any single total coliform-positive sample.[132] A Level 1 assessment is a basic examination of the source water, treatment and distribution

system, and relevant operational practices.[133] A system must perform a Level 2 assessment if any of the following occur: an E. coli MCL violation occurs; a second Level 1 trigger occurs within a rolling 12-month period, unless the State has determined a likely reason that the samples that caused the first Level 1 assessment were total coliform-positive and has established that the system has corrected the problem; or, for systems with approved annual monitoring, there is a Level 1 trigger in two consecutive years.[134] A Level 2 assessment is a more detailed examination of the system, its operational practices, and its monitoring program and results.[135] Level 2 assessments are regarded as more critical in nature than Level 1 assessments because the incidents that trigger a Level 2 assessment are more likely to result in direct public health impact.[136]

Organic Contaminant Monitoring

Organic contaminants can be divided into two broad categories: volatile organic compounds and synthetic organic compounds. There are a wide variety of volatile organic compounds and they are predominantly used as industrial solvents, degreasers, cleaning solutions, dry cleaning fluids, and as chemical components in pesticides and plastics.[137] Volatile organic compounds generally enter the drinking water system through spills and improper disposal.[138] Since volatile organic compounds tend to evaporate and vaporize easily, volatile organic compounds are more likely to be found in groundwater as opposed to surface water.[139] Health effects regarding volatile organic compounds vary. Some of the more hazardous compounds, such as benzene, can cause cancer. Toluene has been found to cause nervous disorders, such as spasms, tremors, and the impairment of speech, hearing, vision, memory, and coordination. Synthetic organic compounds are generally human-made chemical compounds and include pesticides such as atrazine and alachlor. The potential health effects vary based on the synthetic organic chemicals. For example, atrazine has the potential to cause cardiovascular effects and cancer.

Certain public water systems are required to monitor contaminant levels pertaining to organic chemicals. However, the monitoring requirements vary depending on whether the contaminant is a volatile organic compound or a synthetic organic compound as well as the source water for the water system and the type of water system.[140]

Monitoring for Volatile Organic Contaminants

Volatile organic contaminant MCLs apply to community and nontransient, noncommunity water systems (Table 12).

TABLE 12: Standard Monitoring Requirements—Volatile Organic Contaminants

System	Monitoring Requirements
All community and nontransient, noncommunity water systems	Must take four consecutive quarterly samples for each contaminant, except vinyl chloride, during a three-year period.[141]

Systems that meet additional eligibility requirements may conduct less frequent monitoring (Table 13).

TABLE 13: Reduced Monitoring Requirements—Volatile Organic Contaminants

System	Eligibility Requirements	Monitoring Requirements
All community and nontransient, noncommunity water systems	Initial monitoring was completed before 1993, and the system did not detect any volatile organic contaminant.	Must take one sample annually.[142]
All community and nontransient, noncommunity groundwater systems	Three years of annual sampling with no previous detection of any volatile organic contaminant.	Must take one sample every three calendar years.[143]

Additionally, certain systems may be eligible for a "waiver" from reduced monitoring requirements. Notably, these waivers do not completely exempt eligible systems from monitoring for volatile organic contaminants. Instead, it allows eligible systems to further reduce monitoring frequency (Table 14).

TABLE 14: Monitoring Waivers—Volatile Organic Contaminants		
System	**Eligibility Requirements**	**Monitoring Requirements**
All community and nontransient, noncommunity groundwater systems	If a system does not detect a volatile organic contaminant, it may apply to the state for a waiver.	Must take one sample every six years.[144]

Under certain circumstances, water systems may be required to conduct increased monitoring. If any volatile organic contaminant other than vinyl chloride is detected at a level exceeding 0.0005 mg/l in any sample, then the system must monitor quarterly at each sampling point that resulted in the detection.[145] Additionally, any system that violates any volatile organic contaminant MCL must monitor quarterly.[146]

In general, the EPA does not require water systems to routinely monitor for vinyl chloride.[147] However, if any volatile organic contaminant other than vinyl chloride is detected at a level exceeding 0.0005 mg/l in any sample at a groundwater system and if the system detects trichloroethylene, tetrachloroethylene, 1,2-dichloroethane, 1,1,1-trichloroethane, cis-1,2-dichloroethylene, trans-1,2-dichloroethylene, or 1,1-dichloroethylene, then the system must monitor for vinyl chloride at least once every three years.[148] Surface water systems are only required to monitor for vinyl chloride if it is required by the state.[149]

Monitoring for Synthetic Organic Contaminants

Synthetic organic contaminants MCLs apply to community and nontransient, noncommunity water systems. The number of samples a system is required to take is dependent on whether the system is a groundwater or surface water system. Groundwater systems must take a minimum of one sample at every entry point to the distribution system that is representative of each well after treatment.[150] Surface water systems must take a minimum of one sample at points in the distribution systems that are representative of each source or at each entry point to the distribution system after treatment.[151]

Regarding the frequency of sampling, each community and nontransient, noncommunity water system, whether it is a surface water or groundwater system, must take four consecutive quarterly samples during each three-year compliance period for each synthetic organic contaminant, except no monitoring is required for aldicarb, aldicarb sulfoxide, or aldicarb sulfone.[152]

Systems that meet additional eligibility requirements may conduct less frequent monitoring, as shown in Table 15.

TABLE 15: Reduced Monitoring Requirements—Synthetic Organic Contaminants		
System	**Eligibility Requirements**	**Monitoring Requirements**
Any community or nontransient, noncommunity water system that serves more than 3,300 persons	System does not detect a regulated synthetic organic contaminant in the first three years of monitoring.	Reduce monitoring frequency to a minimum of two quarterly samples during one year in each three-year compliance period.[153]
Any community or nontransient, noncommunity water system that serves 3,300 persons or less	System does not detect a regulated synthetic organic contaminant in the first three years of monitoring.	Reduce monitoring frequency to one sample during each three-year compliance period.[154]

Furthermore, each community and nontransient water system may apply for a waiver from the state.[155] A state must consider the factors described by federal regulation in deciding whether to grant a waiver.[156] Waivers granted by states are effective for three years.[157] Certain systems may also be required to conduct more frequent monitoring. If any synthetic organic contaminant is detected in any sample above the specified detection limit, then the system must monitor quarterly at each sampling point that resulted in the detection.[158] A system that violates any synthetic organic contaminant MCL must monitor quarterly.[159]

Inorganic Contaminant Monitoring

Inorganic contaminants are chemicals, metals, and other compounds that do not contain carbon. Many inorganic contaminants naturally occur in the environment, but human activity can introduce elevated amounts of inorganic contaminants to water supplies. Fluoride, which is introduced to water supplies in small amounts for dental health benefits, is also considered an inorganic contaminant.

Monitoring requirements for inorganic contaminants vary depending on the type of water system. Groundwater systems must take a minimum of one sample at every entry point to the distribution system that is representative of each well after treatment.[160] Surface water systems are required to take a minimum of one sample at every entry point to the distribution system that is representative of each source after treatment, except for lead and copper.[161] The required frequency of sampling varies depending on the inorganic contaminant.[162] Under specific circumstances, a water system may be able to conduct less frequent monitoring. A water system may apply for a complete asbestos monitoring waiver.[163] States may grant a waiver based on the potential asbestos contamination of the water source, the use of asbestos-cement pipe for finished water distribution, and the corrosivity of the water.[164] States may grant a monitoring waiver for a group of several other inorganic contaminants as well.[165] If granted, a waiver will allow a water system to take a minimum of one sample during the time of the waiver, which may not exceed nine years.[166]

Disinfection Byproduct and Disinfectant Residuals Monitoring

Public water systems commonly utilize disinfectants to kill or deactivate pathogens; to prevent microbial regrowth in water distribution systems; and to control for color, taste, and odor of finished water.[167] The application of these disinfectants can result in residual amounts of the disinfectant remaining in the water system and also can cause the creation of disinfectant byproducts.[168] While the presence of a detectable amount of disinfectant residuals is beneficial, elevated concentrations can present public health risks. Elevated concentrations of disinfection byproducts and disinfectant residuals can cause a number of serious health effects, including an increased risk of cancer as well as liver, kidney, and central nervous system issues.[169]

The monitoring requirements for disinfection byproducts vary based on the contaminant, the source water, and the number of people served.

Trihalomethane and Haloacetic Acid

Trihalomethanes (TTHM) and haloacetic acids are both byproducts of chemical disinfection. Community water systems and nontransient, noncommunity water systems that use a primary or residual disinfectant other than ultraviolet light must conduct routine monitoring for TTHM and five haloacetic acids (HAA5).[170]

The number frequency of water sampling that is required largely depends on the number of users served by the water system and its source water, and reflects the risk and complexity of the distribution system. Systems that use surface water or groundwater under the direct influence of surface water generally must sample more frequently than systems that use groundwater (Tables 16 and 17).

TABLE 16: Standard Monitoring Requirements for All Community and Nontransient, Noncommunity Surface Water Systems—Trihalomethanes and Haloacetic Acid[171]

System	Monitoring Requirements
System serves less than 500 people	Must take 2 samples per year
System serves 500–9,999 people	Must take 2 samples per quarter
System serves 10,000–49,999 people	Must take 4 samples per quarter
System serves 50,000–249,999 people	Must take 8 samples per quarter
System serves 250,000–999,999 people	Must take 12 samples per quarter
System serves 1,000,000–4,999,999 people	Must take 16 samples per quarter
System serves 5,000,000 people or more	Must take 20 samples per quarter

TABLE 17: Standard Monitoring Requirements for All Community and Nontransient, Noncommunity Ground Water Systems—Trihalomethanes and Haloacetic Acid[172]

System	Monitoring Requirements
System serves less than 500 people	Must take 2 samples per year
System serves 500–9,999 people	Must take 2 samples per year
System serves 10,000–99,999 people	Must take 4 samples per quarter
System serves 100,000–499,999 people	Must take 6 samples per quarter
System serves 500,000 people or more	Must take 8 samples per quarter

Water systems are required to monitor during the month of the highest disinfection byproduct concentrations, which typically increase in warmer temperatures.[173] Monitoring must be conducted at locations recommended in the system's Initial Distribution System Evaluation (IDSE) report or the system's monitoring plan.[174]

Under certain circumstances, a water system may be eligible for reduced monitoring. Surface water systems that use a source water with an annual average concentration of total organic carbon less than or equal to 4.0 mg/l, an annual average concentration of TTHM less than or equal to 0.040 mg/l, and an annual average concentration of HAA5 less than or equal to 0.030 mg/l may reduce their monitoring frequency in accordance with the number of people served by the system (Table 18).[175]

TABLE 18: Reduced Monitoring Requirements for Community and Nontransient, Noncommunity Surface Water Systems—Trihalomethanes and Haloacetic Acid[176]

System	Monitoring Requirements
System serves less than 500 people	Monitoring may not be reduced
System serves 500–3,300 people	Must take 1 TTHM and 1 HAA5 sample per year
System serves 3,301–9,999 people	Must take 2 dual sample sets (one TTHM and one HAA5 sample) per year
System serves 10,000–49,999	Must take 2 dual sample sets per quarter
System serves 50,000–249,999	Must take 4 dual sample sets per quarter
System serves 250,000–999,999	Must take 6 dual sample sets per quarter
System serves 1,000,000–4,999,999	Must take 8 dual sample sets per quarter
System serves 5,000,000 people or more	Must take 10 dual sample sets per quarter

Groundwater systems that have an annual average concentration of TTHM that is less than or equal to 0.040 mg/l and an average annual concentration of HAA5 that is less than or equal to 0.030 mg/l are also eligible for reduced monitoring (Table 19).[177]

TABLE 19: Reduced Monitoring Requirements for Community and Nontransient, Noncommunity Ground Water Systems—Trihalomethanes and Haloacetic Acid[178]

System	Monitoring Requirements
System serves less than 500 people	Must take 1 TTHM and 1 HAA5 sample every third year
System serves 500–9,999 people	Must take 1 TTHM and 1 HAA5 sample per year
System serves 10,000–99,999 people	Must take 2 dual sample sets per year
System serves 100,000–499,999 people	Must take 2 dual sample sets per quarter
System serves 500,000 people or more	Must take 4 dual sample sets per quarter

Additionally, if a system is required to monitor TTHM or HAA5 at a particular location annually or less frequently, it must increase its monitoring to a dual sample set once per quarter at all locations that exceed the MCL for TTHM or HAA5.[179]

Chlorite and Chlorine Dioxide

Chlorine dioxide is used by some water systems as a disinfectant for odor and taste control.[180] Chlorite is a disinfection byproduct that results from the use of chlorine dioxide.[181] Water systems that use chlorine dioxide for disinfection or oxidation are required to monitor for chlorite and chlorine dioxide and conduct daily and monthly monitoring for chlorite. Daily monitoring for chlorite must be done by taking daily samples at the entrance to the distribution system.[182] Monthly monitoring must be done by taking a three-sample set each month in the distribution system at locations near the first user, at a location representative of average residence time, and at a location reflecting maximum residence time.[183] If a daily chlorite sample exceeds the MCL, then the water system is required to take samples in the distribution system.[184] Chlorite sampling at the entrance of the water system may not be reduced, but monthly sampling within the public water system may be reduced.[185] If a sample exceeds the chlorite MCL at the entrance to the distribution system, the system is required to conduct additional monitoring.[186]

Water systems are required to conduct daily monitoring for chlorine dioxide. Daily monitoring for chlorine dioxide must be done by taking daily samples at the entrance to the distribution system.[187] If any daily sample exceeds the maximum residual disinfectant level, the system must take three chlorine dioxide samples in the distribution system the following day.[188] Monitoring for chlorine dioxide may not be reduced.[189]

Bromate

Bromate may be formed during the ozone treatment process if the bromide ion is present in the source water.[190] As such, water systems that use ozone for disinfection or oxidation must take one bromate sample per month at the entrance to the distribution system for each treatment plant using ozone.[191] Systems that are required to analyze bromate may reduce their monitoring frequency from monthly to quarterly if the system's average source water bromide concentration is less than 0.0025 mg/l based on monthly bromate measurements for the most recent four quarters[192] or if the system demonstrates that the average source water bromide concentration is less than 0.05 mg/l based on representative monthly measurements for one year.[193]

Disinfection Byproduct Precursors Monitoring

Disinfection byproduct precursors consist of the organic matter naturally occurring in source water and that react with chemical disinfectants to form a variety of disinfection byproducts.[194] The most prominent disinfection byproduct precursor is natural organic matter, which is usually measured as total organic carbon (TOC).[195]

Surface water systems that use conventional filtration treatment must monitor for total organic carbon in both source water and in treated water once per month per plant.[196] If the system has an average treated water total organic compound concentration that is less than 2.0 mg/l for two consecutive years or less than 1.0 mg/l for one year, the system may reduce monitoring frequency for total organic compound from monthly to quarterly.[197]

Chlorine and Chloramines Monitoring

Chlorine and chloramine are regularly applied to drinking water as disinfectants to kill microbiological contaminants. Water systems that disinfect must maintain a detectable disinfectant residual in the distribution system; chlorine and chloramines are the standard disinfectants for this purpose. Sampling for chlorine and chloramines must be conducted in tandem with sampling for total coliforms.[198] Monitoring for chlorine and chloramines may not be reduced.[199]

Radionuclides Monitoring

For gross alpha particle activity, radium-226, radium-228, and uranium, all water systems must sample at every entry point to the distribution system.[200] Water systems must take samples once every three years, but may be eligible to take samples once every six or nine years depending on detected levels of radionuclides.[201]

For beta particle and photon radioactivity, water systems are only required to monitor if the water system is designated by the state as vulnerable to contamination or as utilizing

source water contaminated by effluents from nuclear facilities.[202] If a system is designated as vulnerable, it must collect routine quarterly samples for beta emitters and routine annual samples for tritium and strontium-90 at each entry point to the distribution system.[203] Additionally, a system may be designated as utilizing waters contaminated by effluents from nuclear facilities. These systems must collect quarterly samples for beta emitters and iodine-131 and annual samples for tritium and strontium-90 at each entry point to the distribution system.[204]

State Monitoring

Similar to MCLs, states are free to create more stringent monitoring schemes than those described by federal regulations. A more stringent state monitoring scheme can take many forms, and may include, among other things, requirements for more frequent water quality sampling or a less permissive reduced monitoring scheme.

Illinois

Illinois' monitoring requirements are slightly more stringent than the federal requirements for microbiological contaminants, but largely mirror the federal requirements for organic and inorganic contaminants, disinfection byproducts, disinfectant residuals, and radionuclides.

Microbiological Monitoring

Illinois has adopted the federal requirements for total coliform monitoring frequency.[205] Notably, it has not adopted the standard in the revised total coliform rule that allows noncommunity groundwater systems that serve less than 1,000 people to monitor for total coliforms on a quarterly basis.[206] Instead, these systems would be required to monitor once per month.[207] Additionally, while federal regulations generally allow systems to reduce their monitoring frequency if they meet specified criteria, Illinois does not allow water systems to reduce their total coliform monitoring frequency.

Organic Contaminant Monitoring

Illinois' monitoring requirements for volatile organic contaminants are identical to federal requirements, including the requirements for routine monitoring,[208] reduced monitoring,[209] and waivers.[210]

Illinois' monitoring requirements for synthetic organic contaminants are identical to federal requirements, including the requirements for routine monitoring,[211] reduced monitoring,[212] and waivers.[213]

Inorganic Contaminant Monitoring

Illinois' monitoring requirements for inorganic contaminants are largely identical to the federal requirements.[214]

Disinfection Byproducts and Disinfectant Residuals Monitoring

Illinois' monitoring requirements for TTHM and HAA5 are identical to federal requirements, including routine monitoring[215] and reduced monitoring requirements.[216] The state monitoring requirements for chlorite,[217] bromate,[218] chlorine and chloramine,[219] and chlorine dioxide[220] are also identical to the federal requirements.

Radionuclides Monitoring

Illinois' radionuclides monitoring scheme is largely similar to the federal radionuclides monitoring scheme.[221]

Indiana

Indiana's monitoring requirements are largely identical to the federal requirements for microbiological, organic, and inorganic contaminants; disinfection byproducts; disinfectant residuals; and radionuclides.

Microbiological Monitoring

Indiana has adopted the federal revised total coliform rule and all of its monitoring requirements by reference.[222] Therefore, Indiana's monitoring requirements are identical to the federal requirements.

Organic Contaminant Monitoring

Indiana's monitoring requirements for volatile organic contaminants are largely identical to federal requirements, including the requirements for routine monitoring, reduced monitoring, and waivers.[223]

Indiana's monitoring requirements for synthetic organic contaminants are largely identical to federal requirements, including the requirements for routine monitoring, reduced monitoring, and waivers.[224]

Inorganic Contaminant Monitoring

Indiana's monitoring requirements for inorganic contaminants are largely identical to federal requirements.[225] However, Indiana does require community water systems to collect and analyze one sample at the entry point of the distribution system for the determination of sodium concentration levels.[226] Community water systems that use surface water in whole or in part must collect samples annually.[227] Community water systems that use ground water sources must collect samples every three years.[228] Notably, neither the EPA nor Indiana has created a primary or secondary MCL for sodium.

Disinfection Byproducts and Disinfectant Residuals Monitoring

Indiana's monitoring requirements for TTHM and HAA5 are identical to federal requirements, including routine monitoring and reduced monitoring requirements.[229] The state monitoring requirements for chlorite,[230] bromate,[231] chlorine and chloramine,[232] and chlorine dioxide are largely identical to the federal requirements.[233]

Radionuclides Monitoring

Indiana's monitoring requirements for radionuclides are largely identical to the federal requirements.[234]

Michigan

While Michigan's monitoring requirements do not differ drastically from federal requirements, its monitoring regulations do vary from federal regulations at specific points.

Microbiological Monitoring

Michigan's monitoring requirements for noncommunity groundwater systems that serve 1,000 or fewer people,[235] surface water systems that serve 1,000 or fewer people,[236] and public water systems serving more than 1,000 people[237] are largely identical to federal requirements.

Regarding community groundwater systems that serve 1,000 or fewer people, Michigan's regulations do not permit reduced monitoring for such systems despite having the authority to do so under federal regulations.[238]

Organic Contaminant Monitoring

Michigan's monitoring requirements for volatile organic contaminants are identical to federal requirements.[239]

Michigan's monitoring requirements for synthetic organic contaminants varies from the federal requirements. Michigan requires water systems to monitor for aldicarb, aldicarb sulfoxide, or aldicarb suflone while federal regulations provide an exception for monitoring regarding those three contaminants.[240]

Inorganic Contaminant Monitoring

Michigan's inorganic contaminant monitoring scheme is generally very similar to the federal inorganic contaminant monitoring scheme.[241]

Disinfection Byproducts and Disinfectant Residuals Monitoring

Michigan's routine monitoring regulations regarding TTHM and HAA5 acids are identical to the federal regulations for both surface water and groundwater systems.[242] Similar to Michigan's routine monitoring scheme for TTHM and HAA5, Michigan's reduced monitoring scheme is also identical to the federal requirements.[243]

Michigan's monitoring requirements for chlorite, chlorine dioxide, bromate, disinfection byproduct precursors, chlorine, and chloramine are largely identical to federal requirements.[244]

Radionuclides Monitoring

Michigan's radionuclides monitoring scheme is largely similar to the federal radionuclides monitoring scheme.[245]

Minnesota

Minnesota has expressly adopted federal monitoring standards by reference, however, has enacted a couple of additional, state-specific monitoring requirements. Minnesota has enacted one broad, additional monitoring

requirement, which allows the Minnesota Pollution Control Agency to impose additional monitoring requirements if the results of a sanitary survey indicate that a public health risk may exist.[246]

Microbiological Contaminant Monitoring

Minnesota has adopted title 40, part 141 of the code of federal regulations by reference.[247] Title 40, part 141 contains the monitoring requirements for microbiological, organic, and inorganic contaminants, disinfection byproducts, disinfectant residuals, and radionuclides. However, Minnesota has slightly amended microbiological contaminant monitoring requirements.

Minnesota requires a public water supplier to collect no fewer than four repeat samples for each total coliform-positive sample found.[248] Notably, this requirement is more stringent than the federal revised total coliform rule, which only requires three repeat samples.[249] Additionally, while the total coliform rule grants states with discretion to allow a system to forgo E. coli testing on a total coliform-positive sample if the system assumes the total coliform-positive sample is E. coli-positive,[250] Minnesota has expressly not incorporated this provision into its rules.[251]

Organic Contaminant Monitoring

Minnesota has adopted the federal monitoring requirements by reference.[252]

Inorganic Contaminant Monitoring

Minnesota has adopted the federal monitoring requirements by reference.[253]

Disinfection Byproducts and Disinfectant Residuals Monitoring

Minnesota has adopted the federal monitoring requirements by reference.[254]

Radionuclides Monitoring

Minnesota has adopted the federal monitoring requirements by reference.[255]

New York

New York's monitoring requirements are largely similar to federal monitoring requirements. The one exception is New York's monitoring requirements for organic contaminants. As highlighted above in the "State Safe Drinking Water Regulations" section of this report, New York regulates organic contaminants in a unique manner. The state's monitoring requirements for organic contaminants reflect this uniqueness.

Microbiological Contaminant Monitoring

New York's monitoring requirements for microbiological contaminants are largely similar to the federal requirements.[256]

Organic Contaminant Monitoring

New York generally has more stringent monitoring requirements for organic contaminants. Regarding routine monitoring, while federal regulations require community and nontransient, noncommunity water systems to take four consecutive quarterly samples during each three-year compliance period, New York requires quarterly samples on an annual basis.[257] Monitoring requirements for unspecified organic contaminants are established at the state's discretion.[258] Additionally, New York does not allow systems that take a minimum of three years of annual samples with no detection of a volatile organic contaminant to reduce their sampling to once per each three-year compliance period.[259] New York does allow for systems to obtain a waiver from the volatile organic contaminant monitoring requirements that is similar to the federal waiver,[260] and has reduced monitoring requirements for synthetic organic contaminants that are similar to the federal requirements.[261]

Inorganic Contaminant Monitoring

For all inorganic contaminants that are regulated under the federal SDWA, New York's monitoring requirements are largely identical to federal monitoring requirements.[262] As described previously, New York has adopted many federal secondary MCLs as inorganic contaminant MCLs.[263] For these inorganic contaminants—chloride, iron, manganese, silver, sodium, sulfate, zinc, color, odor—New York has created its own monitoring requirements. In general, New York will only require a system to monitor for these

contaminants when it has reason to believe the MCL has been violated, the potential exists for an MCL violation, or the contaminant may present a risk to public health.[264]

Disinfection Byproducts and Disinfectant Residuals Monitoring

New York's routine and reduced monitoring requirements for disinfection byproducts and disinfectant residuals are largely similar to the federal monitoring requirements.[265]

Radionuclides Monitoring

New York's routine and reduced monitoring requirements for radionuclides are largely similar to the federal monitoring requirements.[266]

Ohio

Ohio's monitoring requirements are largely the same as the federal requirements; however, there are specific points of difference. Ohio regulations may require more frequent monitoring for certain radionuclides. Ohio is the only state that has at least one monitoring requirement that is more stringent than the federal requirement for each of the five contaminant groups.

Microbiological Contaminant Monitoring

Ohio's microbiological contaminant monitoring requirements vary from federal requirements at specific points. Ohio's regulations regarding when a noncommunity groundwater system that serves 1,000 or fewer people can return to quarterly monitoring after it has been required to conduct monthly monitoring are more detailed and contain more requirements than federal regulations.[267] Ohio's regulations are also more stringent regarding surface water systems. While federal regulations require surface water systems that serve 1,000 or fewer people to monitor for total coliforms monthly, Ohio requires surface water systems that serve less than 4,100 persons to monitor for total coliforms at least four times per month.[268] Ohio's regulations regarding the frequency of routine coliform monitoring for all systems serving more than 1,000 people are identical to federal regulations.[269]

Organic Contaminant Monitoring

At the outset, it's important to note that Ohio's administrative code contains two apparent scrivener's errors. Ohio's administrative code states monitoring for volatile organic chemicals with MCLs listed in Rule 3745-81-12(D) shall be conducted according to the requirements in Rule 3745-81-24(A).[270] However, the contaminants listed in Rule 3745-81-12(D) are synthetic organic contaminants, not volatile organic contaminants. Additionally, Ohio's administrative code states that monitoring for organic contaminants with MCLs listed in Rule 3745-81-12(E) shall be conducted in accordance with Rule 3745-81-24(B).[271] However, there is no Rule 3745-81-12(E) in Ohio's administrative code. Ohio's MCLs for volatile organic contaminants are described in Rule 3745-81-12(C).[272]

This report will assume Rule 3745-81-24(A) describes the monitoring requirements for volatile organic contaminants and Rule 3745-81-24(B) describes the monitoring requirements for synthetic organic contaminants.

Regarding volatile organic contaminants, Ohio does not offer waivers from monitoring requirements;[273] however, it does allow systems to reduce their sampling frequency as allowed by federal regulations.[274] Ohio also does not appear to exempt vinyl chloride from routine monitoring.[275]

Regarding synthetic organic contaminants, Ohio's monitoring requirements largely mirror the federal requirements.[276]

Inorganic Contaminant Monitoring

Ohio's monitoring requirements for inorganic contaminants are largely identical to the federal requirements; however, there are a few points of difference.

Ohio requires a public water system that exceeds 80 percent of an MCL for a group of inorganic contaminants to subsequently increase its sampling frequency to quarterly for the respective contaminant, while the federal requirements only require the same increase in sampling frequency if an MCL is exceeded.[277]

Ohio also requires more frequent nitrate monitoring than what is required by federal regulations. Specifically, Ohio requires surface water systems to monitor for nitrate monthly, while federal regulations only require quarterly monitoring.[278]

Disinfection Byproducts and Disinfectant Residuals Monitoring

Ohio's routine monitoring requirements for TTHM and HAA5 are identical to the federal regulations for both surface water and groundwater systems.[279] Additionally, Ohio's reduced monitoring requirements for TTHM and HAA5 are also identical to the federal requirements.[280] Ohio's monitoring requirements for chlorine,[281] chlorine dioxide,[282] chlorite,[283] chloramine, bromate,[284] and disinfection byproduct precursors[285] are largely similar to federal requirements.

Radionuclides Monitoring

Ohio's monitoring requirements for radionuclides are largely identical to the federal requirements; however, there are a few key points of difference.

If a community public water system is designated as utilizing waters contaminated by effluents from nuclear facilities, Ohio requires the system to collect monthly samples for gross beta particle activity while federal regulations only require quarterly samples.[286] Similarly, Ohio requires designated systems to collect quarterly samples for tritium and strontium-90, while federal regulations only require annual samples.[287]

Pennsylvania

Pennsylvania has enacted monitoring requirements that are slightly more stringent than the federal requirements for microbiological contaminants and organic contaminants.

Microbiological Contaminant Monitoring

Pennsylvania's monitoring requirements for microbiological contaminants are slightly more stringent than the federal requirements. The state's routine monitoring requirements for public water systems serving more than 1,000 people are identical to the federal requirements.[288] However, Pennsylvania's routine monitoring requirements for noncommunity groundwater systems that serve 1,000 or fewer people require such systems to take one sample per month, as opposed to the one sample per quarter required by the federal rule.[289] Additionally, Pennsylvania does not allow community groundwater systems serving 1,000 or fewer people to reduce their sampling frequency from monthly to quarterly as is permitted by the federal rule.[290]

Organic Contaminant Monitoring

In general, Pennsylvania's monitoring requirements for volatile organic contaminants are slightly more stringent than the federal requirements. Regarding routine monitoring, while the federal rule requires water systems to take four consecutive quarterly samples during each three-year compliance period, Pennsylvania requires water systems to take samples every quarter.[291] Additionally, while Pennsylvania allows water systems to apply for a waiver from monitoring requirements, it still requires systems that are granted a waiver to take one sample every three years, whereas federal rules only require water systems to take one sample every six years.[292] Pennsylvania's reduced monitoring requirements for volatile organic contaminants are largely identical to the federal requirements.

Similar to its monitoring requirements for volatile organic contaminants, Pennsylvania's monitoring requirements for synthetic organic contaminants are slightly more stringent than the federal requirements. Regarding routine monitoring, while the federal rule requires water systems to take four consecutive quarterly samples during each three-year compliance period, Pennsylvania requires water systems to take samples every quarter.[293] Pennsylvania's reduced monitoring and waiver requirements are similar to the federal requirements.[294]

Inorganic Contaminant Monitoring

Pennsylvania's monitoring requirements for inorganic contaminants are largely identical to the federal requirements.[295]

Disinfection Byproducts and Disinfectant Residuals Monitoring

Pennsylvania's monitoring requirements for disinfection byproducts and disinfectant residuals are largely identical to the federal requirements.[296]

Radionuclides Monitoring

Pennsylvania's requirements for radionuclides monitoring differ slightly from the federal requirements. While Pennsylvania's routine monitoring requirements are similar to the federal requirements, Pennsylvania does not allow reduced monitoring for gross alpha particle activity and uranium if monitoring results are between 51% and 100% of the MCL.[297]

Pennsylvania's monitoring requirements for beta particle and photon radioactivity are largely identical to the federal requirements. [298]

Wisconsin

In general, Wisconsin's monitoring regulations contained few variations from existing federal regulations.

Microbiological Contaminant Monitoring

Wisconsin's monitoring requirements for coliform are largely similar to federal requirements, but there are specific points of variation. Community water systems that serve 1,000 or fewer people and that serve a municipality must take two samples per month as opposed to one.[299] Wisconsin does not allow community groundwater systems serving 1,000 or fewer people to reduce the monitoring frequency.[300]

Organic Contaminant Monitoring

Regarding volatile organic contaminants, Wisconsin's monitoring requirements largely mirror the federal requirements, except Wisconsin requires water systems to conduct routine monitoring for vinyl chloride.[301]

Wisconsin's monitoring scheme for synthetic organic contaminants largely mirrors federal requirements.[302]

Inorganic Contaminant Monitoring

Wisconsin's monitoring requirements for inorganic contaminants are largely similar to the federal requirements.[303]

Disinfection Byproducts and Disinfectant Residuals Monitoring

Wisconsin's routine monitoring requirements for TTHM and HAA5 are identical to federal requirements.[304] Additionally, Wisconsin's reduced monitoring requirements for TTHM and HAA5 are identical to the federal requirements.[305]

Wisconsin's monitoring requirements for chlorite,[306] bromate,[307] chlorine and chloramine,[308] chlorine dioxide,[309] and disinfection byproduct precursors[310] are identical to existing federal requirements.

Radionuclides Monitoring

Wisconsin's requirements regarding radionuclide monitoring are largely the same as the federal requirements. However, Wisconsin's regulations do grant its DNR the discretion to require water systems that use only groundwater to monitor for man-made radioactivity.[311]

Summary

The national primary drinking water regulations created by the EPA pursuant to the SDWA serve as the floor for drinking water contaminant regulation for both the concentrations regarding a wide variety of contaminants that are allowable in drinking water as well as how systems must monitor for those contaminants. The heart of the national primary drinking water regulations are the primary MCLs, which exist for the purpose of protecting public health and are enforceable. Additionally, secondary MCLs account for the aesthetics of drinking water, including odor and color, but are unenforceable guidelines. Lastly, the EPA has developed dozens of health advisories for contaminants that are not covered by national primary drinking water regulations.

Regarding MCLs, four states—Illinois, Minnesota, New York, and Wisconsin—have enacted a state-specific MCL that is more stringent than the corresponding federal MCL. Two states—Illinois and New York—have enacted state-specific MCLs for contaminants that are not currently regulated under the federal SDWA. New York's regulatory scheme, which assigns a generic MCL for all organic contaminants, went the furthest beyond the federal requirements. Five states—Illinois, Michigan, New York, Ohio, and Pennsylvania—have adopted some form of regulation for secondary contaminants. However, it's important to note that the regulatory approach varies by state. Illinois, New York, and Pennsylvania have all adopted enforceable MCLs for secondary contaminants. Michigan's regulations regarding secondary contaminants only apply in the context of new subdivisions. Ohio's regulations establish nonbinding guidelines, but do require systems to monitor for secondary contaminant parameters.

Regarding monitoring for primary drinking water regulations, all states included in this report have gone beyond the federal regulatory requirements and have created more stringent state requirements in some form or fashion. While the eight states vary widely in how they have amended the federal regulatory scheme, the amendments generally pertain to requiring more frequent routine monitoring, requiring monitoring for contaminants that is not required under federal regulations, having stricter reduced monitoring requirements, and not allowing water systems to obtain a waiver in instances where a waiver is allowed per federal regulations.

Lead as a Drinking Water Contaminant

Overview

Compared with other regulated drinking water contaminants, lead is one of the most difficult to address. Lead in drinking water can lead to delays in physical or mental development, kidney problems, high blood pressure, and other ailments.

Unlike other contaminants that can enter a drinking water supply through source water or treatment chemicals, lead mainly enters drinking water when service pipes or other plumbing components containing lead corrode. The corrosion and lead release takes place throughout the water delivery system, including the service lines that run underneath private property. The water system will own or operate various pipes, fittings, and fixtures that may contain lead, but lead risk can extend inside the home to the domestic plumbing all the way to and including the faucet. Lead can enter drinking water at any point along the way. For that reason, monitoring for lead occurs mostly at consumers' water taps, since the contamination occurs after the drinking water has left the water plant.

The SDWA addresses lead in many ways, including the following: regulating the amount of lead that may be in drinking water infrastructure; establishing drinking water treatment requirements to ensure that corrosion of lead pipes is adequately controlled; and establishing a grant program for lead testing in schools and child care facilities.[312]

In part, given how lead enters drinking water, federal law regulates the sale or manufacture of materials containing lead. The statute prohibits the sale or manufacture of plumbing materials such as pipes, solder, and flux that are not "lead free."[313] However, the requirement for plumbing materials to be "lead free" does not require such materials to be completely free of lead. When lead in drinking water infrastructure was initially addressed in amendments to the SDWA in 1986, "lead free" was defined as not more than 0.2% lead in solders and flux, and not more than 8% lead in pipes and pipe fittings.[314] Beginning in January of 2014, the definition of a "lead free" pipe or pipe fitting was revised to require any pipe, pipe fitting, plumbing fitting, or fixture to contain no more than 0.25% lead.[315]

The SDWA also specifically addresses lead contamination in school drinking water, albeit in a distinct manner. In general, the SDWA does not require water systems, school districts, or any other government agency to actively monitor for lead contamination in school drinking water. However, the SDWA does prohibit the sale or manufacture of drinking water coolers that are not "lead free."[316] The SDWA also requires the EPA to develop guidance documents to assist states, schools, and the general public in determining the level of lead contamination in drinking water coolers.[317] Lastly, recent amendments to the SDWA have created grant programs aimed at helping schools test for lead contamination in drinking water and make infrastructure improvements. While the SDWA does not require schools or day care facilities to test their drinking water for lead, in 2016 the SDWA was amended to establish a voluntary school and child care lead testing program, which provides grants to states and local educational agencies to assist in voluntarily testing for lead contamination in drinking water at schools and child care programs.[318] This program is discussed in more detail in the "Loans and Grants" section later in this report.

The heart of the SDWA's regulation of lead in drinking water is the lead and copper rule (LCR). Through the LCR, the EPA has established a complex process to regulate lead levels in drinking water in each water system.

In this section of the report, the main questions explored are as follows:

- What does the federal LCR require?
- To what extent do states' LCRs differ from the federal LCR?
- What are states doing to address lead in school drinking water?

General Outline of the Federal LCR

The LCR establishes an action level, maximum contaminant level goal (MCLG), a treatment technique, and various requirements for monitoring and reporting.[319]

The LCR establishes an MCLG of zero because there is no safe level of lead in drinking water.[320] MCLGs, however, are nonenforceable health goals.[321] When the EPA finds that it is not feasible to determine the level of a contaminant in drinking water, in lieu of an MCL it can establish a treatment technique that reduces the level of the contaminant to satisfy the law's requirements.[322] Because lead primarily enters drinking water through corrosion of pipes, there is a treatment technique for lead that consists mainly of corrosion control but also source water treatment, LSL replacement (LSLR), and public education.[323]

There is also an action level for lead, which is exceeded if the "concentration of lead in more than 10 percent of tap water samples collected during any monitoring period…is greater than" 15 ppb or 0.015 mg/l.[324] This is sometimes called the 90th percentile lead level. There is a specific way to calculate the 90th percentile lead levels that varies depending on the number of people served by the water system.[325] Given that the MCLG is zero, the action level does not function as a public health measure. Instead, the action level is a threshold beyond which the water system must employ more treatment techniques.

Once the action level is exceeded, depending on the circumstances and subject to various limitations, systems must implement corrosion control, source water treatment, LSL replacement, and public education.[326] Water systems are required to monitor for lead at, among other places, the source water and consumer taps.[327] Finally, systems must report lead-related data through consumer confidence reports, notices to individual consumers, and public education.[328]

Treatment Technique

Subject to meeting certain exception criteria, water systems that implement corrosion control according to the LCR are deemed to be in compliance with the treatment technique requirement.[329] Large water systems must implement corrosion control by default unless they are deemed to have optimized corrosion control.[330] Small and medium water systems are not automatically required to implement corrosion control by default. Instead, when they first come into existence, small and medium systems conduct initial sampling.[331] If during that initial sampling period they exceed the action level, then they must implement corrosion control, unless they are deemed to have optimized corrosion control. If they remain below the action level, then they qualify for reduced monitoring.[332] There is a detailed set of options for systems to demonstrate that they have optimized corrosion control, which involve meeting the action level for a certain number of monitoring periods and providing information to the responsible agency about its lead reduction strategies.[333]

If a system does not have optimized corrosion control, then it must conduct a corrosion control study in order to recommend which kind of corrosion control would be most suitable.[334] Corrosion control options include alkalinity and pH adjustment, calcium hardness adjustment, and the addition of a phosphate or silicon-based corrosion inhibitor.[335] The responsible agency evaluates the recommendation and either approves it or designates an alternative scheme.[336]

When a system exceeds the action level, numerous additional requirements in the federal LCR are triggered. A system that exceeds the lead action level must make a source water treatment recommendation if lead is found in the source water. Source water treatment includes ion exchange, reverse osmosis, lime softening, or coagulation/filtration.[337] The responsible agency determines whether or not to require installation of source water treatment.[338] If after a system has installed corrosion control and/or source water treatment it is still exceeding the action level, it must replace LSLs.[339] The system is to replace annually at least

7% of the initial number of LSLs in the distribution system.[340] There is no requirement to replace any individual LSL where the lead concentration in all samples from that LSL is less than 15 ppb.[341]

Systems are only required to replace the part of the LSL that they own,[342] though there has been much discussion of which lines the systems are and should be responsible for replacing.[343] Through advance notice to the private property owner, it may also replace the service lines that run through the private property if the owner permits it.[344] Partial LSL replacement, or PLSLR, can be problematic. The EPA recognizes that PLSLR is not an effective long-term strategy for lead level reduction, and can actually cause a short-term elevation in lead levels.[345] If a system engages in PLSLR as part of a triggered LSL replacement program, it must provide enhanced notice to potentially affected residents of the lead risk.[346] Systems doing PLSLR as part of regular operations and maintenance are not required to do so.

Systems can cease their required PLSLR when they meet the action level for two consecutive monitoring periods.[347]

Public Notification and Education

A key component of the federal LCR is requiring water systems to prepare and deliver public notification and education materials to its consumers to inform them of lead levels in their water. The rule requires water systems to deliver public notification and education materials in numerous contexts. Specifically, a water system must provide the following public notification and education materials: consumer notice of lead tap water monitoring results, public education materials, and public notice of drinking water violations.

Regarding consumer notice of lead tap water monitoring results, the federal LCR requires that all water systems deliver consumer notices of lead tap water monitoring results to persons served by the system who reside at sites that are tested.[348] This consumer notice must be provided as soon as practical, but no later than 30 days after the system learns of the tap monitoring results.[349] The notice must include the results of lead tap water monitoring for the tap that was tested, an explanation of the health effects of lead, steps the consumer can take to reduce exposure to lead in drinking water, contact information for the utility, and the maximum contaminant level goal and action level for lead.[350]

Additionally, the federal LCR requires water systems that exceed the action level to deliver public education materials.[351] Much of the content is predetermined.[352] Systems must send all such materials to the responsible agency before sending them to the public.[353] The content focuses mostly on health risk and tells consumers where they can go for help.[354] Community water systems, but not nontransient, noncommunity water systems (in part because they rarely serve individual homes), must also tell consumers how to get their water tested and what it means for plumbing to be "lead free" and low lead.[355] Systems are required to conduct their public education tasks within 60 days after the end of the monitoring period in which the exceedance occurred.[356] The LCR contains specific requirements for delivery of the materials, and allows states to define which communities have enough non-English speakers to trigger a requirement for the water system to translate its public education materials into other languages.[357]

Lastly, public water systems are required to provide public notice of drinking water violations. Federal regulations divide the public notice requirements into three tiers to take into account the seriousness of the violation, and the potential adverse health effects that may be involved.[358] A violation of the treatment technique for lead requires a Tier 2 public notice, which must be provided to all consumers of the system no later than 30 days after the system learns of the violation.[359] A violation of monitoring, testing, or reporting requirements in the LCR requires a Tier 3 public notice, which must be provided to all consumers of the system no later than one year after the system learns of the violation.[360]

Monitoring

The LCR requires systems to monitor for both lead and specified water quality parameters. All systems are required to monitor for lead at consumer taps, and systems that fail to meet the lead or copper action level must monitor for lead in source water as well. Additionally, all large water systems and all small and medium systems that exceed the lead or copper action level must monitor for water quality parameters, which indicate the effectiveness of corrosion control.[361]

For lead monitoring at consumer taps, each system must identify a "pool of targeted sampling sites."[362] There needs to be a pool because the 90th percentile is calculated based on numerous tap samples within a system. Sample sites cannot include faucets with treatment devices designed to remove inorganic chemicals like lead.[363]

For community water systems, sampling sites are broken down into Tier 1, Tier 2, and Tier 3.[364] Tier 1 sites are single-family structures that contain lead pipes or copper pipes with lead solder installed after 1982, or are served by an LSL.[365] When multifamily residences make up 20% or more of the structures served by a system, they can be included in the pool.[366]

Tier 2 sites can only be used if there are insufficient Tier 1 sites to complete the sampling pool. Tier 2 sites can be any building that contains lead pipes or copper pipes with lead solder installed after 1982, or are served by an LSL.[367]

When a community water system has insufficient Tier 1 and Tier 2 sites, it can use Tier 3 sites, which are single-family structures that contain copper pipes with lead solder installed before 1983.[368] When even Tier 3 sites do not provide a community water system with sufficient sites, it can complete its pool with representative sites throughout the system.[369]

The LCR contains some prescriptions for sample collection.[370] Samples should be collected from first-draw, be 1 liter in volume, "and have stood motionless in the plumbing system of each sampling site for at least six hours."[371] Samples must also be collected from the cold water tap and from a tap that is typically drawn for consumption (as opposed to a laundry sink faucet, for example).[372] Water system employees or residents can collect the samples.[373] The LCR further addresses when samples can be deemed invalid.[374]

Sampling protocol has been a matter of great controversy in different water systems. In Washington DC, Flint, Michigan, and other places, there have been issues with state agencies providing poor sampling guidance to residents.[375] The LCR itself only provides limited instruction on sampling collection protocol; to the extent there is more instruction, it is in informal guidance documents.[376] During the lead crises in Washington DC and Flint, various sampling errors were made, including using small mouth bottles instead of wide mouth bottles, flushing the household plumbing prior to sampling, and not properly removing filters or addressing aerators. Recently, in response to the Flint crisis, the EPA has revised or clarified some of its sampling protocol guidance, though not yet in the form of binding regulation.[377]

In general, monitoring occurs at six-month intervals.[378] During each monitoring period, systems must take at least one sample from a specified number of sites.[379] However, certain systems may be eligible to conduct less frequent monitoring and to take fewer samples. Small and medium systems are eligible for reduced monitoring after meeting the action level during two consecutive six-month monitoring periods and do not need approval from the responsible agency.[380] Any system, no matter the size, can also earn reduced monitoring if it maintains the range of values for water quality control parameters that reflect optimized corrosion control treatment, does not exceed the action level for two consecutive six-month periods, and obtains approval.[381] Additionally, small and medium water systems that meet the reduced monitoring requirements for three consecutive years can further reduce monitoring frequency to once every three years.[382] Small systems that can demonstrate they meet the action level and have "lead free" materials in their systems can qualify for a "full waiver" from monitoring, which is defined as monitoring once every nine years.[383]

Notably, the federal LCR does not require public water systems to test for lead concentrations at locations where children, who are particularly susceptible to lead poisoning, are likely to be exposed, such as schools and day care centers.

State Implementation

To have primary enforcement responsibility, a state must adopt a LCR that is at least as stringent as the federal rule.[384] The EPA has express oversight authority over state determinations of corrosion control and source water treatment requirements, and can step in to issue its own determinations where the state has failed in some way.[385] When states have taken action to address lead in drinking water beyond what is required by the federal rule, it has generally been in response to some crisis regarding elevated levels of lead in drinking water provided by public water systems. However, states responses to such crises have varied.

Illinois

In 2016, an investigation found that the water system in Galesburg, Illinois had exceeded the lead action level 22

times over the past 30 test periods.[386] The county in which Galesburg is located has historically had some of the highest rates of lead poisoning in Illinois.[387] As a result, the EPA recommended the city of Galesburg provide bottled water or filters to residents affected by high levels of lead in their drinking water, and ordered the city to perform a corrosion control study to determine treatments that would better prevent lead in old drinking water infrastructure from leaching into the water.[388] The city has also begun a program to completely replace LSLs, including portions of the line that are privately owned, with financial assistance from the Illinois State Revolving Fund.[389] Additionally, a recent investigation of lead contamination in Chicago public schools found that many had levels of lead contamination that exceeded the federal action level.

Illinois' LCR is largely similar to the federal rule, with some material alterations. The most notable deviations are in regard to lead sampling procedures and the additional distribution system material inventory requirements. First, regarding water quality parameter monitoring, the Illinois EPA *must* delete obvious errors from water quality parameter sampling results. In the federal rule, states *may* do this.[390] Second, regarding source water monitoring, the Illinois EPA *must* require the supplier to collect one additional sample upon a determination that the initial sample indicated an exceedance of the maximum permissible source water levels. In the federal rule, states *may* require additional sampling.[391] Regarding its public education materials, Illinois has not identified, by rule, the number of non-English speaking consumers that will trigger a requirement for the water system to provide translation services.[392]

In the wake of Galesburg, Illinois took legislative action to address lead in drinking water. In 2017, Illinois passed a law that requires public water systems to provide a more detailed water distribution system inventory than what is required by the federal LCR. Each community water system must submit their distribution system material inventory on an annual basis.[393] This inventory must include the following information: the total number of service lines within or connected to the distribution system, including privately owned service lines; the number of all known LSLs within or connected to the distribution system, including privately owned LSLs; and the number of LSLs that were added to the inventory after the previous year's submission.[394] This same law also requires community water systems to provide written notice of planned work to repair or replace LSLs to potentially affected residents at least 14 days in advance. The notice must warn the residents that the work may cause lead sediment to enter the resident's water supply, information regarding the dangers of lead in young children, and information concerning best practices for preventing the consumption of lead in drinking water.[395]

Illinois has adopted a law to specifically address lead contamination in school drinking water. In 2017, Illinois enacted Public Act 099-0922, which requires every school district to test each source of potable water for lead contamination in a school building that is occupied by more than 10 students and was constructed before January 1, 2000.[396] Specifically, the statute requires each school to collect a first draw 250 mL sample. Following the first draw sample, the system must be flushed for 30 seconds. After the system has been flushed, a second draw 250 mL sample must be taken.[397] If any samples exceed 5 ppb, the school district must promptly provide an individual notification of the sampling results to the parts or legal guardians of enrolled students.[398] This notification must include the sampling location within the school building and the U.S. EPA's website for information about lead in drinking water.[399] Notably, the requirement that school districts test each source of potable water in certain school buildings is a one-time requirement, rather than a continuous requirement.

Legislators in Illinois have submitted other bills to further regulate lead in drinking water. In 2018, two bills were introduced to require every community water system in Illinois to create a plan to remove all known LSLs that are both publicly and privately owned within 10 years.[400] Neither bill was enacted into law.

Indiana

In 2016, tap monitoring in East Chicago found that 18 of the 43 homes tested exceeded the federal lead action level of 15 ppb.[401] In response, the city had begun a partial LSLR program. However, this program was recently halted due to concerns that partial LSLRs often increase lead contamination in drinking water.[402]

Indiana has adopted the federal LCR with very few material alterations. Indiana's LCR does require a water supply to include in their public education materials a list of some state-approved laboratories that residents can contact to have their water tested for lead, which is not required by the

federal rule.[403] Regarding public education materials, Indiana requires a public water system that serves a population in which 20% or more of the customers speak the same language other than English to include some information in the appropriate language regarding the importance of the notice, or contain a telephone number or address where persons served may contact the water system to obtain a translated copy of the public education materials.[404]

Indiana does not require schools to monitor for lead in drinking water. In 2019, a bill was introduced to require the drinking water in every child care center facility and school building to be tested to ensure it meets the standards described in the federal LCR.[405] If the testing reveals lead levels exceed the federal lead action level of 15 ppb, then it would require the person or entity having authority over the building to take action to reduce lead levels to below the action level.[406] Also in 2019, a bill was introduced, which would require each school to ensure that any plumbing product installed as part of the water system of a school building will be "lead free," as that phrase is defined by the federal SDWA.[407] At the time of the publication of this report, both bills are still pending.

In the wake of the lead crisis in East Chicago, Indiana amended its public utility law to expressly allow water utilities to replace privately owned LSLs, and to recover the costs through an adjustment to the utility's basic rates and charges, subject to a plan approved by the Indiana regulatory commission.[408]

Michigan

In the wake of the Flint Water Crisis and increased public attention to drinking water, Michigan revised its SDWA and LCR to more stringently regulate lead in drinking water. These revisions made several, material revisions and additions to the requirements described in the federal LCR.

One of the most fundamental, yet least consequential, changes to Michigan's LCR was the revision to the lead action level. Beginning January 1, 2025, the lead action level will be lowered from 15 ppb to 12 ppb.[409]

Michigan's amended regulations introduce some changes to monitoring requirements. First, they revised the method by which sampling sites are selected to ensure that monitoring is done at locations with the greatest risk of lead contamination.[410] Specifically, Michigan does not allow structures that contain copper pipes soldered with lead and installed after 1982 to be regarded as Tier 1 or Tier 2 sampling sites.[411] Functionally, this means that systems will now have to rely on structures that either contain lead pipes or are served by a LSL for lead monitoring before they can conduct monitoring at structures with copper pipes soldered with lead and installed after 1982. Second, they created additional tap sampling procedures. All tap sampling sites must not have undergone systematic flushing, the tap aerator shall not have been removed or cleaned in anticipation of the sampling, and all tap samples must be collected in wide mouth bottles.[412] Michigan's rule also requires a second sample to be taken from all sites served by a LSL. Specifically, such sites must collect a second sample, the fifth liter of water drawn through the tap.[413] This second sample is not required by the federal LCR, and is meant to be representative of the lead concentration in water that has been sitting in the service line that runs from the water main to the home.

Michigan's rule also contains more detailed requirements for the inventory of distribution system materials. While the federal rule requires each water supply to complete a materials evaluation of its distribution system, this is only required in order for the system to identify a pool of sampling sites.[414] In addition to this requirement, the Michigan rule also requires every community and nontransient, noncommunity water supply to complete and submit a complete distribution system materials inventory, which must describe all materials in all service lines, including any lines that are owned by private parties.[415]

One of the more notable changes in the Michigan regulations is the mandatory replacement of all LSLs, even in supplies not exceeding lead and copper action levels. Under Michigan's rule, even water supplies that are under the lead action level must replace all LSLs and galvanized service lines that are or were connected to lead piping by 2041.[416] Notably, Michigan's rule requires a water supply to replace the entire LSL, including any privately owned portion of the line.[417] If a portion of an LSL is owned by a private person who does not consent to the replacement of the line, Michigan's regulations ban the partial replacement of LSLs, except in conjunction with an emergency repair.[418]

Michigan's regulatory amendments introduced some changes to public education requirements regarding lead in drinking water. Under both the federal and Michigan rule,

public education materials must be distributed when a water supply exceeds the lead action level.[419] Michigan's rule requires public water systems to include additional content in their public education materials regarding the hazards of lead in drinking water,[420] and also includes additional requirements regarding the distribution of public education materials.[421] Michigan's rule further requires water suppliers that have more than 10% non-English speaking customers to include information in the appropriate languages regarding the importance of the notice, or a telephone number or address where persons may contact the water supplier to receive a translated copy of the public education materials.[422]

Michigan has also revised its LCR to require water systems to monitor for two additional water quality parameters—sulfate and chloride—at customer taps.[423] Additionally, Michigan's regulations were amended to specifically allow for the state to require a supply to conduct a new or updated corrosion control study, additional monitoring, or other actions deemed appropriate to ensure the system maintains optimal corrosion control anytime it is notified that a water system is using a new source of water, or is making a long-term change in treatment.[424]

Michigan has also revised its SDWA to require water systems to provide quicker notice to its consumers when it exceeds the lead action level. Michigan requires a water system that exceeds the lead action level to deliver a public advisory within three business days after the Michigan Department of Environmental Quality notifies the system that an exceedance of the lead action level occurred.[425] Comparatively, the federal LCR requires a water system that exceeds the lead action level to deliver public education materials to its consumers within 60 days after the end of the monitoring period in which the exceedance occurred.[426] Michigan also requires public education materials to include additional information, including more detailed monitoring results, information about effectiveness and availability of filters, and information about the availability of lead-free plumbing fixtures.[427]

Lastly, Michigan's amended regulations also provide for the establishment of a statewide and water supply advisory council. The statewide council is to consist of nine people from specific backgrounds, as specified by the rule.[428] Duties of the statewide council include developing plans for continuing public awareness about lead in drinking water, generating public awareness campaign materials about lead to be distributed by water supplies, assisting in promoting the transparency of data and documents related to lead in drinking water within the state, assisting and advising water supply advisory councils (discussed below), and providing advice and assistance as needed to water supplies.[429] Additionally, each water supply that serves a population of 50,000 or more, and each consecutive water system that serves a population of 50,000 or more, must create a water system advisory council. Each water system advisory council shall consist of five people, appointed by the community supply.[430] A water system advisory council shall develop plans for continuing public awareness about lead in drinking water, review public awareness campaign materials, advise and consult the water supply on the development of public education materials and on efforts to replace private LSLs, assist in promoting transparency, and collaborate with local community groups.[431]

Regarding the translation of public education materials, Michigan requires systems serving communities where more than 10% of the population are non-English speaking to provide limited translation services. Specifically, Michigan requires public education materials to contain information in the appropriate language(s) about the importance of the public education materials, and a phone number or address where they may obtain a translated copy or request assistance in the appropriate language.[432]

Michigan does not require schools to monitor for lead in drinking water. In 2019, a bill was introduced to require water supplies to require each school and child care center to conduct periodic sampling and testing of its drinking water for the presence of lead.[433] At the time of the publication of this report, the bill was still pending. The Michigan Department of Environmental Quality (MDEQ) does provide a "School Drinking Water Training Program," which exists to give school personnel tools to protect the drinking water in their buildings.[434]

Minnesota

Minnesota has adopted the federal LCR by reference.[435] Therefore, Minnesota's LCR is identical to the federal LCR. Since it has adopted the federal rules by reference, Minnesota has not specified when and in what manner a system must provide translated public education materials to its non-English consumers.

In 2017, Minnesota enacted a law to require school districts to monitor for lead in school drinking water. The law requires the Minnesota commissioners of health and education to jointly develop a model plan to require school districts to accurately and efficiently test for the presence of lead in water in public school buildings.[436] By July 1, 2018, the board of each school district was required to either adopt the model plan, or develop and adopt an alternative plan.[437] At a minimum, the lead monitoring plan must require that each building be tested at least once every five years.[438] A school district that has tested its buildings for the presence of lead must make the results of the testing available to the public for review, and further must notify parents of the availability of the information.[439]

Additionally, in 2018 a bill was introduced that would extend the requirements regarding monitoring for lead in school drinking water to charter schools.[440] That bill was not enacted into law.

New York

In 2016, the Ithaca City School District shut off its drinking water after tests revealed high lead levels at two schools.[441] The school district only recently started using water from the public water system at the end of 2018.[442] Additionally, in 2017, an investigation of lead contamination in school drinking water in New York City found 83% of school buildings had at least one outlet with a lead level at about the federal action level.[443]

New York's LCR diverges from the federal LCR in a couple of ways. Regarding monitoring requirements, New York's rule requires that the state specify sampling locations when a system is conducting reduced monitoring, which the federal rule does not require.[444] Additionally, New York requires any system serving 50,000 or fewer persons that has optimal corrosion control treatment installed to monitor for the applicable water quality parameters every six months, whereas the federal rule only requires such systems during each six-month period in which the system exceeds the lead or copper action level.[445]

Regarding public education requirements, New York has not identified how many non-English speaking consumers will trigger a requirement for the public water system to provide some type of translation service.[446]

In 2016, New York enacted a law requiring every school district to conduct periodic first-draw tap testing of potable water to monitor for lead contamination in each occupied school building.[447] All schools must take a first-draw 250 mL sample at least every five years.[448] If the lead concentration at an outlet exceeds the action level, which is 15 ppb, the school must prohibit the use of the outlet until a lead remediation plan is implemented to mitigate the lead level of the outlet, and test results indicate that the lead levels are below the action level.[449] Additionally, the school must provide all building occupants with an adequate supply of potable water while remediation is performed, report the results to the local health department no more than one business day after the school receives the results, and notify all staff and all parents of students of the test results in writing no more than 10 business days after the school receives the results.[450]

In 2019, a bill was introduced that would expand the requirements regarding monitoring for lead in school drinking water to day care facilities.[451] As of the publication of this report, that bill is still pending.

Ohio

In 2016, tap samples at 7 of 20 homes in Sebring showed levels of lead contamination that exceeded the federal action level, which prompted the city manager in Sebring to issue an advisory stating that children and pregnant women should not drink the public water.[452]

Ohio's LCR is significantly different from the federal rule. In 2016, the Ohio legislature passed HB 512, which amended various aspects of the Ohio SDWA, including provisions addressing lead.[453] HB 512 revises various aspects of Ohio's SDWA and also requires the Ohio EPA to promulgate regulations to implement certain statutory revisions.

Both the federal LCR and the Ohio rule require every water system to deliver to its consumers a notice of lead tap water monitoring results from the sites that are tested.[454] However, Ohio has sped up the process. The federal LCR requires water systems to provide tap monitoring results as soon as practical after receipt, but no later than 30 days after.[455] Water systems must in turn provide notice to the relevant consumers no later than two business days after receipt from the laboratory.[456] Additionally, Ohio regulations establish a "lead threshold level," which is equal to the action level of 15 ppb, and require the agency to provide

additional information to consumers if the monitoring results from their tap exceed the lead threshold level. For such consumers, their notification of monitoring results must provide information on the availability of health screening and blood lead level testing.[457] Additionally, the Ohio EPA must provide notice of the results to the applicable board of health.[458] If the system is a nontransient, noncommunity water system, then it must immediately remove from service all fixtures identified as contributing to elevated lead levels.[459]

Both the federal LCR and the Ohio rule require a community water system to provide a notice and education materials to all of its consumers.[460] Similar to its requirements for consumer notice of lead monitoring results discussed above, Ohio's rule has sped up the process. While the federal rule requires a community water system to deliver public education materials within 60 days after the end of the monitoring period in which an exceedance of the lead action level occurred, Ohio's rule requires a community water system to deliver its public education materials within 30 business days after the receipt of lab result that show the lead action level has been exceeded.[461] In general, Ohio's delivery requirements are largely similar to the federal requirements.[462] Ohio does require water systems to include more information regarding the steps consumers can take to reduce their exposure to lead in drinking water.[463] Ohio requires water systems to provide the following information, which is not required by the federal LCR: note that the Centers for Disease Control and Prevention (CDC) recommends children and pregnant women use bottled water or water from a filtration system that has been certified by an independent testing organization to reduce or eliminate lead for cooking, drinking, and baby formula preparation in homes; provide information about the availability of health screenings and blood lead level testing in the areas served by the system; provide a list of Ohio EPA-approved laboratories that test for lead, including their names and phone numbers.[464]

Both the federal LCR and the Ohio rule require a nontransient, noncommunity water system to distribute public education materials.[465] Similar to Ohio's rule regarding public education for community water systems, Ohio requires nontransient, noncommunity water systems to provide public education materials quicker than is required by the federal rule. While the federal rule requires nontransient, noncommunity systems to deliver public education materials within 60 days after the end of the monitoring period in which the exceedance occurred, the Ohio rule requires that public education materials be delivered within 30 days after receipt of lab results that show the lead action level has been exceeded.[466] As to translation of public education materials required by the Ohio LCR, the Ohio EPA has the discretion to determine what constitutes a large population of non-English speaking consumers.[467]

Ohio has also developed additional requirements for public notice of lead action level exceedances. Similar to Michigan, Ohio requires a water system to issue a public notification of a lead action level exceedance to its consumers no later than two business days after receipt of the laboratory results.[468] This notification includes the 90th percentile lead level, the number of samples used to compute the 90th percentile, an explanation of the health effects of lead, a list of steps consumers can take to reduce lead exposure in drinking water, and contact information for the water system.[469] Under the federal rule, if a water system exceeds the lead action level, it must provide public education materials within 60 days after the end of the monitoring period in which the exceedance occurred.[470]

In addition to requiring each water system to complete a materials evaluation of the distribution system in order to identify a pool of targeted sampling sites, which is a requirement of the federal LCR,[471] Ohio also requires water systems to map areas of the system that are known or likely to contain LSLs, and identify characteristics of buildings served by the system that may have solder, fixtures, or pipes that contain lead.[472] The map must be submitted to the Ohio EPA, the Ohio DOH, and the Ohio department of job and family services.[473] The map must be updated and resubmitted once every five years.[474]

Ohio has enacted laws to specifically address lead contamination in school drinking water. In 2016, Ohio appropriated $12 million for Lead Plumbing Fixture Replacement Assistance Grants, which provides funding to public and chartered nonpublic schools for the cost of a drinking water assessment, and for the reimbursement of the cost of the replacement of drinking water fountains, water coolers, plumbing fixtures, and limited connected piping that are found to be a cause of lead above the federal action level of 15 ppb.[475] In 2018, a bill was introduced and would mandate the Ohio EPA to adopt rules to require local

boards of health to conduct annual monitoring for lead in drinking water, and to require a school to comply with remediation regulations if the school's drinking water exceeds applicable standards.[476] This bill has not been enacted.

Pennsylvania

In 2016, tap sampling at 100 Pittsburgh homes revealed that 10% had lead contamination above the federal action level.[477] In response, the city announced a plan to distribute free water filters to residents in homes with high lead levels,[478] and has approved funding to replace LSLs.[479]

Pennsylvania's LCR differs slightly from the federal rule. Regarding sample site selection, Pennsylvania requires each system to prepare a sample site location plan and to submit that plan to the state prior to conducting initial lead and copper tap monitoring.[480] The federal rule does not contain any requirement for water systems to develop a sample site location plan. Regarding monitoring, Pennsylvania's rule does not provide for reduced source water monitoring, while the federal LCR does.[481]

In 2018, Pennsylvania enacted a law that allows, but does not require, the testing of lead levels in the drinking water of any school.[482] If a school does test its lead levels and the level is above zero, it must implement a plan to ensure that no child or adult is exposed to lead contamination in drinking water, and it must report its monitoring results to the Department of Education.[483] If a school does not test its lead levels, the school must, at a public meeting, discuss lead issues in the school facilities.[484]

Wisconsin

Wisconsin has adopted the federal LCR without any material revisions.[485] Even as to the translation of public education materials for systems with certain amounts of non-English speaking consumers, Wisconsin leaves it to the discretion of the water system to determine when to provide translation services.[486]

Wisconsin does not require schools to monitor for lead in drinking water. In 2017, a bill was introduced to increase financial aid to schools for the purposes of testing for the presence of lead in water, as well as replacing pipes, drinking fountains, and fixtures.[487] Also in 2017, two bills were introduced to require child care centers to test for lead in drinking water, and to not use drinking water outlets if tests revealed lead concentrations in excess of 5 ppb.[488] None of these bills were enacted into law.

Summary

Ohio and Michigan are the only two states that have made significant revisions to the federal LCR to make it more stringent. Both states focus on improving water system transparency by requiring water systems to provide more information to their consumers. This includes requiring water systems to issue immediate notices of action level exceedances, and to issue public education materials faster than is required under the federal LCR. Additionally, water systems in both states must do more than is required by the federal rule to inventory the materials in the water system. Illinois also requires water systems to submit a more detailed inventory pursuant to a recent amendment to its SDWA.

In addition to the requirements described above, Michigan is the only state that requires all LSLs to be replaced on a set schedule, and is the only state that has enacted a lead action level that is lower than the federal level.

In recent years, there have been a number of bills introduced by state legislators. At least one bill has been introduced in each of the Great Lakes states to address lead contamination in school drinking water, with most of these bills being introduced in the last couple of years. Five Great Lakes states (Illinois, Minnesota, New York, Ohio, and Pennsylvania) have taken legislative action to address lead in school drinking water. What is required by these laws varies widely. Some states, such as Ohio, authorize funds for grants to voluntarily conduct drinking water assessments and infrastructure replacements. Other states, such as New York, require schools to conduct testing and to take specific measures if the lead levels are above the action level. In general, the most school-specific action levels adopted by states mirror the 15 ppb action level that exists for public water systems. Only Illinois has adopted a lower, school-specific action level of 5 ppb.

Consumer Confidence Reporting

Overview

The SDWA amendments of 1996 introduced the concept of consumer confidence reports or CCRs.[489] CCRs are annual reports submitted by water systems to their consumers and to their regulators.[490] They are intended to communicate in a relatively readable way a system's performance for that year in terms of compliance with the drinking water laws. The EPA has promulgated detailed rules,[491] and it requires the states to adopt a CCR scheme that tracks the federal scheme.[492]

In this section of the report, the main questions explored are as follows:

- What is the federal scheme for CCRs?
- In what ways have states chosen to fill in CCR gaps?
- In what ways have states chosen to require more than what the federal scheme requires?

Generally, the states decided to copy word for word the EPA's CCR rules. Below where the state schemes are described, the report highlights only those areas where there is a material difference between the state and federal standards.

Federal CCR Scheme

The SDWA and EPA regulations require CCRs to contain specific content, including the following:[493]

- Information on source water
- Definitions for "maximum contaminant level goal," "maximum contaminant level," "variance," and "exemptions"
- With regard to any regulated contaminant that is detected in the delivered water, a statement on the MCLG, the MCL, the level of the contaminant in the system, and a description of the health concern of those contaminants found at levels that violate the MCL
- Information on compliance with the primary drinking water standards, and about any granted variance or exemption
- Information on the levels of unregulated contaminants for which monitoring is required
- A statement about the degree of health risk posed by contaminants found in drinking water and encouragement for consumers to call the EPA to learn more
- Lead-specific information, including an informational statement about lead in drinking water and its effects on children

CCRs must be mailed or otherwise directly delivered annually,[494] subject to certain exceptions for small systems that can seek alternatives, such as newspaper notice or public availability.[495] Additionally, community water systems serving 100,000 people or more must post the current year's CCR on a publicly accessible website.[496] Each system must also deliver the CCR to the regulating agency, make the reports available to the public upon request, and retain copies for at least three years.[497]

Minnesota has adopted the EPA's CCR rules by reference, without any alterations or additions.[498]

Illinois, Indiana, Michigan, New York, Ohio, Pennsylvania, Wisconsin

Unregulated Contaminants

If a water system performed monitoring that indicates the presence of other contaminants in the finished water, the EPA strongly encourages systems to report any results that may indicate a health concern.[499] The EPA considers the detection of a contaminant in drinking water above a proposed MCL or a health advisory level to be an indication

of possible health concerns.[500] Indiana's requirement is identical to the EPA's requirement.[501]

Rather than strongly encourage it, Michigan simply encourages water systems to report results that may indicate a health concern. However, Michigan also expressly requires reporting on levels of sodium, which Michigan requires community water systems to monitor.[502]

New York specifies that systems must identify a person and provide the telephone number to contact for information regarding monitoring results for certain unregulated contaminants.[503] Additionally, New York requires information regarding giardia to be reported, including a summary of the sampling sites, number of tests per year, testing results, action taken in response to results, and an explanation of the significance of the results.[504]

Ohio simply recommends that water systems report results that may indicate a health concern.[505]

Illinois and Pennsylvania go beyond the federal requirement and require systems to report any results that indicate the presence of other contaminants in the finished water.[506] Additionally, both states require systems to provide the results of the monitoring as well as an explanation of the significance of the results noting the existence of any health advisory or proposed regulation.[507]

Wisconsin goes beyond encouragement and simply requires systems to report such information.[508]

Language and Translation

In communities with "a large proportion of non-English speaking residents," there is no requirement to fully translate the CCR.[509] However, the CCR must contain information in the appropriate language either about the importance of the report or about how they can contact the system to obtain a translated copy or assistance with it.[510] The rule leaves it to the state to define "a large proportion."

Indiana defines it as a community where at least 20% or more of the residents speak the same language other than English.[511]

Michigan and Ohio define it as a community where at least 10% or more of the residents speak a language other than English.[512]

Illinois and New York do not define what constitutes "a large proportion of non-English speaking residents."[513] Guidance published by the New York DOH states that water systems should make the determination whether to include information for non-English speaking residents in consultation with the local health department.[514]

Pennsylvania requires all CCRs to contain information in Spanish regarding the importance of the report, or a telephone number or address where persons served may contact the water system to obtain a translated copy of the report or request assistance.[515] Notably, this requirement applies to all systems regardless of the number of Spanish speaking people that the system may serve. For all other languages, Pennsylvania's translation requirements are partially dependent on the number of people served by the water system. For systems that serve at least 1,000 people, information in other languages is required for each non-English speaking group other than Spanish-speaking groups that exceeds 10% of the residents being served by the system.[516] For systems that serve less than 1,000 people, information in other languages is required for each non-English speaking group other than a Spanish-speaking group that exceeds 100 people.[517]

Wisconsin defines it as "a specific non-English speaking group [that] comprises at least 5 percent of the population of the community served."[518]

Additional Health Information

The EPA requires systems to include specific language in their CCRs about how certain populations may be more vulnerable to drinking water contaminants, such as the elderly and those with immune deficiencies.[519] The EPA also requires water systems to provide specific health educational statements related to arsenic, nitrates, lead, and TTHM if a system detects these contaminants at concentrations above specified thresholds.[520] It provides water systems language it can use, but also gives them the option of developing their own educational statements in consultation with the agency.[521]

Illinois, Indiana, Ohio, Pennsylvania, and Wisconsin have adopted rules regarding the required additional health information that must be included in a water system's CCR that mirror the EPA's rules.[522] In general, these states either allow a drinking water system to use the language provided

by the state agency for the health educational statement, or it allows the system to develop its own educational statement in consultation with the state agency. Only Ohio and New York require a water system to use the specific language provided by the agency, and do not allow systems to develop their own educational statements in consultation with the state agency.

In addition to the educational statements required for arsenic, nitrates, and TTHM, New York also requires water systems to include an educational statement for fluoride if it detects levels above 2 mg/l but below the MCL.[523] The language of the educational statement is specified in guidance issued by the New York DOH.[524]

Michigan goes one step further. Michigan's drinking water law requires that for regulated contaminants, if "certain subpopulations are particularly vulnerable to the adverse effects because of age, gender, pregnancy, or preexisting medical conditions," the CCR or other forms of notice must contain information about the contaminant, its detected level, the population that may be vulnerable to it, and potential adverse health effects. As a result, Michigan requires water systems to provide information as to fecal coliform, E. coli, copper, fluoride, lead, nitrate, and nitrite.[525]

Lead

Uniquely, Michigan requires water supplies with LSLs, or service lines of unknown material, to describe the number of known LSLs, the number of service lines of unknown material, and the total number of service lines in the supply in their CCRs.[526]

Delivery

The EPA requires water systems to deliver their CCRs by mail or some other direct means, but also allows each state to provide a waiver from mailing for smaller systems that includes the use of alternatives to mailing.[527]

Illinois' rules do allow for the state to waive the requirement that a community water system directly deliver a copy of the CCR to each customer if the system serves fewer than 10,000 persons.[528] In all other respects, Illinois' rules regarding the delivery of CCRs mirror the EPA's rules.

Indiana's rules do not allow for a small system to waive its obligation to directly deliver a copy of its report to each customer.[529] Indiana also requires a water system to distribute its report to any other agency or clearinghouse that is identified by the Indiana Department of Environmental Management.[530]

Michigan's rules do allow for the state to waive the requirement that each community water supply directly deliver a copy of the CCR to each customer if the system serves fewer than 10,000 persons.[531] Michigan's rules also require that water systems deliver the CCR to the local health department that has jurisdiction in the county served.[532]

New York does not allow for a small system to waive its obligation to deliver a copy of its report to each customer. Additionally, New York's delivery requirements vary from the federal rule in regard to its reporting timeline and the parties that must receive the report. Regarding its reporting timeline, New York requires a water system to distribute the report on or before May 31, whereas the federal rule requires report distribution by July 1.[533] Additionally, New York requires a water system to send its certification form, verifying that the report has been distributed, by September 1, whereas the federal rule requires such certification by October 1.[534] New York also requires a water system to send its report to more parties. Specifically, New York not only requires each report to be distributed to the primary regulatory agency and each customer, but also requires that each report is sent to the county or district health department office that has jurisdiction over the water system.[535] Each system serving 1,000 or more connections must also deliver a copy of the report to the Commissioner of Environmental Conservation.[536] Lastly, an investor-owned community water system that is regulated by the public service commission must deliver a copy of the report to the public service commission.[537]

Ohio and Pennsylvania do not provide a waiver for small systems, requiring all water systems to mail or otherwise directly deliver CCRs.[538]

Wisconsin provides the same waiver from the federal rule, but also expressly allows water systems to provide the CCR on a website so long as it mails or otherwise directly delivers the URL information to customers.[539]

Summary

While the SDWA requires water systems to prepare and send consumer confidence reports, and describes basic requirements as to their contents, states have a significant amount of discretion in determining the specifics.

Regarding unregulated contaminants, Illinois, Pennsylvania, and Wisconsin all require systems to report any results that indicate the presence of unregulated contaminants in finished water, which is not required by the SDWA.

Regarding the translation of consumer confidence reports, most states require a system to provide some type of translation when the population it serves contains over a specified percentage of non-English speaking people. This percentage ranges from 5% (Wisconsin) to 20% (Indiana). Only Illinois and New York did not specifically define the number of non-English speaking residents that will trigger a requirement that the water system provide some translation services. Only Pennsylvania requires all systems, regardless of the number of non-English speaking people, to include information in Spanish in every consumer confidence report.

Regarding additional health information, Michigan's requirement that consumer confidence reports contain health information specifically for vulnerable populations, such as children, people with preexisting health conditions, the elderly, and pregnant women, was unique.

Regarding the delivery of the report, Indiana, New York, Ohio, and Pennsylvania do not provide waivers for small systems regarding the requirement that they mail or otherwise directly deliver their consumer confidence reports to their consumers.

Loans and Grants

Overview

There are over 150,000 public water systems in the country. They come in every size and serve various kinds of communities. From source water to tap water, all of them must comply with the SDWA's drinking water standards.[540]

In order for systems to operate under normal conditions and adjust to revised standards, emergencies, and other unpredictable events, the systems must have access to financing. Other than revenues from consumers, financing comes mainly in the form of loans and grants.

In this section of the report, the main questions explored are as follows:

- What is the SDWA scheme for financing of water systems?
- What do states offer in terms of loans and grants?
- What kind of special assistance is available for environmental justice communities, source water protection, lead and copper regulation, and small systems?

SDWA and the Drinking Water State Revolving Fund

In 1996, the SDWA was amended to create a State Revolving Fund (SRF) program for the purpose of providing financial assistance to states to help them meet their drinking water infrastructure needs.[541] Pursuant to the SRF program, the EPA makes annual capitalization grants to states to capitalize a state revolving loan fund that states may use to provide financial assistance to public water systems.[542] The primary form of financial assistance authorized by the SDWA is subsidized loans.[543] The federal capitalization grants, along with state match, funds from loan repayments, and other funds, are meant to create a revolving loan fund that will serve as a perpetual source of drinking water infrastructure funding. The SRF program is designed to give states flexibility in setting their funding priorities. However, there are a few requirements that states must comply with.

In the 1996 SDWA amendments, Congress authorized SRF appropriations in the amount of $599 million for fiscal year 1994 and $1 billion for fiscal years 1995 through 2003.[544] Congress has continued to provide annual appropriations of varying amounts since 2003.[545] In fiscal year 2016 and 2017, Congress appropriated $863.2 million to the SRF program.[546] In fiscal year 2018, Congress appropriated $1.1 billion to the SRF program.[547] For fiscal year 2019, the Administration has requested $863.23 million for the SRF program.[548] In a recent national assessment of public water system infrastructure needs, the EPA estimated that approximately $23.6 billion per year over the next 20 years is needed for the necessary capital improvements to ensure that water systems continue to provide safe drinking water to the public.[549] The greatest area of need is of transmission and distribution projects, such as the rehabilitation and replacement of existing water mains, installing new pipe to eliminate dead end mains that result in stagnant water, installing new mains in areas where existing homes do not have a safe and adequate water supply, and installing or rehabilitating pumping stations to maintain adequate pressure.[550]

To receive a capitalization grant from the EPA, a state must establish an SRF and submit a grant application to the EPA.[551] Ultimately, the EPA allots funds to states for their respective SRFs in accordance with the needs of the state as identified in a needs survey conducted by the EPA.[552] The needs survey is an assessment of the water system capital improvement needs of all eligible public water systems in the country.[553] It is prepared by the EPA every four years.[554] The most recent Drinking Water Infrastructure Needs Survey

and Assessment was submitted by the EPA to Congress in March 2018.[555] Due to the 2018 amendments to the SDWA, the next needs survey must include an assessment of costs to replace all LSLs of all eligible public water systems in the country.[556]

When a state is issued a capitalization grant, the EPA and the state will enter a capitalization grant agreement.[557] Among other things, the terms of the capitalization grant agreement must require the state to deposit moneys in an amount equal to at least 20 percent of the total capitalization grant provided by the EPA.[558] Additionally, states must prepare an IUP that describes the intended uses of moneys in the SRF.[559] For years in which a state has submitted a capitalization grant application, the IUP must be received prior to the award of a capitalization grant.[560] For years in which a state has not submitted a capitalization grant application, the state must still submit the IUP so long as the SRF program remains in operation.[561] The IUP must include a list of projects that will receive financial assistance, the criteria or methods established by the state for the distribution of funds, a description of the financial status of the SRF, and the short-term and long-term goals of the SRF.[562] It must also include a list of projects, including the priority assigned to each project, and the expected funding schedule for each project.[563] Lastly, an IUP may provide for the funding of emergency projects that require immediate attention to protect the public health, so long as the state defines what conditions constitute an emergency and the state later reports the projects undertaken on such basis.[564] A state's IUP is incorporated by reference into the state's capitalization grant agreement.[565]

The SDWA does contain additional restrictions regarding how states administer their respective SRFs. States are required to make 15% of their SRFs available solely for providing loan assistance to public water systems that regularly serve fewer than 10,000 persons.[566] Starting in 2016, each appropriation bill requires states to use 20% of their capitalization grants to provide additional subsidies to eligible recipients in the form of forgiveness of principal, negative interest loans, or grants.[567]

Lastly, the SDWA authorizes, but does not require, states to utilize a certain portion of their capitalization grants for specific purposes, detailed as follows:

- **Administrative Costs:** The SDWA allows a state to reserve the greater of $400,000, one-fifth percent of the current valuation of the fund, and 4% of its capitalization grant to cover the reasonable costs of administration of the SRF program.[568]
- **Additional Assistance for Disadvantaged Communities:** In 2018, the SDWA was amended to raise the total amount of additional subsidies that a state could offer to a disadvantaged community from 30% to 35%.[569]
- **Additional Assistance for Small Systems:** A state may set aside 2% of its capitalization grant to provide technical assistance to public water systems serving 10,000 or fewer persons.[570]
- **State Programs:** The SDWA allows a state to set-aside 10% of its capitalization grant for a combination of any of the following programs and activities:[571]
  - Public water supervision programs
  - Technical assistance through source water protection programs
  - Development and implementation of a state capacity development strategy
  - Operator certification programs
- **Other Authorized Activities:** The SDWA authorizes a state to set aside 15% of its capitalization grant for a combination of any of the following programs and activities:[572]
  - Loans to any public water system for the acquisition of land or conservation easements
  - Loans to any community water system to implement local, voluntary source water protection measures
  - Technical and financial assistance to water systems as part of a capacity development strategy
  - Expenditures to delineate and assess source water protection areas
  - Expenditures to fund the establishment and implementation of a wellhead protection program

SDWA and Grants to Address Lead Contamination

In 2016, the Water Infrastructure Improvements for the Nation (WIIN) Act significantly amended the SDWA to address lead contamination in drinking water in a number of different contexts, including contamination from LSLs as well as contamination at schools and day care centers.

The WIIN Act amended the SDWA to establish a program that provides grants to states and local educational agencies to assist those agencies in voluntarily testing for lead contamination in drinking water at schools and child care programs.[573] When this program was first created, the SDWA authorized an appropriation of $20 million for each fiscal year from 2017 through 2021.[574] The America's Water Infrastructure Act of 2018 increased the amount that is authorized for appropriation from $20 million to $25 million for fiscal years 2020 and 2021.[575] In the fall of 2018, the EPA sent letters to governors notifying them of the program, and the appropriation of $20 million in fiscal year 2018 for grant funds.[576] States interested in participating in the program were required to submit letters of intent to the EPA by February 11, 2019.[577]

Additionally, the WIIN Act required the EPA to establish a grant program to provide assistance to water systems, municipalities, and states for lead reduction projects.[578] A "lead reduction project" is a project or activity that has a primary purpose of reducing lead concentration in water by replacing publicly owned LSLs, conducting testing or planning to identify and address conditions that contributed to increased concentration of lead in water, and providing assistance to low-income homeowners to replace LSLs.[579] For this program, Congress has authorized appropriations of $60 million for each of fiscal years 2017 through 2021.[580] This program has yet to be implemented.

Lastly, America's Water Infrastructure Act of 2018 amended the SDWA by establishing another grant program to provide assistance to local educational agencies to replace drinking water fountains manufactured prior to 1988.[581] The Act authorized appropriations of $5 million for each fiscal year starting in 2019 and running through 2021.[582] This program has yet to be implemented.

Notably, all of these programs have their own appropriated funding that is distinct from the funding for the SRF program.

State Revolving Funds

Following the creation of the SRF program by the 1996 SDWA amendments, several states created revolving loan funds in order to become eligible to receive capitalization grants from the EPA. Below are details as to how the states have created their funds for drinking water assistance and how the states administer those funds.

Illinois

In its 2018 needs survey, the EPA estimated that approximately $1.04 billion per year over the next 20 years is needed to fund the necessary capital improvements to ensure that public water systems in Illinois continue to provide safe drinking water.[583]

In 1997, Illinois amended its Environmental Protection Act to include the Public Water Supply Loan Program.[584] The Illinois Environmental Protection Agency administers the fund. For the 2018 fiscal year, Illinois received $34,393,000 from its federal capitalization grant.[585] It has received a total of $815,200,400.

Illinois regulations establish three fixed loan interest rates: a base rate, a small community rate, and a hardship rate. The base interest for loan agreements is a fixed rate not to exceed 50% of the market interest rate with a repayment period of 20 years.[586] All systems eligible to receive funds from the Public Water Supply Loan Program may receive the base rate. The small community rate is a fixed rate equal to 75% of the base rate.[587] A system with a service population of less than 25,000 and that meets one of three economic-based eligibility criteria may receive the small community rate.[588] The hardship rate is a fixed rate of 1%.[589] A system with a service population of less than 10,000 and that meets one of the three economic-based eligibility criteria may receive the hardship rate.[590] Illinois also provides for an environmental impact discount. When at least 50% of the eligible project costs fund green infrastructure projects, projects lowering water demand, projects reducing energy demands at a public water supply, or projects involving the removal and replacement of lead in water mains or service lines, then the system shall receive a 0.2% discount from the base rate, small community rate, or hardship rate.[591]

All proposed Public Water Supply Loan Program projects are reviewed and placed on a Project Priority List, which is published in the IUP.[592] Illinois uses its Loan Priority Index

to determine the order of projects on its Project Priority List. The Loan Priority Index is used to score and prioritize projects in order of their relative public health significance.[593] The Loan Priority Index incorporates a number of factors, including the number of people served by the system, the drinking water needs associated with the project, the financial hardship of the population served by the system, whether the applicant has taken steps to protect the source water or incorporated water conservation measures, and whether the system serves a population of less than 10,000.[594] The primary factor for prioritizing projects is the project need factor.[595]

Indiana

In its 2018 needs survey, the EPA estimated that approximately $376 million per year over the next 20 years is needed to fund the necessary capital improvements to ensure that public water systems in Indiana continue to provide safe drinking water.[596]

Indiana has established a drinking water revolving loan fund, which is administered by the Indiana Finance Authority (IFA).[597] Indiana's loan fund has provided more than $321 million in financing to various drinking water projects since the first loan was issued in 1999.[598] For the fiscal year 2018, Indiana received a capitalization grant in the amount of $13.4 million. It has received a total of $313,509,100.

The Base Rate is calculated by using 90% of the daily average 20-year AAA-rated, general obligation bond Municipal Market Data composite index for the most recent calendar month.[599] This Base Rate may then be discounted further based on the median household income of the service area, which is calculated from the 2012–2016 American Community Five Year Survey and projected post-project monthly user rates.[600] Eligible projects have their financial information reviewed by the IFA to finalize their interest rate, and then the project's "rate consultant" completes a rate study before a rate ordinance is adopted by the project's governing body.[601] Interest rates for nonprofits and for-profit entities may be further set at the discretion of the IFA and may be higher than those mentioned, but cannot be set lower than the interest rates calculated by the means previously noted.[602] Finally, the IFA may waive additional fees for projects that delay repayment of new debt around existing debt service.[603]

Indiana ranks eligible projects according to its priority ranking system that is established by the IFA in Indiana's IUP. The total number of points available in Indiana's scoring system is 100.[604] Scoring is broken down into four sections: acute public health and SDWA compliance (up to 55 points); chronic public health and SDWA compliance (up to 25 points); public health and water works regulations compliance (up to 14 points); affordability and population served (up to 6 points).[605] Eligible projects are listed on Indiana's Project Priority List according to their score.

Michigan

In its 2018 needs survey, the EPA estimated that approximately $652 million per year over the next 20 years is needed to fund the necessary capital improvements to ensure that public water systems in Michigan continue to provide safe drinking water.[606]

In 1997, Michigan amended the Shared Credit Rating Act to authorize the Michigan Finance Authority to establish the state drinking water revolving fund to comply with the requirements and objectives of the SDWA.[607] Michigan has received a total of $819,205,400 in federal funding for its SRF program.[608] For the fiscal year 2018, Michigan received $25.7 million.[609]

Michigan law requires the Department of Environmental Quality to annually establish interest rates to be assessed for projects receiving assistance from the SRF.[610] In setting interest rates, the Department must consider future demands, present demands, market conditions, and the cost of compliance with program elements.[611] Michigan's 2019 IUP establishes a 2% interest rate for loans made to municipal borrowers.[612] Private borrowers will receive an interest rate subsidy that equates to the same subsidy received by municipal borrowers.[613] According to its IUP, Michigan determines its interest rate based on loan demand, market conditions, program costs, and future needs.[614]

All proposed projects are reviewed and scored based on the criteria described in Part 54 of the Natural Resources and Environmental Protection Act.[615] Each project is assigned points, with 1,000 points being the maximum score.[616] Specifically, a maximum of 450 points may be awarded to a project that addresses drinking water quality, a maximum of 350 points is awarded to a project that addresses infrastructure improvements, a maximum of 100 points

may be awarded to communities that have completed an approved source protection program, a maximum of 50 points is awarded based on the size of the population served by the water system, and a maximum of 50 points is awarded to a community water supply that serves a disadvantaged community.[617] Based on the scores assigned to various applications, the MDEQ prepares a priority list of projects eligible to receive assistance from the state drinking water revolving fund.[618]

Notably, in early 2019 the MDEQ announced a "second call" for projects to receive below market rate loan financing from its SRF. Specifically, more than half of the available fund resources for the 2019 fiscal year were still available after all initial applications were received.[619]

Minnesota

In its 2018 needs survey, the EPA estimated that approximately $375 million per year over the next 20 years is needed to fund the necessary capital improvements to ensure that public water systems in Minnesota continue to provide safe drinking water.[620]

The Minnesota legislature has established the Drinking Water Revolving Fund so that the state can receive federal capitalization grants.[621] The Minnesota Public Facilities Authority is responsible for managing the fund and its assets, and to prepare the state's annual IUP.[622] For the fiscal year 2018, Minnesota was awarded a capitalization grant of $16.8 million.[623] It has been awarded a total of $386,290,500.

Interest rates are set at the time a loan is made according to Minnesota Rules Part 7380.0272. Interest rates are "based on the greater of the current bond market rates for tax-exempt municipal bonds as determined by a daily index, or the bond yield scale of the PFA's bonds, if PFA bond proceeds are available."[624] Minnesota's IUP establishes a base discount of 1.5% that is applied for loans up to $20 million.[625] Loans over $20 million may still be eligible for a lesser discount.[626] Lastly, a discount of up to 2.5% may be applied to systems that serve under 2,500 people.[627] However, under no circumstances may an interest rate be lower than 1%.[628]

Minnesota's project priority list is prepared by the Minnesota DOH.[629] Projects are listed in order of priority based on a point system.[630] Minnesota's point system is completely based on violations of MCLs and treatment techniques.[631] Additionally, Minnesota's scoring system assigns additional points for projects that will connect people served by private wells to a public water supply in instances where the private wells at issue have been contaminated.[632]

New York

In its 2018 needs survey, the EPA estimated that approximately $1.1 billion per year over the next 20 years is needed to fund the necessary capital improvements to ensure that public water systems in New York continue to provide safe drinking water.[633]

New York's Environmental Facilities Corporation (EFC) administers the state's drinking water revolving fund jointly with the New York DOH.[634] Since its inception in 1996, the fund has received $1.27 billion in federal funds.[635] The 2018 federal capitalization grant allotted New York $45,363,000.[636]

New York offers a variety of types of financial assistance. In 2018, New York's effective interest rate was 2.15%.[637] New York offers interest rates as low as 0% for certain projects that are eligible for hardship financing.[638]

New York scores projects with its priority ranking system.[639] The ranking system includes technical factors, such as the number of MCL and treatment technique violations, and nontechnical factors, such as governmental needs and financial needs.[640] Greater weight is given to technical factors as opposed to nontechnical factors.[641]

Ohio

In its 2018 needs survey, the EPA estimated that approximately $670 million per year over the next 20 years is needed to fund the necessary capital improvements to ensure that public water systems in Ohio continue to provide safe drinking water.[642]

In 1997, Ohio amended its code to create the drinking water assistance fund for the purpose of providing financial and technical assistance to protect public health and to achieve and maintain compliance with the SDWA.[643] The drinking water assistance fund consists of moneys credited to it from all capitalization grants received under the SDWA as well as all moneys credited to the fund from nonfederal sources.[644] In 2018, the capitalization grant awarded to Ohio was in the amount of $27,935,000.[645] It has received a total of $648,240,400.

The centerpiece of the drinking water assistance fund is the water supply revolving loan account, which provides financial

assistance for the planning, design, and construction of improvements to community water systems[646] and nonprofit noncommunity public water systems.[647] Both public and private water suppliers are eligible to receive financial assistance from the drinking water assistance fund. Proposed projects seeking funds from the water supply revolving loan account are scored based on six categories: public health, capacity to ensure continued compliance with federal and state SDWA requirements, effective management of the water system, consolidation/regionalization, economic affordability, and population.[648]

Depending on the program year and tier category a project qualifies for, the term and interest rates vary.[649] According to Ohio's 2018 IUP, the standard long-term interest rate is established based on an eight-week daily average of the municipal market data index.[650] Disadvantaged communities, small systems, and systems that meet affordability criteria are given discounted interest rates.[651]

Pennsylvania

In its 2018 needs survey, the EPA estimated that approximately $838 million per year over the next 20 years is needed to fund the necessary capital improvements to ensure that public water systems in Pennsylvania continue to provide safe drinking water.[652]

In 1988, Pennsylvania passed the Pennsylvania Infrastructure Investment Authority Act to create the Pennsylvania Infrastructure Investment Authority (PENNVEST), an entity designed to help fund water-related infrastructure projects around the state.[653] After the passage of the 1996 amendments to the SDWA, PENNVEST, along with the Pennsylvania DEP, were tasked with managing the state's use of the Drinking Water State Revolving Fund. In 2018, Pennsylvania received a federal capitalization grant of $26,351,000.[654] Pennsylvania has received a total of $691,020,300.[655]

Pennsylvania charges interest on all SRF loans based on the community's ability to repay. A minimum interest rate of 1% is required for any loan.[656] The maximum interest rate is determined by comparing the state unemployment rate to the unemployment rate of the county in which the project is located:[657]

- If the county unemployment rate exceeds the statewide average by 40% or more, the maximum interest rate allowable is 1% for the first five years of the loan term, and 25% of the state bond issue rate for the remainder of the term.
- If the county unemployment rate exceeds the statewide average by less than 40%, the maximum interest rate is 30% of the state bond issue rate for the first five years of the term of the loan, and 60% of the state bond issue rate for the remainder of the term.
- If the county unemployment rate is below the statewide average, the maximum interest rate is 60% of the bond issue rate for the first five years of the term of the loan, and 75% of the state bond issue rate for the remainder of the term.

Pennsylvania ranks eligible projects according to its ranking framework.[658] The total number of points available is 125.[659] Scoring is broken down into five sections: public health (30 points), compliance (30 points), community health (15 points), source water protection (5 points), infrastructure health (25 points), and affordability (20 points).[660] Additionally, the ranking framework allows for up to 70 additional points to be added onto a project's score. Additional points may be awarded if the project has a link to job creation or preservation and private investment; is in a community that is considered financially distressed; serves a city, borough, or township of the first class; or serves a designated brownfield site.[661]

Wisconsin

In its 2018 needs survey, the EPA estimated that approximately $428 million per year over the next 20 years is needed to fund the necessary capital improvements to ensure that public water systems in Wisconsin continue to provide safe drinking water.[662]

Wisconsin amended its code in 1997 to provide for a safe drinking water loan program to offer assistance to local government units and to private owners of community water systems that serve local government units regarding planning, design, construction, and modification projects in order to facilitate compliance with national primary drinking water regulations or to otherwise significantly further the health protection objectives of the SDWA.[663] The DNR and the Department of Administration jointly administer the program.[664] In 2018, Wisconsin received a capitalization grant of $18,931,000 from the EPA.[665] It has received a total of $398,107,585.[666]

Applicants of the safe drinking water loan program are scored based on the priority scoring criteria described in Wisconsin's regulatory code.[667] The criteria include the proposed project's impact on public health, the financial need of the public water system, and the public water system's existing technical, financial, and managerial capacity.[668] The DNR maintains a project priority list based on the priority scores assigned by the scoring criteria.[669]

The interest rates for loans made from the safe drinking water loan program vary based on the financial status of the applicant. An applicant that does not meet financial eligibility criteria established by the DNR must pay an interest rate that is 55% of the market interest rate.[670] An applicant that does meet the financial eligibility criteria established by the DNR pays a further discounted rate that is 33% of market interest rate.[671] The DNR has set the financial eligibility criteria by regulation. In order to satisfy the financial eligibility criteria and receive a lower interest rate, a municipality must have a population of less than 10,000 and must have a median household income that is 80% or less than the median household income of the state.[672] The Wisconsin Department of Administration has been charged with setting the market interest rate for the safe drinking water loan program. The current market interest rate is 3.6%.[673] Therefore, the interest rate for applicants meeting the eligibility criteria is 1.188%. For all other applicants, the interest rate is 1.980%.

State Grant Programs

Pursuant to the SDWA, capitalization grant funds received by states from the EPA generally must be used for providing loans.[674] However, the SDWA does authorize states to provide additional subsidies to "disadvantaged communities." These subsidies are discussed in the "Specific Assistance for Environmental Justice Communities" subsection later in this report.

Additionally, some states offer additional subsidies for specific projects, or have state-specific grant programs. These subsidies and grant programs are described below.

Illinois

Illinois offers principal forgiveness for LSL replacement. Specifically, the Illinois EPA will provide principal forgiveness for projects directly related to activities that reduce or eliminate lead from potable water by removing and replacing LSLs.[675] For fiscal year 2018, up to $2 million in LSL replacement principal forgiveness was available for communities with a median household income less than 70% of the state average.[676] All other loan recipients are eligible to receive principal loan forgiveness up to 50% of the initial loan amount.[677]

Indiana

Other than additional subsidies for disadvantaged communities, Indiana does not offer any other grant programs.

Michigan

Michigan operates a Source Water Protection Grant Program to public water systems for the development and implementation of a source water protection program.[678] Funds for this program are drawn from the capitalization grant provided by the EPA.[679] Other than the additional subsidies for disadvantaged communities, Michigan does not offer any other grant programs for drinking water infrastructure improvements.

Minnesota

Minnesota offers its own grant program called the Water Infrastructure Fund or WIF.[680] The WIF is administered by the Minnesota Public Facilities Authority, and it provides matching grants to communities that meet affordability criteria.[681] A system may be given a grant from the WIF if it meets affordability criteria. Specifically, a system is eligible for a grant if the average annual residential drinking water system cost would otherwise exceed 1.2% of the median household income of the project service area.[682] The amount of assistance is limited to 80% of the amount needed to reduce the average annual residential drinking water system cost to 1.2% of median household income in the project service area, to a maximum of $5,000,000 per project, or $20,000 per existing connection, whichever is less.[683] WIF grants are generally provided in conjunction with an SRF loan.

New York

In 2017, New York enacted the Clean Water Infrastructure Act.[684] This law established six New York specific grant programs, including the Lead Service Line Replacement

Grant Program, and the Drinking Water Response Account.[685] New York offers Water Infrastructure Improvement Act (WIIA) grants, which provides local governments with grants to fund drinking and wastewater treatment infrastructure projects. The 2017–2018 budget provided $2.5 billion for grant funding for the six grant programs created by the Clean Water Infrastructure Act.[686]

Ohio

Ohio's 2018 IUP states that it will provide the additional subsidy required by the Consolidated Appropriations Act of 2016 in the form of principal forgiveness.[687] The IUP specifies that the granting of principal forgiveness will focus primarily on disadvantaged communities, communities with a known contamination in drinking water wells, and communities in need of regionalization.[688]

Pennsylvania

Pennsylvania's 2018 IUP stated that it would use at least $6,840,400 of its federal capitalization grant for principal forgiveness, which is the minimum amount required based on a total allocation of $34,202,000.[689] Pennsylvania's IUP does not specifically define a "disadvantaged community."

Beyond the federally funded projects, Pennsylvania also has a few state-funded programs designed to help communities improve their water systems. The main vehicle through which these monies are distributed is the Commonwealth Finance Authority. Through legislation, Pennsylvania has created two separate pots of money that can be given out through this program through the Commonwealth Financing Authority: (1) The Small Water and Sewer grant program is designed to target smaller projects. In the fiscal years 2017–2018, the State has set aside $25 million for projects in the $30,000 to $500,000 range.[690] Municipalities or municipal authorities may apply for the program, but they must put up 15% of the grant in matching funds.[691] This money can be used for projects ranging from improvement, repair, expansion, construction, and rehabilitation of water supply or sanitary sewer systems. Additionally, it can be used to connect multiple water systems to create a regional system.[692] Money for the projects comes from the funding received by the Commonwealth Financing Authority from the Marcellus Legacy Fund.[693]

The other major source of financing is through the Pennsylvania H2O Act, passed in 2008, which sets aside money for larger projects.[694] Specifically, this money can only be used for projects between $500,000 and $20 million.[695] Furthermore, the municipality must put up 50% of the projects' total in matching funds.[696] Besides these differences, the H2O Act money is used for similar projects to those eligible for the Small Water and Sewer grant program. In creating legislation from 2008, the legislature gave the Commonwealth Finance Authority permission to take loans up to $800,000,000 to fund the project over a 30-year period.[697] This money is allocated from the Pennsylvania Gaming Economic Development and Tourism Fund.[698]

Wisconsin

Wisconsin's 2018 IUP states that it will provide the additional subsidy required by the Consolidated Appropriations Act of 2016 in the form of principal forgiveness.[699] The criteria for distribution of principal forgiveness include income, unemployment data, and population trends.[700]

Specific Assistance for Small Systems

The SDWA places a specific emphasis on small systems for the purpose of the state revolving loan fund. It expressly requires that 15% of each capitalization grant shall be made available solely to provide loan assistance to public water systems that regularly serve fewer than 10,000 persons.[701] Additionally, states are eligible to provide a 2% set-aside from their capitalization grant to provide technical assistance to public water systems serving 10,000 or fewer persons in their IUP.[702] Set-asides are statutory authorizations for a state to spend a certain percentage of its capitalization grant for specific uses and programs.

Illinois

In 2018, approximately 10% of the projects on Illinois' Intended Funding List were projects serving fewer than 10,000 persons.[703] The Illinois EPA has stated that it intends to take steps to increase the amount of funding to small systems in the future.[704] Illinois' 2018 IUP includes a 2% set-aside for technical assistance for small public water systems. Illinois intends to "bank" the entirety of this amount for future use.[705]

Indiana

According to its IUP, the Indiana Finance Authority regularly makes at least 15% of its federal capitalization grant available for small systems only.[706] Additionally, population is a criterion of the project priority system in Indiana, and small systems receive more priority points than large systems, per population monitoring by the State.[707] The first quarter project priority list for 2019 included 19 small systems, and accounted for 63% of the total list, and constituted 26% of the total project costs for the list.[708]

Michigan

Michigan's 2019 IUP includes a set-aside for technical assistance for small public water systems. The IUP requested that 2% of the capitalization grant be set aside to provide technical assistance to small water systems.[709] Michigan's 2019 IUP also states that it must provide $4,089,900 to water suppliers serving fewer than 10,000 people to meet the 15% required by the SDWA for small systems.[710]

Minnesota

In Minnesota's 2019 IUP, one of their listed set-aside goals was to provide technical assistance to small systems.[711] Specifically, Minnesota sought to give operators of small systems "personal, non-regulatory technical assistance ... so they can effectively manage the complexities of the systems they operate, and for operators whose systems utilize groundwater, to also identify and manage potential sources of contamination."[712] In fiscal year 2018, Minnesota set aside approximately $294,940 of its federal capitalization grant in order to accomplish this goal, which is nearly the entire allotment for the small system assistance set-aside allowed under the federal SDWA.[713]

New York

In its 2019 IUP, New York State planned to use $900,000, which is 2% of the total annual federal capitalization grant, to continue to fund the enhancement of the State's existing Small Water Systems and Comprehensive Performance Evaluation Programs and provide for "direct technical assistance to small water systems."[714]

Ohio

Ohio's 2018 IUP includes a set-aside for technical assistance for small public water systems. Specifically, the Ohio EPA has proposed to set aside 2% of its capitalization grant to provide technical assistance for small public water systems.[715] Additionally, Ohio offers more favorable interest rates to certain small public water systems.[716] All water systems that serve a population of 5,000 or less will receive an interest rate that is 0.5% less than the standard long-term interest rate.[717] Water systems that serve a population of less than 2,500 with a median household income of $50,547 or less will receive an interest rate of 0%.[718] Water systems that serve a population between 2,500 and 10,000 with a median household income of $46,948 will receive an interest rate of 1%.[719]

Pennsylvania

In its 2018 IUP, Pennsylvania planned to use 2% of the total annual federal capitalization grant to provide technical assistance to small systems.[720] Pennsylvania has also created the small water systems regionalization grant program to assist small systems with the cost of feasibility studies for the development of a regional water system.[721] Small systems may obtain up to $75,000 in grant funding through this program.[722] Additionally, Pennsylvania has created the small water systems technical and management assistance program.[723] The primary purpose of this program is to coordinate ongoing training, and to comment on policies and regulations that may impact small water systems.[724]

Wisconsin

Wisconsin's 2019 IUP includes a 1.2% set-aside for technical assistance for small public water systems.[725] Additionally, small public water systems that serve a disadvantaged community are also eligible for a discounted interest rate.[726]

Specific Assistance for Source Water Protection

The SDWA specifically authorizes the use of capitalization grants for the protection of source waters that serve as drinking water intakes for public water systems. States are authorized to use up to 10 percent of their capitalization grant to, among other things, administer or provide technical assistance through source water protection programs and for public water system supervision program so long as the state matches the expenditures with an equal amount of state funds.[727]

Additionally, states may utilize up to 15% of their capitalization grant to, among other things, issue loans to a public water system for the acquisition of land or the acquisition of a conservation easement so long as the purpose of the acquisition is to protect the source water of the system from contamination and to ensure compliance with national primary drinking water regulations.[728] For community water systems, a state may provide a loan from its SRF for the system to implement local, voluntary source water protection measures to protect source water.[729]

Illinois

Illinois' scoring criteria for its public water supply loan program prioritizes applicants that have taken specific steps to protect their source water by including it as a scoring factor in its Loan Priority Index.[730] While Illinois has claimed the 10% state program management set-aside, it plans to bank the total amount for future use.[731] While these funds may be used for source water protection in the future, the federal SDWA also allows these funds to be used for other purposes.

Indiana

Indiana's 2018 IUP includes a $500,000 state program management set-aside for a water supply study in Southeastern and Central Indiana.[732] The study will assess the current water supply for these regions, and assess the future demand and cost of infrastructure needed to meet the future demand.[733] Indiana's scoring criteria provides for 1 bonus point for projects that include wellhead protection plan implementation measures.[734]

Michigan

As described previously, Michigan's 2019 IUP states that MDEQ is planning to utilize $400,000 from the 2018 wellhead protection set-aside to provide funding for the 50/50 match grants for source water protection efforts by local communities.[735] The 2019 IUP also requests approximately $1,363,300 (5%) of the federal capitalization grant for a wellhead protection set-aside.[736]Additionally, the 2019 IUP includes a request for a 10% set-aside to provide local assistance for capacity development to specifically support new and existing staff regarding source water protection activities.[737]

Michigan's scoring criteria for its state drinking water revolving fund awards points for projects that address source water protection. Specifically, Michigan's scoring criteria awards 50 points for infrastructure improvements that address source water protection.[738] Additionally, Michigan's scoring criteria awards an additional 100 points to communities that have completed an approved source water protection program.[739]

Minnesota

For the 2019 fiscal year, Minnesota did not use any of the federal capitalization grant for "source water protection."[740] However, the State did allot 10%, approximately $1,695,500, in funding for wellhead protection[741] in order to "effectively manage potential contaminant sources in the areas that contribute water to wells."[742] Additionally, Minnesota assigns 25 priority points to eligible projects if there have been one or more violations of the maximum contaminant level for total coliforms[743] when said coliform is found to be present in wells of groundwater systems or at a point of entry for a surface water system within 36 months.[744]

New York

New York's 2019 IUP states that it will use 10% of its federal capitalization grant to administer its Public Water System Supervision (PWSS) program.[745] In part, the PWSS assures that public water systems are operated in a manner that ensures adequate protection of source water(s).[746] The listed goals for the PWSS program for 2019 include the continued implementation of the Source Water Assessment and Protection Programs (SWAP) and the Well Head Protection Program.[747] In addition, project scoring points are awarded for a point or nonpoint source project that is necessary "to preserve, protect and/or improve surface and/or groundwater quality from a source of pollution."[748]

Additionally, the Clean Water Infrastructure Act of 2017 created a grant program for land acquisition projects with a purpose of source water protection.[749] In total, $110 million was appropriated for this program in the 2017–2018 fiscal year.[750]

Ohio

One of the long-term goals expressed in Ohio's 2018 IUP is to utilize the drinking water assistance fund to assist public water systems in efforts to update source water assessments and to provide technical assistance to promote locally developed source water protection plans.[751] Ohio's 2018 IUP also states that it intends to set aside 5% of its

capitalization grant for the Public Water Systems Supervision program.[752] This program includes the implementation of Ohio's Harmful Algal Bloom Response Strategy.[753] The funds will be utilized to support the Ohio EPA staff to assist public water systems in their response to raw and finished water cyanotoxin detections.[754]

Additionally, Ohio's 2018 IUP includes a set-aside of 5% for funding to implement voluntary, incentive-based source water quality protection measures.[755] These funds would be used to fund staff to assist new public water systems in completing source water assessments and to provide direct technical assistance to public water systems in the development and implementation of source water protection plans.[756] In regard to scoring criteria, the Ohio EPA awards 5 bonus points if a public water system has an endorsed source water protection plan.[757]

Pennsylvania

Pennsylvania's 2018 IUP indicates that they will set aside $3,420,200 to be allocated to a continuation of source water protection.[758] This funding will come mainly from the set-asides allowed under the SDWA for "other activities" and the "state programs."[759]

Additionally, Pennsylvania's priority rating factors award a maximum of 5 points to systems that practice source water protection.[760]

Wisconsin

In its 2018 IUP, Wisconsin has proposed to set aside portions of the capitalization grant for programs that focus on source water protection. It has proposed to utilize its capitalization grant to sponsor three workshops to provide training to teachers on the use of the groundwater sand tank model and associated outreach to promote source water protection through increased local awareness.[761] Wisconsin's priority scoring system awards 10 points if a project addresses a source or capacity deficiency where there is demonstrated need within the existing public water system.[762]

Specific Assistance to Address Lead and Copper

While the SDWA does not specifically refer to lead and copper contamination in regard to state revolving loan funds, states have expressed intentions to use capitalization grants to help provide technical assistance to public water systems regarding lead and copper monitoring and reporting. Additionally, some states have incorporated compliance with the LCR into scoring criteria.

Illinois

Illinois provides a 0.2% discount from the otherwise applicable rates for projects where at least 50% of the eligible project costs fund the removal or replacement of lead in water mains or service lines.[763] Additionally, Illinois provides principal loan forgiveness for projects that involve the removal and replacement of LSLs.[764]

Indiana

Indiana's scoring criteria gives priority to projects that address the most serious risks to human health, including the replacement of LSLs.[765] As discussed in the "Lead as a Drinking Water Contaminant" section of this report, Indiana law expressly allows for water utilities to replace privately owned LSLs.

Indiana has also set aside approximately 20% of its 2018 capitalization grant for additional subsidization for "eligible recipients" which include debt relief for projects that address a threat to public health from heightened exposure to lead in drinking water.[766] This additional subsidization set-aside is also available if a federal or state agency has issued an emergency declaration to a municipal water supply due to a threat to public health from heightened exposure to lead.[767]

In 2018, the Indiana Finance Authority implemented a Lead Sampling program for Indiana Public Schools.[768] Funding for the Lead Sampling program was taken from the federal capitalization grant, and lead sampling was listed as one of the program's goals in 2018.[769] Additionally, the Indiana Finance Authority allows certain projects to go through a "bypass procedure," wherein projects outside the state's defined "fundable range" may still receive funding through the Drinking Water State Revolving Fund (DWSRF); such projects include those that address the loss of safe drinking water due to lead contamination.[770]

Michigan

In its 2018 IUP, Michigan requested an 8% set-aside for local assistance and capacity development.[771] This set-aside would be used to support new and existing staff,

whose responsibilities would be to provide direct technical assistance to public water supplies, including implementing a centralized approach to community water supply LCR oversight.[772] Specifically, this would consist of a staff-level analyst and a lead and copper compliance specialist processing all lead and copper monitoring, conducting statewide reporting, and providing assistance to public water systems.[773] Additionally, the 2018 IUP proposed to forgive the city of Flint its prior debt totals of $20,770,336 using the capitalization grant additional subsidy amount.[774] Michigan has made private side LSL replacement explicitly an allowable expense under the DWSRF program.[775]

Minnesota

Minnesota's SRF does not give any specific financial assistance for entities seeking to control copper/lead contamination.

New York

In its 2018 IUP, New York does not offer any specific financial assistance for copper and/or lead contamination. However, in the State's Priority Ranking System Scoring criteria, it does award 30 points to potential DWSRF recipients for projects that address copper/lead corrosion.[776]

Additionally, the Clean Water Infrastructure Act of 2017 created a LSL replacement grant program.[777] Priority is given to regions with documented elevated levels of childhood lead blood levels, to low-income communities, and to water systems with a high number of LSLs in need of replacement.[778] A total of $20 million was appropriated for this program in the 2017 to 2018 fiscal year.[779]

Ohio

Ohio's 2018 IUP specifically states that it is accepting applications for 0% interest planning loans, including planning loans for conducting corrosion control studies, mapping the location of LSLs, and developing public notification systems.[780] Additionally, Ohio expressly states that it will accept nominations for construction loans with normal interest rates to replace LSLs.[781] In 2019, Ohio will offer up to $5 million in 0% interest loans to projects that involve the total replacement of LSLs. These funds are only available for projects that entirely replace both the publicly and privately owned portions of the LSL.[782]

Ohio's SDWA also permits the Ohio EPA to provide financial assistance from the drinking water assistance fund to community water systems and nontransient, noncommunity water systems to map areas of the system that are known or are likely to contain LSLs; to identify characteristics of buildings served by the system that may contain lead piping, solder, or fixtures; and to comply with corrosion control requirements.[783] Additionally, Ohio has created a Lead Plumbing Fixture Replacement Assistance Grants Program, which was appropriated $12 million in 2016.[784] The program is to be used by the Facilities Construction Commission to provide funding to eligible public and chartered nonpublic schools for the reimbursement of the cost of replacing drinking water fountains, water coolers, plumbing fixtures, and limited connected piping that are found to contain lead above the federal action level in drinking water.

Ohio also incorporates lead and copper in its scoring criteria. If a water system has exceeded the copper action level, it is given 25 points.[785] If it has exceeded the lead action level, it is given 45 points.[786]

Pennsylvania

In the fall of 2017 the Pennsylvania legislature amended the Fiscal Code to expressly provide local entities with the ability to replace private water laterals and sewer laterals if it is determined that doing so will benefit the public health.[787] Moreover, the act condones the use of public funds to do so.[788] Prior to this act, no express provision banned these water systems from doing this, but there is a provision preventing water systems from using funds received through the DWSRF for the repair of laterals.[789] Thus, while Pennsylvania does not specifically allocate funds to this process in its IUP to the DWSRF, it does free up the use of public monies to be used for the removal of lead and other pipes that are deemed to have a negative impact on public health. The 2018 IUP does state that identifying options and opportunities to utilize the SRF to help systems address potential issues with lead in drinking water is one of their short-term goals.[790]

Wisconsin

Providing assistance to public water systems that have replaced or will be replacing LSLs is both a long-term and short-term goal in Wisconsin's 2018 IUP. In the short-term, Wisconsin will provide financial assistance in the form of principal loan forgiveness to economically disadvantaged

communities for the purpose of replacing privately-owned LSLs.[791] In order to be eligible to receive this assistance, a local government unit's population must be less than 10,000 and its median household income must be 80% or less when compared to the median household income in Wisconsin as a whole.[792] In 2017, Wisconsin awarded 35 financial assistance agreements for LSL replacements totaling $13,781,375.[793] In 2018, Wisconsin plans to issue an additional $13,026,510 in principal forgiveness for LSL replacement projects.[794] In the long term, Wisconsin's stated goal is to replace all remaining LSLs in their entirety.[795] Additionally, Wisconsin's most recent IUP requires any funding for water main replacements to include the complete removal of all lead components of service lines from the water main to the water meter.[796]

Wisconsin also incorporates lead and copper contamination considerations into its scoring criteria. Four points is awarded if a project includes the replacement of LSLs.[797]

Specific Assistance for Environmental Justice Communities

The SDWA provides that a state making a loan from its SRF to a disadvantaged community or to a community that it expects to become disadvantaged may provide additional subsidization, including the forgiveness of principal.[798] A disadvantaged community is defined as the service area of a public water system that meets affordability criteria established by the state after public review and comment.[799] However, for each fiscal year, a state may not grant subsidies to disadvantaged communities in excess of 30% of the capitalization grant received that year.[800]

Illinois

Illinois has established a "hardship" interest rate of 1% for certain water systems. This interest rate is available to systems that serve less than 10,000 and that meet at least one of the following criteria: (1) the public water supply's service population has a median household income below 70% of the statewide average; (2) the public water supply's service population has an unemployment rate of at least 3% greater than the statewide average; or (3) the public water supply's annual user charge is greater than 1.5% of the median household income of the public water supply's service population.[801]

Additionally, in 2018, Illinois made $10,317,900 of its capitalization grant available for principal forgiveness for loan recipients who meet the definition of a "disadvantaged community," which is 30% of its capitalization grant.[802] According to Illinois' 2018 IUP, all qualifying loan recipients could seek principal forgiveness in the amount of 50% of the initial loan amount up to a maximum of $500,000.[803] Illinois defines a "disadvantaged community" as all systems that serve a population with a median household income less than or equal to the state average and a population of less than or equal to 25,000, or systems with a population greater than 25,000 and with a median household income of less than 70% of the state average.[804]

Indiana

Indiana's scoring system prioritizes projects based on the affordability of drinking water as follows: 5 points awarded if the post-project annual water bill will be greater than or equal to 1.5% of the median household income of the population served; 4 points awarded if the post-project annual water bill will be 1.0%–1.4% of the median household income of the population served; and 1 point awarded if the post-project annual water bill will be less than or equal to 0.9% of the median household income of the population served. [805]

In its 2018 IUP, Indiana did not specify how much additional subsidization it planned to provide to disadvantaged communities. Instead, Indiana simply states that it may, at its discretion, utilize up to 30% of its capitalization grant for such purposes. The 2018 IUP did not set a cap on the amount of principal forgiveness that a community may receive.[806]

Indiana may offer lower interest rates and a term length of 30 years to disadvantaged communities. Interest rates are not specified, and are set at the discretion of the Indiana Finance Authority using the calculation described in the IUP.[807] The 2019 IUP defines a "disadvantaged community" as a community that meets any of the following criteria: median household income below 80% of the state's median household income; an estimated post project user rate greater than $45 per month; and an average annual residential post project user rate that would exceed 1% of the community's median household income.[808]

Michigan

In its 2018 IUP, the MDEQ stated that it would use 20% of its capitalization grant to provide additional subsidies in the form of principal loan forgiveness to eligible borrowers.[809]

In order to be classified as a disadvantaged community in Michigan, an applicant must meet three criteria. First, the applicant must meet the definition of "municipality" as defined by Part 54 of the Natural Resources and Environmental Protection Act.[810] Accordingly, a municipality is defined to include a city, village, county, township, authority, public school district, or other public body with taxing authority, including an intermunicipal agency of two or more municipalities, authorized or created under state law.[811] Second, the median annual household income of the area to be served must be less than 120% of the state's median annual household income.[812] Third, the applicant must satisfy one of the following criteria: more than 50% of the area to be served is identified as a poverty area by the U.S. Census Bureau, the median annual household income of the area to be served is less than the most recently published federal poverty guidelines for a family of four in the contiguous United States, the median annual household income is less than the updated statewide median annual household income and the annual user costs for water supply exceed 1% of the service area's median annual household income, or the median annual household income is more than the statewide median annual household income and the annual user costs for water supply exceed 3% of the service area's annual median household income.[813]

If a community qualifies as a disadvantaged community, then it can be awarded 50 additional project priority points,[814] can have its loan term extended up to 30 years after the date of project completion,[815] and, if the disadvantaged community has a population of less than 10,000 people, receive technical assistance to cover project planning costs.[816]

Minnesota

In 2018, Minnesota provided a total of $5,692,573 in principal forgiveness, which is approximately 38.5% of its capitalization grant, to subsidize improvements in disadvantaged communities.[817] This assistance is available for systems where the average annual residential drinking water system cost would otherwise exceed 1.2% of the median household income of the project service area.[818] The amount of assistance is limited to 80% of the amount needed to reduce the average annual residential drinking water system cost to 1.2% of median household income in the project service area to a maximum of $5,000,000 per project, or $20,000 per existing connection, whichever is less.[819]

New York

New York's 2018 IUP states that it is anticipated that it will use 20% of its federal capitalization grant to provide principal forgiveness to disadvantaged communities, which is the minimum amount allowed by federal law.[820] New York restricts principal forgiveness to a total of $14 million over a five-year period.[821] A "disadvantaged community" is defined as a community with a population of less than 300,000 people with a median household income that is less than 80% of the regionally adjusted statewide median household income, or that has an American Community Survey family poverty rate that is greater than the statewide family poverty rate of 12%.[822]

New York considers a variety of nontechnical factors in scoring projects, and some of these factors are relevant for environmental justice communities. Specifically, New York's scoring criteria may assign between 5 and 25 points to a project based on the median household income of the community in which the water service area is located.[823]

Additionally, New York offers reduced interest rates and grants to disadvantaged communities. In general, a water system must serve a population of less than 300,000 persons, and the median household income of the population served must be less than 80% of the regionally adjusted statewide median household income.[824] Projects are limited to the lesser of $3 million, or 60% of the total project costs.[825]

Ohio

According to Ohio's administrative code, a community is eligible to be designated as disadvantaged and therefore receive loan assistance if it meets the following criteria: a nonprofit public water system operates or provides water to a community water system, a public water system is regulated by the public utilities commission of Ohio and operates or provides water to a community water system, a political subdivision[826] operates or provides water to a community water system or a nonprofit noncommunity public water system.[827] If an applicant is eligible, the Ohio EPA may designate an applicant as a disadvantaged community based on the consideration of at least five

criteria.[828] The Ohio EPA must consider whether the applicant serves populations with costs per user for water and sewer services that are greater than statewide values, whether there is the potential for serious public health risks for users served by the applicant, the median household income in the area served by the applicant, the number of people served by the applicant, and the poverty rate of the community served by the applicant.[829] Additionally, the Ohio EPA may consider other factors such as unemployment, population growth, age distribution of population, and other socio-economic factors in making a determination as to whether an applicant is a disadvantaged community.[830] The Ohio EPA determines whether an applicant qualifies for disadvantaged community status based on the scoring criteria described in Appendix F of its 2018 IUP.[831]

If eligible according to the requirements described in the paragraph above, the Ohio EPA may award financial assistance from the water supply revolving loan fund.[832] The amount, form, and duration of each award of financial assistance to a disadvantaged community are at the discretion of the Ohio EPA.[833]

Pennsylvania

While PENNVEST does not explicitly indicate that it provides special assistance for environmental justice communities, its IUP as well as the EPA criteria for applications to the DWSRF ensure some money is set aside for disadvantaged communities. Disadvantaged communities are identified based on a financial capability analysis that compares various community-specific demographic data to similarly situated communities across the state.[834] In 2018, Pennsylvania planned to make a minimum of $6,840,400 available to disadvantaged communities for principal loan forgiveness.[835] Pennsylvania also offers reduced interest rates and/or extended terms for disadvantaged communities.[836]

Wisconsin

Wisconsin offers two additional benefits to disadvantaged communities. First, a local government unit that has a population of less than 10,000 and that has a median household income of 80% or less of Wisconsin's median household income receives an interest rate that is 33% of the State's market rate.[837] Second, all applications submitted are analyzed with and given an affordability criteria score in addition to the general priority criteria score. Pursuant to the affordability criteria, an applicant can be awarded up to 165 points.[838] The criteria include population, median household income, projected population loss, and unemployment rate.[839] Principal forgiveness funds are allocated to the highest priority projects in municipalities with the greatest financial need as determined by the affordability criteria score.[840]

On a quarterly basis, the Wisconsin Department of Administration or DOA assesses the market rate on which Environmental Loans Program subsidies are based. Then environmental loans are provided at or below the market rate. The DOA has set the market rate at 3.4% for loans with municipal meetings on or after July 1, 2018 through September 30, 2018.[841]

Summary

While the DWSRF Program was created by the 1996 Safe Drinking Water Act Amendments, it has been subject to changes in subsequent funding appropriation bills. In the aftermath of the 1996 Safe Drinking Water Amendments that originally created the program, all of the states surveyed created their state loan funds through a variety of statutory mechanisms in order for eligibility to receive federal assistance. In general, Minnesota and Indiana received the least via their capitalization grants in 2018, with both receiving just less than $17 million. New York and Illinois are the only two states that received more than $40 million. However, it's also worth noting that New York's capitalization grant was the lowest per capita, while Illinois' was the highest.

The SDWA also requires states to offer a baseline of support to small water systems. While the SDWA authorizes states to provide assistance to disadvantaged communities via loan subsidies, states are not required to provide such assistance. As a result, the assistance states provide to disadvantaged communities varies. Michigan offers applicants that qualify as a disadvantaged community more points on its application and an extended loan term. Ohio may award financial assistance in the form of an increased loan term, lower interest rate, or some other form for eligible disadvantaged communities, but such determinations are at the discretion of the Ohio EPA. While Wisconsin offers a lower interest rate to disadvantaged communities, the community must also be a small system in order to be eligible.

Public Participation in Standards, Permits, and Enforcement

Overview

Drinking water is one of the most precious and important public resources that the government regulates. Regulation of water systems directly impacts nearly every member of the public. The question is, to what extent can the public participate in key aspects of the regulation?

The federal government and all the states involved have an administrative procedures act (APA) that regulates how agencies can promulgate rules and adjudicate disputes. Often, those APAs provide opportunities for public participation such as commenting and challenges to government action no matter the underlying substantive law. This report acknowledges that fact, but focuses on what the drinking water laws themselves provide by way of public participation.

Three areas of focus were chosen: standards, permits, and enforcement.

In this section of the report, the main questions explored are as follows:

- When it comes to developing and altering standards such as MCLs and treatment techniques, what opportunities for public participation do the drinking water laws provide?
- When it comes to issuing permits for either construction or operation of systems, what opportunities for public participation do the drinking water laws provide?
- When it comes to enforcing the drinking water laws against alleged violators, or challenging permits and other agency actions, what opportunities for public participation do the drinking water laws provide?

Federal

In terms of developing standards, the SDWA itself provides various opportunities for public notice and comment and for public hearings. Some of them relate to its own implementation of the substantive aspects of the drinking water scheme. For example, any time it proposes a national primary drinking water regulation that includes an MCL or treatment, the EPA seeks public comment on the analysis of health risk reduction benefits and costs.[842] Others relate to the EPA's role of overseeing states trying to obtain or maintain primary enforcement authority. For example, if the EPA finds that a state has abused its discretion in granting exemptions or variances, it holds a public hearing.[843]

In terms of permits, compared to other environmental laws such as the Clean Water Act and Clean Air Act, the SDWA does not have a formal permitting scheme for construction or operation of water systems.

With regard to enforcement, the SDWA provides for citizen enforcement of the federal law. Citizen enforcement provisions are found in several federal environmental laws and they allow citizens to directly sue alleged violators. Based on the SDWA, any person can bring a civil action against any person or relevant agency for violating the law.[844] However, any person desiring to initiate the civil action must first provide a minimum of 60 days of notice to the violator and the relevant agencies. If prior to filing the civil action the responsible government agency "diligently prosecutes" its own civil action against the violator to enforce the law, that complicates the citizen's ability to continue with the civil action.[845] Citizens who are successful can obtain court orders that help ensure future compliance, compel the violator to pay financial penalties to the United States Treasury, and require the violator to pay the citizen's attorney fees.

Illinois

Standards

Illinois' APA regulates rulemaking generally, which provides various opportunities for public involvement.[846] However, the APAt's general rulemaking provisions do not apply to Illinois drinking water law.[847] Under Title IV of the Illinois Environmental Protection Act, the Illinois Pollution Control Board is directed to adopt regulations "identical in substance" to certain federal EPA regulations and the amendments to them. [848] These regulations include those promulgated by the U.S. EPA to implement sections 1412(b), 1414(c), 1417(a), and 1445(a) of the federal SDWA.[849] Section 1412(b) of the SDWA covers primary standards. Additionally, the Illinois Environmental Protection Act expressly states that the procedures for rulemaking in the Illinois APA does not apply rules adopting federal drinking water standards.[850] However, the Illinois Environmental Protection Act does require the Illinois Pollution Control Board to provide for notice and public comment before adopted rules are filed with the Secretary of State.[851]

While the Illinois Environmental Protection Act requires the Illinois Pollution Control Board to adopt regulations that are identical in substance to specified federal regulations, it is not restricted from adopting additional, Illinois-specific regulations. Any such regulations would be subject to the Illinois APA's general rulemaking requirements.

Permits

The Illinois EPA requires all systems to obtain both a construction permit and an operating permit.[852] A construction permit is required prior to the construction of any new community water supply installation; prior to all alterations, changes, or additions to an existing community water supply that may affect the sanitary quality, mineral quality, or adequacy of the community water supply; and prior to adding any new chemicals to the treatment process or changing the points of chemical application.[853] A construction permit is not required prior for "normal work items," which expressly includes the following:[854]

- Installation of customer service connections to distribution system mains
- Installation or replacement of hydrants and valves in the distribution system
- Repair of water mains, including replacement of existing water mains with mains of equivalent size pipe in the same location
- Routine maintenance of equipment, such as painting, reconditioning, or servicing
- Replacement of chemical feeders, pumps, controls, filter media, softener resins, pipes and appurtenances that have the same rater capacity as existing facilities previously permitted by the agency
- Installation or replacement of meters

An operating permit is required for any community water supply that obtains a construction permit, and it must be obtained before the system or modification to the system is placed in service.[855]

None of Illinois' drinking water statutes or regulations require the Illinois EPA to consider public input in the issuance of either construction or operating permits.

Enforcement

Title VIII of Illinois' Environmental Protection Act governs enforcement of environmental law.[856] The Illinois EPA makes investigations of a potential violation either upon the request of the Illinois Pollution Control Board, or upon the receipt of any information concerning an alleged violation.[857] If the Illinois EPA is unable to reach a compliance agreement with the alleged violator, then the Illinois Attorney General or the State's Attorney of the county in which the alleged violation occurred shall serve upon the alleged violator a formal complaint, and shall require the alleged violator to answer to the charges at a hearing before the Illinois Pollution Control Board.[858] A copy of the notice of the hearing must be sent to any person who has complained to the Illinois EPA within six months preceding the formal complaint, and to any person in the county in which the offending activity occurred who has requested notice of enforcement proceedings.[859] All hearings are open to the public, and any person may submit written statements to the Board.[860]

Additionally, Illinois' Environmental Protection Act provides citizens with the opportunity to file a complaint with the Pollution Control Board against any person allegedly in violation of the Act, any rule or regulation adopted under the Act, any term or condition of a permit, or any Board order.[861] Unless the Illinois Pollution Control Board finds that the complaint is duplicative or frivolous, then the complaint is

heard by a hearing in front of the Illinois Pollution Control Board.[862] If the Board denies relief, the plaintiff may file a civil suit for injunctive relief after a minimum of 30 days.[863]

Indiana

Standards

Indiana's APA regulates rulemaking generally, which provides various opportunities for public involvement.[864] Indiana's statutes and regulations do not include any public participation requirements that specifically apply to the creation or amendment of drinking water standards.

Permits

Indiana requires all systems to obtain a construction permit.[865] A construction permit is required prior to the installation or modification for any facility, equipment, or device of any public water system.[866] However, a construction permit is not required for the replacement of equipment of similar design and capacity, so long as the replacement will not adversely change the plant's operation, its hydraulic design or waste products, or the water distribution system design, operation, or capacity.[867] Once a construction permit is granted, the system cannot make any changes to the system, other than the replacement of equipment of similar design and capacity, without first receiving an amended construction permit.[868] None of Indiana's drinking water statutes or regulations provide for public involvement in the issuance of construction permits, nor do they allow a private citizen to challenge the issuance of a permit.

Somewhat curiously, regulated water utilities may choose to submit an environmental compliance plan detailing how the water supply system plans to comply with the SDWA.[869] The procedures for environmental compliance plans include a public hearing,[870] but these procedures are voluntary to public utilities.[871] While not technically part of the permitting process, public hearings on environmental compliance plans bear some resemblance to public involvement in permitting—but since all of it is voluntary, all the initiative lies with the utility.

Enforcement

There is no ability for citizens to enforce the state drinking water law in Indiana courts.

Indiana's statutes and legislation do not provide the public with any opportunities for meaningful involvement in enforcement proceedings involving public water systems. While the Indiana Department of Environmental Management is required to notify the alleged violator that it believes a violation may exist, and to offer the alleged violator with an opportunity to enter into an agreed order, it does not require any public notice, hearing, or comment period regarding any such order.

Michigan

Standards

Michigan's APA regulates rulemaking generally, which provides various opportunities for public involvement.[872] Other than what is part of the tiered public notice scheme, there is nothing in the drinking water law that expressly requires or encourages public notice and comment on establishing MCLs, treatment techniques, analytic methods, or any other aspect of drinking water standards.[873]

MDEQ regulates chemicals or substances that may be added to a public water supply, or materials that may be used in one, which are all referred to as "products."[874] Should MDEQ find that a product does not meet the applicable standards, MDEQ notifies the water system and provides it an opportunity to request a hearing.[875] While this is likely a public hearing given how administrative agencies typically behave, the wording does not make it clear.

Permits

MDEQ issues construction permits for water systems,[876] but does not issue operating permits. For construction permit applications, MDEQ evaluates the ability for the water system to satisfy the drinking water standards.[877] Normally, there is no public notice and comment period for construction permits. However, for certain community water systems that have large capacities, when MDEQ evaluates the impact of the water withdrawal on the watershed,[878] it provides public notice of its evaluation and a comment period of at least 45 days.[879] High-capacity water system construction permitting is the only kind of permitting in Michigan where the law requires public notice and comment.[880]

Enforcement

There is no ability for citizens to enforce the state drinking water law in Michigan courts.

There is not much in the way of public participation in MDEQ enforcement. If based on inspection the MDEQ issues an order to a water system, the system alleged to be in violation can request a public hearing within 30 days of the order. While members of the public can presumably attend such a hearing, nothing in the law requires public notice of it. Otherwise, the drinking water law does not require or encourage the public to comment on MDEQ enforcement activities.

Members of the public can challenge agency actions, including but not limited to permits, orders, and variances.[881] In Michigan, these challenges are called contested case hearings. While the Michigan APA provides the details on how these hearings are conducted, the drinking water law expressly authorizes citizens to file the challenges.

Minnesota

Standards

Minnesota's APA regulates rulemaking generally, which provides various opportunities for public involvement.[882] Other than what is part of the tiered public notice scheme, there is nothing in the drinking water law that expressly requires or encourages public notice and comment on establishing MCLs, treatment techniques, analytic methods, or any other aspect of drinking water standards.

Permits

Before construction of any new public water system, the owners of at least 50% of the area to be served must sign a petition asking for the establishment of a water system. This petition is to be filed with the county auditor (if within one county) or the court administrator of the district court (multiple counties).[883] An appointed engineer conducts a preliminary survey,[884] the results of which are to be presented at a preliminary public hearing.[885] The auditor or court administrator must give at least 10 days' notice to everyone affected before this hearing.[886] If the board or court finds in favor of moving forward with the construction, the engineer must perform a detailed survey,[887] followed by a second public hearing.[888] The court or board must notify all interested persons and parties of the second hearing between 25 and 50 days before the hearing.[889] This is followed by an assessment and a final, smaller hearing before an order is issued.[890]

However, there are limited opportunities for the public to have input regarding modifications to a public water system. After the board or court has ordered the establishment of a water system, the board or court appoints a water and sewer commission to maintain the water system. Subject to the approval of the county board (or of county boards in multicounty systems), this commission has broad authority and discretion to maintain and modify the water system within its charge.[891] All construction and modification is subject to approval by the commissioner of the Minnesota DOH, insofar as it would have an effect on the public health.[892] Maintenance and improvement construction in public rights-of-way is governed by local ordinance and require no franchises.[893]

Parties aggrieved by any order from the board or court in any water system proceeding may appeal in the state district courts.[894] The Minnesota APA governs all citizen appeals from agency granting or denial of permits—here, aggrieved individuals can seek redress directly and individually from the permitting agency.[895] This process is known as a contested case proceeding, and it includes notice, a hearing, and cross-examination.[896]

Minnesota does not issue operating permits to water systems; the DOH only licenses water system operators individually.[897] Subject to the Minnesota APA, the commissioner is empowered to promulgate water quality standards and rules no less stringent than federal rules and standards.[898]

Enforcement

Minnesota does not provide members of the public with the opportunity to comment on enforcement proceedings, and it does not provide the public with any opportunities for meaningful involvement in enforcement proceedings of public water systems.

New York

Standards

New York's APA regulates rulemaking generally, which provides various opportunities for public involvement.[899] The New York DOH sets the state drinking water standards and any rules or regulations relating to drinking water.[900] Apart from the rulemaking procedures set out in the APA, a few administrative provisions are in place. Any new rules or regulations must be published in at least one newspaper in the county where a water supply that would be subject to the rule or regulation is located; this must happen at least once per week for two consecutive weeks.[901] Since no timeframe for such notice is mentioned, this must happen 60 days before the adoption of the rule.[902] If the DOH commissioner recommends lowering MCLs (that is, tightening standards), the State must hold a public hearing within one year of the recommendation.[903] Otherwise, public hearings are not a part of the rulemaking process.[904]

Permits

In New York's nomenclature, what most other states would call public water supply systems are included in the definition of water withdrawal systems.[905] All systems withdrawing more than 100,000 gallons of water per day, including both private and public water supply systems, must obtain a water withdrawal permit.[906] Initial permits (for new withdrawal systems) last for a period not exceeding 10 years.[907] After the initial permit expires, the permit must be renewed.[908] New York's environmental regulations, which encompass drinking water regulations, include permit application and renewal procedures. These procedures include public notice and comment for all "major" projects, while minor projects may be subject to fewer notice requirements at the discretion of the permitting department.[909] Minor projects include initial permits, ownership changes, extension of water districts to existing facilities, and enlargements of existing facilities resulting in minor withdrawal volume increases.[910] Renewal procedures for permits do not include opportunities for public involvement;[911] this means that in the permitting process, the only real opportunity for public notice and comment are in cases of larger expansions of public water systems.

Enforcement

New York drinking water law authorizes "any person interested in the protection of the purity of the water supply" to maintain an action in a court of record against any person for allegedly violating DOH water quality rules and regulations.[912] However, this is only an option if the DOH commissioner has issued an order to the local board of health to enforce compliance and the board has failed to enforce the order of the commissioner within 10 days after its receipt.[913] Such citizen suits, if brought, are for "the recovery of the penalties" and for injunctive relief.[914]

Ohio

Standards

Ohio's APA regulates rulemaking generally, which provides various opportunities for public involvement.[915] Other than what is part of the tiered public notice scheme, there is nothing in the drinking water law that expressly requires or encourages public notice and comment on establishing MCLs, treatment techniques, analytic methods, or any other aspect of drinking water standards.

Permits

Ohio approves plans for construction of water systems[916] and issues licenses for operating them.[917] In neither case is there any express opportunity for public notice and comment or public hearings.[918]

Enforcement

There is no ability for citizens to enforce the state drinking water law in state courts.

Ohio invites the public to make complaints about impure water that the Ohio EPA will then investigate.[919] When the Ohio EPA finds that there is a "danger of contamination" that threatens the public health, it can, although is not required to, hold a hearing.[920] It is likely that such a hearing would be public, though there is no indication that public input would be accepted.

The Ohio EPA orders that affect a license or other approval are subject to Ohio's APA.[921] The Ohio APA requires a hearing for many of those orders,[922] though nothing in the drinking water law expressly defines how the public can be involved.

The drinking water laws themselves do not expressly authorize citizens to challenge related agency actions such as issuing orders, grant permits, and entering consent agreements. However, Ohio has an Environmental Review Appeals Commission that exercises jurisdiction over challenges to a broad range of agency actions.[923] Aggrieved persons can bring challenges there.[924]

Pennsylvania

Standards

Title 2 of the Pennsylvania Statutes (hereinafter "Administrative Agency Law"[925]) regulates rulemaking generally. There is nothing in the drinking water law that expressly requires or encourages public notice and comment on establishing MCLs, treatment techniques, analytic methods, or any other aspect of drinking water standards. Technically, the Environmental Quality Board sets drinking water standards as it deems necessary;[926] in reality, Pennsylvania simply incorporates federal primary and secondary standards by reference.[927]

Permits

The Pennsylvania Department of Environmental Protection (DEP) issues water system permits for water system construction and operation.[928] "Substantial modifications" require amended construction and operation permits.[929] The Pennsylvania SDWA defines a substantial modification as "one which may affect quality or quantity of water served to the public or may be prejudicial to the public health or safety."[930] Waterline extensions require no permit.[931]

Pennsylvania drinking water law provides for public involvement in the issuance of water system construction permits.[932] Pennsylvania drinking water regulations do not provide for public involvement in the issuance of operating permits.[933] The DEP has the power to grant permits if it finds that the proposed water system is "not prejudicial to the public health" and complies with state and federal drinking water law.[934]

Enforcement

Citizens can bring civil suits to force compliance with any rule, regulation, order, or permit issued pursuant to the Pennsylvania SDWA if they have "an interest which is or may be adversely affected."[935] This provision allows citizen enforcement suits against the department alleged to be in violation of the act as well as any person in violation.[936] Members of the public who have been adversely affected by agency actions, including the issuing of permits, can appeal the action before the Environmental Hearing Board within 30 days of the publication of public notice regarding the action.[937]

Wisconsin

Standards

Wisconsin has a legal scheme for administrative procedure and review that regulates rulemaking generally, which provides various opportunities for public involvement.[938] Other than what is part of the tiered public notice scheme, there is very little in the drinking water law that expressly requires or encourages public notice and comment on establishing MCLs, treatment techniques, analytic methods, or any other aspect of drinking water standards.

One exception relates to Wisconsin DNR's authority to order testing of chemicals not already regulated by the drinking water law.[939] Within 90 days of issuing such an order, it must provide public notice and an opportunity for a public hearing.

One other exception relates to conditional waivers. For nonmicrobial contaminants, water systems can seek conditional waivers from the law's requirements if certain criteria are met.[940] Before the Wisconsin DNR can issue a conditional waiver, though, it must provide notice and an opportunity for a public hearing.[941]

Permits

Wisconsin approves plans for the construction of water systems,[942] which must also contain details about compliance with the operating standards.[943] However, there does not appear to be a distinct permit requirement purely for operation.[944] One possible exception is that there is no opportunity for members of the public to comment on construction plans.

The one possible exception relates to source water wells for water systems. For source water wells that will deliver water to community water systems, Wisconsin reviews the construction proposals for, among other things, the volume risk that the well may pose to other community water system wells.[945] If a valid notice of objection is filed, the DNR

may hold a public hearing where interested parties are invited to discuss whether restrictions should be placed on the volume of the withdrawal.[946]

Enforcement

There is no ability for citizens to enforce the state drinking water law in state courts.

The drinking water laws themselves do not expressly authorize citizens to challenge related agency actions such as issuing orders, grant permits, and entering consent agreements. However, Wisconsin's APA allows members of the public to request an adjudicatory hearing if they are aggrieved and if there is a dispute of material fact.[947] There is no clear definition of which kinds of agency actions the law addresses, although it expressly excludes rulemakings.[948] Agency actions pursuant to certain laws are excluded from the process, but the drinking water laws are not the laws that trigger exclusion.[949]

Summary

Overall, the manner in which states allow for public involvement in rulemaking, permitting, and enforcement regarding drinking water vary in some key areas. Not surprisingly, the states rely mostly on their APA to involve the public in rulemaking. Each state's permitting schemes for public water systems vary widely. However, few states require robust public participation procedures regarding public water system permitting.

Some states have provided the public with meaningful opportunities to be involved in enforcement. States such as Ohio encourage citizens to submit complaints of suspected violations. Additionally, Illinois, Minnesota, New York, and Pennsylvania each authorize citizens to commence a civil suit or formal administrative complaint regarding drinking water quality violations. Illinois and Minnesota broadly authorize citizen suits for state environmental laws and regulations. Both Pennsylvania and New York specifically authorize citizen enforcement in the context of drinking water regulation. However, New York only allows citizen enforcement if the governmental enforcing agency has failed to act.

Operator Certification

Overview

Public water systems are complex. Among other things, they require significant physical infrastructure, multiple forms of disinfection and treatment, and water quality sampling and analysis. For that reason, the SDWA requires certification of those who operate the systems.

In this section of the report, the main questions explored are as follows:

- What is the federal scheme for operator certification?
- How does each state address operator certification, including qualifications, enforcement, renewal, and recertification?

The Federal Scheme

The SDWA requires the certification of water system operators.[950] Federal standards for operator certification can be found in the statute[951] and in guidance documents, the primary one being *Operator Certification Guidelines: Implementation Guidance*.[952] States that wish to exercise primary enforcement responsibility must have operator certification programs that are based on minimum federal guidelines.[953]

In 2000, the EPA developed nine baseline standards for water operator certification programs, requiring each state to meet or exceed these minimum standards. If a state failed to meet or exceed the baseline standards, the EPA could withhold 20% of a state's DWSRF capitalization grant.[954] Specifically, the EPA required that each state address legal authorization to implement certification; classification of systems, facilities, and operators; operator qualifications; enforcement; certification renewal; resource adequacy; recertification; stakeholder involvement; and program review.[955]

Indiana

Indiana has authorized the Indiana Department of Environmental Management (IDEM) to implement its operator certification program.[956]

Every water treatment plant or water distribution system must have a certified operator.[957] The certification requirements vary based on the classification of the water system. Indiana distinctly classifies water treatment plants and water distribution systems. Indiana classifies all distribution systems into three classes: DSS (distribution system small), DSM (distribution system medium), or DSL (distribution system large) based on the number of consumers served, and whether they have mechanical methods of moving water.[958] Indiana classifies all treatment systems into six classes: WT 1, WT 2, WT 3, WT 4, WT 5, and WT 6.[959] The classification of a water treatment plant is based on the number of people served, the source of the water, and treatment processes used by the plant.[960] Indiana issues water distribution system operator certificates and water treatment plant operator certificates that correspond to the classes of systems and plants described above.[961] Indiana requires all water distribution systems and water treatment plants to be under the supervision of an operator with a certificate in classification that corresponds to the classification of the plant or distribution system to be supervised.[962] There are two ways that a person may become a certified operator in Indiana: by passing a certification exam or by being granted reciprocal certification.

To obtain an operator certificate by examination, a person must apply to take and pass an operator certification exam. There is a distinct exam for each class of distribution system and treatment plant.[963] In order to be eligible to take the exam, a person either must have experience deemed

acceptable by the Indiana Department of Environmental Management, or be an operator-in-training.[964] To be eligible for this program, a person must currently work either at a system with Class WT 3, WT 4, or WT 5 water treatment facilities, or at a DSL water system, in addition to the abovementioned base requirements.[965] Except for WT 6 treatment plants, all certified operators of water distribution systems and treatment plants must have a high school diploma or GED, and some level of work experience in order to be eligible to receive operator certificates.[966] Once a person receives an operator certificate, that operator is permitted to manage a distribution system or treatment plant that corresponds with the certification.

Indiana also issues reciprocal certification to persons who hold a certificate in any state or territory of the United States.[967] If persons are granted reciprocal certifications, they are not required to pass certification exams before obtaining an operator certificate from the Indiana Department of Environmental Management.[968] In order to be granted reciprocal certification, the applicant's certificate must have been issued by a jurisdiction with requirements that do not conflict and are at least as stringent as with Indiana's certification requirements, and that also grants reciprocal certification to Indiana's certified operators.[969] The Indiana Department of Environmental Management makes determinations regarding whether to grant reciprocal certification, and which class of certification to grant.[970]

Indiana requires all distribution system and treatment plant operators to renew their certification cards every three years.[971] Specifically, certification cards expire on the last day of June in the third year after they have been issued or renewed.[972] In order to renew their certification cards, certified distribution system and treatment plant operators must complete a specific number of contact hours.[973] At least 70% of the required contact hours must be obtained from the technical category of approved continuing education courses, while not more than 30% may be obtained from the nontechnical category of approved continuing education courses.[974]

Illinois

Illinois has authorized the Illinois EPA to implement its operator certification program.[975]

Every community water supply is required to have at least one person on its operational staff that is certified as competent as a water supply operator.[976] The certification requirements for water supply operators vary depending on the classification of the system. Illinois divides all water supplies into four classes: A, B, C, and D.[977] A system's classification is dependent on the treatment methods used by the system.[978] The Illinois EPA issues four classes of operator certificates that correspond to the four classes of water systems.[979] In general, all systems must have an operator certified at the same level or above the system classification.[980] However, specific community water supplies are exempt from the requirement to have a certified operator.[981] There are two ways that a person may become a certified operator in Illinois: by applying for and passing an examination, or by being granted reciprocal certification.

To obtain an operator certificate by examination, a person must apply to take and pass an operator certification exam. The Illinois EPA administers water supply operators' examinations for each of the four system classes.[982] In order to be eligible to take the exam, applicants must submit evidence of their character.[983] Additionally, any persons who have been exposed to typhoid or amoebic dysentery must demonstrate that they are not carriers.[984] In addition to requiring certificate applicants to pass an examination, Illinois also requires applicants for classes to have a minimum number of hours of training and hands-on experience in water supply operation or management.[985] All operators must have a high school diploma or equivalent, and additional "acceptable study, training, and responsible experience in water supply operation or management."[986] This training can include up to one year of "waterworks seminars, waterworks short courses, waterworks workshops, and applicable correspondence courses,"[987] and up to one-and-a-half years' credit for hours toward the completion of a Baccalaureate degree associated with water supply operation.[988] Class A and B operators require at least three years of such training.[989] Class C operators require one year of such training, and Class D operators require six months.[990] Once applicants pass the exam, they become operators in training for the class of examination passed.[991] Operators in training have six years to fulfill the necessary experience requirements and obtain their operator certificates.[992]

The Illinois EPA also issues reciprocal certification to persons who have been certified by another state, territory, possession of the United States, or any other country, and to persons who have been trained as water system operators

by the United States as members of the Air Force, Army, Coast Guard, Marine Corps, or Navy.[993] If persons are granted reciprocal certification, they are not required to pass certification exams before obtaining operator certificates from the Illinois EPA.[994] In order to be granted reciprocal certifications, applicant certificates that were issued by other certifying jurisdictions must be current, the standards for obtaining an operator's certificate in the certifying jurisdictions must be equivalent to or more stringent than Illinois' standards, and the certifying jurisdictions that issued the certificates must accept certificates issued by the Illinois EPA by reciprocity.[995] Determinations as to whether to issue applicants reciprocal certifications and which level of certification the persons are appropriate for are made by the Illinois EPA.[996]

In Illinois, operator certificates must be renewed every three years.[997] Specifically, certificates expire on July 1 of the third year of certification.[998] In order to be eligible to renew a certificate, an operator must complete a specified amount of training.[999] Illinois requires between 5 and 30 hours of continued education, depending on the level of certification.[1000]

Michigan

Michigan[1001] has authorized MDEQ to implement its operator certification program.[1002] To help in developing and revising the program, MDEQ's director is tasked with appointing an advisory board.[1003]

In general, every water system must be under the supervision of a certified operator.[1004] Michigan's operator certification scheme is based in part on water system classification. Michigan separately classifies treatment systems and distribution systems. All treatment systems are classified into one of two base classifications: complete treatment (Class F) and limited treatment (Class D).[1005] Whether a treatment system is classified as a "complete" or "limited" treatment system is dependent on the method of water treatment used by the system.[1006] Additionally, each Class F and Class D system is further classified into one of five sub-classifications that are dependent on the number of people the treatment system serves.[1007] Michigan also distinctly classifies all distribution systems into one of five classifications: S-1, S-2, S-3, S-4, and S-5.[1008] The classification of a distribution system is dependent on the number of people it serves. Michigan issues operator certificates that correspond to the classification of each treatment and distribution system. A certified operator may operate any treatment or distribution system that is within the same category and at or below the level of the operator's certificate.[1009] For example, an operator with an S-2 certificate could operate an S-3 distribution system, but not an S-1 system nor any Class F or Class D treatment system. A certified operator who holds a Class F certificate can operate a Class D system of a comparable numerical sub-classification.[1010] In Michigan, there are two ways a person may become a certified operator: by applying for and passing an examination or by being granted reciprocal certification.

To become a certified operator by examination, a person must take and pass an exam for the specific system the applicant wishes to operate.[1011] The MDEQ offers an exam for each treatment and distribution system classification.[1012] To sit for the exam, however, an applicant must be qualified to take the exam.[1013] To determine whether an applicant is qualified to sit for an exam, Michigan implements a points system based on educational and professional experience.[1014] In order to take the written exam for the lowest level of certification (F-5, D-5, or S-5), an applicant at the very least must have a high school diploma or a GED. So long as an applicant has the minimum required educational requirements, however, that applicant is not required to have any professional experience to take the lowest level certification exam.[1015] Eventually, if a certified operator wants to become authorized to operate a water system at a higher level, certain professional experience requirements must be met.[1016]

Michigan also issues reciprocal certification to persons who have been certified by another state, territory, or possession of the United States, or another country.[1017] An applicant for a reciprocal certificate is not required to pass any Michigan exam, but the MDEQ must make a determination that the requirements of the certification of operators under which the certificate was granted are comparable to Michigan's requirements.[1018]

Once certified, an operator is permitted to manage the public water system immediately without being subjected to a period of oversight. A public water supply system shall be under the supervision of an operator who is certified at the same level or higher than the plant's classification.[1019] Consequently, the only time an operator would be under the supervision of a higher certified operator would be when an

operator is unqualified to manage the water system plant. A single operator can be the operator in charge of multiple public water systems.

Lastly, certified operators are required to renew their certificates every three years.[1020] In order to renew their certifications, operators are required to complete a certain amount of continuing education hours.[1021] The amount of required training hours varies based on the level of certification held, and ranges from 9 to 24 hours. Depending on the level of certification, a certain number of those continuing education hours must be "technical" or "managerial" in nature.[1022]

Minnesota

Minnesota has authorized the DOH to implement its operator certification program.[1023]

All systems must have a certified water supply system operator.[1024] The certification requirements established by the DOH vary based on the classification of the system. Minnesota divides each water supply into five distinct classes: A, B, C, D, and E.[1025] Systems are classified based on a point system that accounts for the water source, treatment processes, distribution storage capacity, the number of wells, and the population served.[1026] The DOH issues five classes of operator certificates that correspond to the five system classes.[1027] All systems must have an operator certified at the same level or above the system classification.[1028] There are two ways that a person may obtain an operator certificate: by meeting the eligibility qualifications for the given system class and passing an exam, or by meeting the requirements for reciprocity.

To become a certified operator by examination, a person must pass an exam prepared by the DOH.[1029] The DOH prepares a separate exam for each system class.[1030] In order to be eligible to receive a certificate, an applicant must satisfy the education and experience requirements specified for the given system class.[1031] All applicants must have at least a high school diploma or GED.[1032] Additionally, applicants for a Class A, B, or C certificate must have a specified amount of experience in the operation of a water system.[1033] Applicants for a Class D or E certificate are not required to have any experience in the operation of a water system.[1034] Under certain circumstances, an applicant for an operator certificate can substitute experience in a wastewater treatment facility or additional education for the experience requirements described in the eligibility qualifications.[1035] Additionally, one year of experience in the operation of a water system or at a wastewater facility may be considered as equivalent to one year of high school for the purposes of the education requirements described in eligibility qualifications.[1036]

When a person has received an operator certificate in another state, that person may be eligible for reciprocal certification. Minnesota will grant an operator certificate to a person who has already obtained a certificate in another state if the state's certification requirements are not in conflict and at least as stringent as Minnesota's requirements.[1037] The DOH determines whether a person satisfies the requirements for obtaining an operator certificate through reciprocity and determines what class of certification the applicant is eligible for.[1038]

Once a person obtains an operator certificate, that person is permitted to manage a water system immediately without any additional oversight. Minnesota requires water system operators to renew their certificates.[1039] To be eligible for renewal, water system operators must continue their education by completing a specific number of contact hours.[1040] Minnesota requires between 4 and 32 contact hours, depending on the level of certification, and that at least half of a certified operator's contact hours be from water-related courses approved by the DOH.[1041]

New York

New York has authorized the New York DOH to administer its operator certification program.[1042]

In New York, the owners of all community water systems and nontransient, noncommunity water systems are required to place the direct supervision of their water system, including each treatment plant and/or distribution system, under the responsible charge of a water treatment operator that holds a valid certification.[1043] New York classifies all water supply systems into six classes: IA, IIA, IB, IIB, C, and D.[1044] The classification of a water system is based on how much water the system is designed to treat per day, the source water of the system, and other factors.[1045] New York issues operator certificates that correspond to the classes of systems.[1046] A certified operator for a given system is required to hold a valid certification that is equal to or greater than that which is required for the classification of the system.[1047] The only way for a person to obtain an operator's certificate in New

York is through examination.[1048] New York does not allow persons who have been issued operator certificates in other states to obtain New York operator certificates through reciprocal certification.

In order to obtain an operator certificate in New York, a person must pass an exam, meet specified education and experience requirements, and have a specific number of training hours. In general, all levels of certification require the applicant to have at least a high school diploma or GED.[1049] However, experience and/or relevant training may be substituted for a high school diploma or GED for a class C or D certification.[1050] The experience requirements vary from 6 months to 10 years based on the certification class.[1051] However, a New York State professional engineer's license, a bachelor's degree, or an associate degree may be used as a substitute for experience.[1052] Lastly, training requirements vary from 15 hours to 120 hours of training based on the certification class.[1053] Once an operator is certified, that operator is permitted to manage a public water system of an equivalent or lower classification without being subjected to a period of oversight.

New York requires all certified operators to renew their certificates every three years.[1054] In order to qualify for renewal, certified operators must have received a specific amount of continuing education units from an organized course, training, meeting, or workshop approved by the New York DOH.[1055] The amount of continuing education required of certified operators varies depending on the class of their certifications. Class IA, IIA, IB, and IIB operators are required to receive 30 hours of continued education training, while Class C and D operators are required to receive 15 hours of continued education training.

Ohio

Ohio has authorized the Ohio EPA to implement its operator certification program.[1056] To help in developing and revising the program, the Ohio EPA's director is tasked with appointing an advisory council.[1057]

In Ohio, each public water system or water treatment plant and distribution system must have a certified operator.[1058] The certification requirements for operators vary depending on the classification of the system. Ohio classifies its water systems into two categories: distribution systems and public water systems.[1059] Distribution systems are classified as either I or II, based on the population served.[1060] Public water systems are divided into five classes: A, I, II, III, or IV. Classification is based on source of supply, quality of source, complexity of treatment, design capacity, and the system's potential for health hazards.[1061] Ohio issues operator certificates that correspond to the two classes of distribution systems and the five classes of public water systems.[1062] Ohio specifically describes what class of operator certification is required to operate each different class of distribution system and public water system.[1063] There are two ways that a person may become a certified operator in Ohio: by applying for and passing an examination, or by being granted reciprocal certification.

To obtain an operator certificate by examination, an applicant must apply for and pass the state's operator certification exam, have completed the Ohio EPA Professional Operator Certification Training course, and have the requisite amount of hands-on working experience.[1064] In order to apply for the operator exam, an applicant must have a high school diploma or its equivalents.[1065] Furthermore, an applicant must have the requisite amount of operating experience to sit for any of the public water system examinations.[1066] Individuals applying for Class A, I, or II certification and who do not have the necessary working experience are permitted to take the operator exam.[1067] Upon successfully completing the exam, an applicant becomes an operator-in-training (OIT) and has four years to fulfill the necessary experience requirements.[1068]

Ohio also issues reciprocal certification to persons who hold a valid certification issued by the certifying authority of another state or province, or the Association of Boards of Certification.[1069] In order to be eligible for reciprocal certification, the Ohio EPA compares the out-of-state or Association of Boards of Certification exam that was passed by the applicant with Ohio's examinations to determine which certificate classification the applicant is eligible for.[1070]

In Ohio, to remain certified, an operator must renew the certificate every two years.[1071] Specifically, certificates expire on December 31 of the second year of certification.[1072] Additionally, in order to renew certifications, operators must continue their education by completing a specific number of contact hours.[1073] The number of contact hours required varies from 8 to 24 hours.[1074] Ohio requires that at least half of a certified operator's contact hours be directly related to operation and maintenance of a water system plant.[1075]

Pennsylvania

Pennsylvania has authorized the State Board for Certification of Water and Wastewater System Operators to implement its operator certification program.[1076]

In Pennsylvania, each water system must insure that process control decisions are made by operators with a valid operator's certificate with the appropriate class and sub-classification.[1077] The certification requirements for a water system operator varies depending on the classification of the system. Pennsylvania divides all water supplies into five classes: A, B, C, D, and E.[1078] In general, systems are classified based on the amount of water the system serves per day.[1079] Class E systems are distribution and consecutive water systems without treatment.[1080] Class A, B, and C systems are also assigned one or more of 14 sub-classifications that identifies the treatment methods used at the water treatment plant.[1081] There are two ways that a person may become a certified operator in Pennsylvania: by applying for and passing an examination or by being granted reciprocal certification.

To obtain an operator certificate by examination, a person must apply to take and pass an operator certification exam.[1082] There are no experience or education requirements that a person must fulfill before taking the exam.[1083] The Pennsylvania DEP prepares the exam, and the State Board for Certification of Water and Wastewater System Operators administers it.[1084] All exams consist of at least two parts: Part I measures a person's knowledge, skills, and abilities common to all water systems regardless of size; and Part II measures a person's knowledge, skills, and abilities necessary to operate specific treatment technologies and system components.[1085] Additionally, Class E systems have their own certification test.[1086] Pennsylvania also has a "master examination" for water system operators who desire a master certificate to operate all available treatment technologies and system components.[1087] Once the certification exam is passed, the person can apply for an operator's certificate. In order to obtain an operator's certificate, an applicant generally must have a high school diploma or GED, as well as a specified amount of experience.[1088] However, the Board may grant an education exemption if the applicant provides written verification by the applicant's supervisor or another certified operator with direct knowledge of the applicant's experience working in a water system.[1089] Pennsylvania requires applicants to have between one and four years of experience, depending on the class of certification the applicant is seeking.[1090] However, less experience is required if the person has a certificate from a program in water treatment that has been approved by the Pennsylvania DEP, an associate degree in specified areas of study, or a bachelor's degree in specified areas of study.[1091] If a person has passed the operator's exam, meets the minimum education requirements, and the minimum experience requirements, then the applicant will be granted an operator's certificate. The certificate will correspond to the class of system that the person is authorized to operate.[1092] If a person has passed the operator's certification exam but does not meet the education or experience requirements, that person may qualify as an operator-in-training.[1093]

Pennsylvania also allows the State Board for Certification of Water and Wastewater System Operators to issue certificates to persons without requiring them to pass an exam if they hold a valid certificate issued under the laws of any other state, territory, the District of Columbia, or any board-approved register.[1094] A reciprocal certificate shall only be issued if the out-of-state certificate was issued as a result of the applicant successfully passing an exam equivalent to the exam required by Pennsylvania for the same classification.[1095] Additionally, the experience and education requirements for obtaining an operator's certificate described above still apply to applicants for a reciprocal certificate.[1096]

In Pennsylvania, to remain certified, an operator must renew the certificate every three years.[1097] In order to be eligible for renewal, certified operators must satisfy continuing education requirements.[1098] The number of hours of continuing education that is required for renewal varies based on whether it is the operator's first renewal cycle and based on the operator class. In general, operators obtaining their first certificate renewal are required to complete 8 to 15 hours of continuing education.[1099] After the first renewal cycle, operators are generally required to complete 15 to 30 hours of continuing education[1100]

Wisconsin

The Wisconsin Legislature has granted the DNR the authority to implement the state's operator certification program.[1101] Unique to Wisconsin, an operator can be certified to run either a waterworks or water system.[1102] A waterworks system is defined as a community water

system that is either owned by a public entity, or is owned by a private entity but serves a county, city, village, town, town sanitary district, utility district, or a county-owned or state-owned public institution.[1103]

Wisconsin requires every water system to have a certified operator.[1104] The certification requirements for water supply operators vary depending on the classification of the system. Wisconsin divides water systems into five subclasses, which are differentiated based on the water system's treatment methods.[1105] Wisconsin issues certificates that correspond to the sub-classifications of water systems.[1106] In general, an operator must have a certificate that corresponds to the sub-classification of the system.[1107] There are two ways that a person may become a certified operator in Wisconsin: by applying for and passing an examination, or by being granted reciprocal certification.

To obtain an operator certification by examination, a person must take and pass an examination.[1108] To sit for the exam, the applicant must have a high school diploma or GED.[1109] To obtain a reciprocal certification, a person must have been issued a certificate by another state, territory, or possession of the United States, or another country, and the DNR must determine that the issuing jurisdiction had equivalent requirements for certification as exist in Wisconsin.[1110] Certification is based on the subclass of water system.[1111] Should a subclass treatment process be added to a water system, the operator-in-charge has 12 months to earn a certification for that subclass. Water system certificates last for three years.[1112] Operators are required to complete six hours of continued education over their certification period.[1113]

Similar to water system operators, waterworks operators must have at least a high school diploma or GED and pass one or more of the subclass exams.[1114] Additionally, to manage a waterworks subclass, an operator must hold a Grade 1 level certification, which requires one year of working experience to obtain.[1115] After passing the general operator exam and one or more of the subclass exams, the operator is considered a Grade T (operator-in-training), until completing one year of experience.[1116] An operator-in-training is permitted to operate a Grade 1 water system for a period not to exceed one year.[1117] Furthermore, waterworks operators are required to renew their certificates every three years.[1118] Over that three-year period, both Grade T and Grade 1 operators need to complete 18 hours of continuing education.[1119] Wisconsin's continuing education requirement can be satisfied by attending professional organization meetings, conferences, or approved online waterworks courses.[1120]

Summary

Every state has adopted the EPA's baseline standards for water operator certification programs. Almost all states allow a person to obtain an operator's certificate either by examination or by reciprocity. Only New York does not allow for reciprocal certification. In general, most states require that an applicant has a high school diploma or a GED. However, Illinois, New York, and Pennsylvania allow for training or on-the-job experience to be substituted for the general requirement that applicants have a high school level education. Additionally, Indiana does not require a high school level education for one classification of treatment plant. Each state demands that an operator renew certification every two or three years. However, to renew one's license, an operator must continue with water operation education by taking and completing various state approved courses. The amount of continuing education required by each state was fairly similar.

Although each state has met or exceeded the baseline standards, each state's operator certification program is also slightly different from one another. Specifically, each state has divided its public water systems based on different criteria. For instance, Michigan categorizes its public water systems based on its function and number of people served. On the other hand, Ohio differentiates its public water systems based on its function, which is either subdivided by number of people served or an array of factors, such as source of supply, quality of source, complexity of treatment, design capacity, and potential for health hazards. Notably, Michigan, Indiana, and Ohio distinguish treatment plants from distribution systems for certification purposes.

Additionally, all states differentiate based on the necessary amount of experience required to operate a public water system. Additionally, Illinois and Ohio require people who pass the certification exam to becoming an operator-in-training before become a fully certified operator.

Management of Drinking Water Emergencies

Overview

Drinking water emergencies are among the worst kinds of emergencies because people rarely have easy and cheap access to alternative sources of water. Especially when emergencies arise suddenly, water systems, regulators, community groups, and citizens face serious logistical hurdles.

While the federal government and states have various laws and policies on the books to address emergencies in general, this section focuses on drinking water laws and policies that expressly address drinking water emergencies.

In this section of the report, the main questions explored are as follows:

- What is the SDWA scheme for addressing drinking water emergencies?
- In order to have primary enforcement responsibility, what does the SDWA require states to do with regard to drinking water emergencies?
- What can an agency itself do, and what can it require a water system to do, to respond to a drinking water emergency?
- How do agencies and water systems plan for potential drinking water emergencies?
- What financial assistance is available to address a drinking water emergency?

The Federal Scheme

Part D of the SDWA is devoted to providing the EPA with certain emergency powers.[1121] There is no specific definition of what constitutes a drinking water emergency, though the statute applies emergency management standards to situations involving manmade and natural events that cause significant disruption to drinking water access.

The SDWA provides emergency authority to the EPA and addresses certain kinds of threats to water systems. In the event of an "imminent and substantial endangerment to health," the EPA has broad authority to do what is necessary to address the threat.[1122] Among other things, it can issue administrative orders and sue a violator.[1123]

The SDWA prohibits tampering defined as interfering with a water system with the intention to harm people.[1124] The EPA, in conjunction with the CDC, must also review methods to detect the intentional introduction of contaminants into water systems and source water.[1125]

Part D requires community water systems serving a population of 3,300 persons or more to conduct an "assessment of the risks to, and resilience of, its system" and to prepare and revise, as is necessary, an emergency response plan that incorporates findings of the risk assessment.[1126] The risk assessment must assess the following: the risk to the system from malevolent acts and natural hazards; the resilience of the infrastructure and technological systems used by the system; the monitoring practices of the system; the financial infrastructure of the system; the use, storage, or handling of various chemicals by the system; and the operation of the system.[1127] An emergency response plan (ERP) must include strategies and resources to improve the resilience of the system; plans, procedures, and equipment that can be used in the event of a malevolent act or natural hazard that threatens the ability of the community water system to deliver safe drinking water; actions, procedures, and equipment that can obviate or significantly lessen the impact of a malevolent

act or natural hazard; and strategies that can be used to aid in the detection of malevolent acts or natural hazards.[1128] The EPA has published guidance documents to assist large water systems, as well as medium and small systems in developing ERPs.[1129]

The EPA promotes the use of the Water and Wastewater Agency Response Network or WARN model for quickly tapping into nearby resources.[1130] WARN is a network of water and wastewater utilities that through mutual aid agreements agree to help each other in emergencies with personnel, equipment, materials, and services.[1131]

Minimum Drinking Water Emergency Requirements for States That Seek to Have Primary Enforcement Responsibility

In terms of states that seek to have primary enforcement responsibility and management of drinking water emergencies, the SDWA requires states to have a plan "for the provision of safe drinking water under emergency circumstances, including earthquakes, floods, hurricanes, and other natural disasters…"[1132]

Illinois

Illinois does not specifically define what constitutes a drinking water emergency. When discussing emergency operations, the rules refer broadly to situations where the safety of the water supply is endangered for any reason.[1133]

Illinois requires each public water system to develop an emergency management plan that identifies the potential natural- and human-caused risks to the water system; identifies the personnel responsible for response actions, notification procedures, and public/press relations; and contains measures for averting or avoiding emergencies and the means for implementing the ERP.[1134] There is no requirement in the law for any water system to update any ERP or contingency plan. Additionally, beginning in 1999, all new nontransient, noncommunity public water supply systems must include a contingency plan with an application for a construction permit.[1135] A contingency plan must include the following information: indicate the name of the alternate water supply and describe the method for transporting water, which must also meet all drinking water quality standards and treatment techniques; and describe how water from the alternate water supply will be provided if water service is interrupted due to broken pipes, pump failure, or lack of water from the well or surface supply, or if water quality fails to meet any drinking water maximum contaminant level or treatment technique.[1136]

If a public water system is unable to prevent a drinking water emergency from occurring, Illinois law makes available several responses to address it. Whenever the safety of a supply is endangered for any reason, the owner of the water supply must notify the Illinois EPA immediately.[1137] Additionally, the owner must notify all consumers of appropriate actions to protect themselves against the waterborne hazards.[1138] If the owner of the water system does not notify its consumers, the Illinois EPA may notify the consumers directly.[1139]

Funds from Illinois' DWSRF are available for projects that help to correct a public health emergency.[1140] Such projects are given high priority in accordance with the rating system for applications for low-interest loans from the revolving fund.[1141]

Illinois also empowers water systems to enter into Mutual Aid Agreements (MAAs) to increase access to resources in the event of an emergency. Through the Illinois Water/Wastewater Agency Response Network (ILWARN), public and private water and wastewater utilities in Illinois can share resources concerning emergency response.[1142] ILWARN provides water and wastewater agencies with an MAA template that is written broadly enough to encompass various kinds of drinking water emergencies.[1143]

Indiana

Indiana does not specifically define what constitutes a drinking water emergency. However, in its general environmental law, Indiana does specify that the contamination of air, water, or land in any area where the contamination presents a clear and present danger to the health and safety of persons may constitute an emergency.[1144]

Indiana requires all community water systems and all noncommunity water systems that plan to maintain operations in the event of an emergency to develop ERPs.[1145] An ERP must include system-specific information, water

system personnel roles and responsibilities, communication procedures, personnel safety, identification of alternate water sources, replacement equipment and chemical supplies, property protection, and water sampling and monitoring.[1146] If the water system is required to develop an ERP, the water system is under an obligation to obtain annual certification that their plan was reviewed and updated, if necessary.[1147]

If a public water system is unable to prevent a drinking water emergency from occurring, then the Indiana Department of Environmental Management may respond through the general emergency procedures described in Indiana law. Whenever the Indiana Department of Environmental Management, in consultation with the commissioner of the state DOH, "that contamination of air, water, or land in any area has reached the point where the contamination constitutes a clear and present danger to the health and safety of persons in any area," then the commissioner of the Department of Environmental Management must request that the governor declare that an emergency exists.[1148] Upon such a request, the governor may proclaim the existence of an emergency.[1149] If the governor does declare an emergency exists, then he or she may issue emergency orders to all persons causing or contributing to the contamination.[1150]

Funds from Indiana's drinking water state revolving fund are available in cases of emergencies. As described in the Loans and Grants section of this report, the SRF is generally used to provide low-interest loans to public water systems to help them meet their drinking water infrastructure needs. Projects that are necessary to alleviate an unanticipated catastrophic or emergency situation that poses a threat to public health may be elevated to the top of the project priority list upon the recommendation of the Indiana Department of Environmental Management's drinking water program.[1151] This includes projects that address an immediate risk to public health due to drinking water contamination.[1152]

Indiana empowers water systems to enter into intrastate and interstate MAAs to increase access to resources in the event of an emergency.[1153] Under Indiana's Emergency Management laws concerning Interstate MAAs, an emergency is defined as an occurrence or condition in a jurisdiction that results in a situation that poses an immediate risk to health, life, property, or the environment; is not initially at the level of a disaster or emergency that requires a local or state declaration of disaster or emergency; and for which the governing jurisdiction determines that the situation exceeds its ability to render appropriate aid and that it is in the public's best interest to request mutual aid from a governmental jurisdiction or private entity in another state with which the governing jurisdiction has entered into a mutual aid agreement.[1154] Through the Indiana Water/Wastewater Agency Response Network (INWARN), public and private water and wastewater utilities in Indiana can share resources concerning emergency response.[1155] INWARN provides water and wastewater agencies with an MAA template that is written broadly enough to encompass various kinds of drinking water emergencies.[1156]

Michigan

Michigan defines an "emergency" as something that "results in contamination, loss of pressure, lack of adequate supply of water, or other condition that poses an imminent hazard or danger to the public health."[1157] An "imminent hazard" is defined as something that would cause the MDEQ director to believe that there is a violation or possible violation of the drinking water standards that needs immediate attention to protect public health.[1158] Michigan's drinking water emergency scheme addresses all such emergencies but expressly mentions terrorism and other intentional acts.[1159]

Michigan requires water systems to conduct emergency response planning.[1160] All Type I systems must develop ERPs, and MDEQ can require certain Type II systems to develop them.[1161] A Type I system is all community water systems.[1162] A Type II system is all noncommunity water systems.[1163]

Michigan appears to have more specific and extensive ERP criteria than the EPA's, although it is not clear what must go in an ERP and what is voluntary. On the one hand, ERPs "shall, at a minimum, outline a program for rapid correction or mitigation of emergencies and shall include actions, procedures, and an identification of equipment which can significantly lessen the impact of terrorist acts or other intentional actions on the public health and safety and supply of drinking water to the public."[1164] On the other hand, the rule goes on and lists five categories of information that an ERP may address, but does not require systems to address any of them.[1165] They are roles for personnel in an emergency; inventory of emergency response equipment; operational procedures to be implemented in an emergency, including supply treatment and mutual aid agreements;

identification of short-term and long-term alternative water supplies; internal and external communication procedures during emergencies.[1166] However, plans must identify the type, number, and capacity of standby power sources necessary to maintain operations in a power outage, and must include a listing of critical customers or users for whom the provision of a continuous supply of safe drinking water is most urgent.[1167]

The ERP must contain a schedule for updating the plan, though there are no minimum criteria that apply.[1168] Generally, there is no expressed role for MDEQ to review or approve the ERP.

If a public water system is unable to prevent a drinking water emergency from occurring, Michigan law makes available several responses to it. No matter the cause, should a public water supply pose an imminent hazard to public health, MDEQ can issue immediate, necessary orders without having to go through ordinary notice or hearing procedures.[1169]

After an emergency, water systems must notify MDEQ immediately about the proposed response.[1170] Within 90 days of the emergency, systems must file a report characterizing the emergency and the response to it.[1171]

Pursuant to the state's Emergency Management Act,[1172] Michigan has an overall plan, called the Michigan Emergency Management Plan, to address various kinds of emergencies including those that involve drinking water.[1173] MDEQ, in coordination with other agencies, is tasked with assisting communities that are suffering from a drinking water emergency, particularly to help procure short- and long-term alternate water supplies. However, there is no distinct state emergency management plan that exclusively addresses drinking water. There is also no distinct source of funds to use for emergency response efforts.

Michigan empowers local municipalities to enter into MAAs to increase access to resources in the event of an emergency.[1174] The MAAs are made available through the MiWARN system,[1175] which is the state's WARN system. MiWARN provides water and wastewater agencies with an MAA template that is written broadly enough to encompass various kinds of drinking water emergencies.[1176]

Minnesota

Minnesota does not specifically define what constitutes a drinking water emergency.

As part of its emergency planning effort, Minnesota requires public water suppliers serving more than 1,000 persons to submit a water supply plan to the commissioner of natural resources.[1177] The plan must address projected demands, adequacy of the water supply system and planned improvements, existing and future water sources, natural resource impacts or limitations, emergency preparedness, water conservation, supply and demand reduction measures, and allocation priorities.[1178] Additionally, public water suppliers must update their plan, and upon notification, submit it to the commissioner of natural resources for approval every ten years.[1179] In addition to requiring public water suppliers to plan for emergency preparedness, Minnesota also grants the Minnesota DOH the authority to develop its own emergency plan to protect the public when a decline in water quality creates a serious health risk.[1180]

To assist systems in responding to drinking water emergencies, Minnesota has created an emergency loan program. Through this program, any eligible public drinking water supply[1181] may apply for emergency assistance in the case of a catastrophic failure of or unforeseen threats to the drinking water supply.[1182] Approval of an emergency loan is based on the determination by the Minnesota DOH as to whether the applicant has demonstrated a need for emergency funding and whether the proposed remediation will provide a solution to the problems presented.[1183]

Minnesota allows for two or more government units to jointly and cooperatively exercise their powers in accordance with a mutual aid agreement.[1184] Water systems can become members of the Minnesota Water Utilities Agency Response Network (MnWARN), which promotes and supports statewide response to drinking water related emergencies and disasters for water utilities in Minnesota.[1185] MnWARN provides water systems with a mutual aid agreement template.[1186]

New York

New York does not specifically define what constitutes a drinking water emergency. However, New York does define an "emergency," in the context of its SRF, as a situation that results in an imminent threat to public health, which includes situations that result in the unavailability of a source of potable drinking water for an extended period of time.[1187] The New York State DOH has the sole authority to determine the existence of an emergency.[1188]

In New York, all community water systems that supply drinking water to more than 3,300 people must submit a water supply emergency plan to the State Commissioner of Health.[1189] The plan must identify and outline the steps necessary to ensure that potable water is available during all phases of a water supply emergency.[1190] The water supply emergency plan must:

- Describe procedures to notify consumers during all phases of a water supply emergency; criteria and procedures for determining, and reporting of, critical water levels or safe yield of the source(s) of water
- Identify existing and future source(s) of water available during normal nonemergency and water supply emergency conditions
- Identify all available water storage; the identification, capacity, and location of existing inter-connections; a specific action plan outlining all the steps to be carried out, taken, or followed during a water supply emergency, including a process for State notification, emergency notification rosters of key water supply personnel with current phone numbers, and details of the follow-up corrective action process to minimize the reoccurrence of an emergency
- Describe procedures for water conservation and water use restrictions to be put in place during a water supply emergency; the identification of and the procedures for prioritization of potable water users during a water supply emergency
- Identify emergency equipment needed during a water supply emergency
- Assess the system's capacity and ability to meet peak water demands and fire-flow conditions concurrently during a water supply emergency[1191]

New York additionally requires the community water system, before final submission of its plan to the state, to publish a notice in a newspaper of general circulation stating that the proposed water supply emergency plan is available for review and comment.[1192] The notice is to be printed at least once in two successive weeks, and public comments are to be accepted for at least 14 days following the date of first publication.[1193] All of the public comments that the water system received are to be submitted with the water supply emergency plan to the state.[1194]

For community water systems that supply drinking water to 3,300 or fewer people, nontransient noncommunity water systems, and noncommunity water systems, a written water supply emergency plan for providing potable water during a water supply emergency may be required to be prepared, updated, and submitted to the State.[1195] However, the regulations do not state what conditions may require such a system to prepare and submit a water supply emergency plan.

The water supply emergency plan must be submitted to the State Commissioner of Health for review at least once every 5 years and within 30 days after major water facility infrastructure changes have been made.[1196] The system is responsible for keeping the emergency plan up to date and must provide updated communication and notification information to the State Commissioner of Health by December 31 of each year.[1197]

If a public water system is unable to prevent a drinking water emergency from occurring, New York law grants the New York State DOH to respond to it. The Department has the general statutory authority to "order reasonable improvements to be made for the protection of public health" whenever a water supply is "so polluted" or "subject to dangerous pollution" so as to constitute a menace to the public health.[1198] Additionally, New York has state notification and public notification requirements, both that contemplate notification of potential drinking water emergencies.[1199] A water supplier must provide the state with notification of the potential existence of a public health hazard within either 24 or 48 hours.[1200]

New York provides for emergency financing in the form of low-interest loans from its drinking water SRF. Projects that are designed to address emergency situations receive the highest priority ranking.[1201] The DOH makes determinations as to whether an emergency exists.[1202]

New York empowers municipalities to create a mutual aid plan and empowers community water systems to enter into MAAs to increase access to resources in the event of an emergency.[1203] Additionally, through the New York Water/Wastewater Agency Response Network (NYWARN), public and private water and wastewater utilities in New York can share resources concerning emergency response.[1204]

Ohio

In the context of drinking water, Ohio defines an emergency as "an imminent and substantial danger to human health."[1205] There is no more specific definition of what constitutes such a danger.

Community and wholesale water systems must prepare and maintain a contingency plan for managing emergencies.[1206] In general, contingency plans must provide for protection of public health through public notification, provision of alternate water sources, and restoration of service.[1207] There is a detailed list of items that must go in a contingency plan. Among the 15 distinct requirements, plans must contain detailed maps of the system, an emergency budget statement, response to power failure, a list of critical users and the methodology for the list.[1208] Water systems must revise their contingency plans as necessary but at least annually.[1209] The Ohio EPA has the right to deem the plan inadequate and require revisions.[1210] Additionally, at least once per year water systems must discuss or perform a drill of the contingency plan.[1211]

With regard to water supply redundancy, systems must detail in the contingency plans the process to provide water from an alternate source and must include a list of three or more alternative water sources. [1212] Alternate sources must be able to support a minimum of 1 gallon per day per person for the customers of the system.[1213] Water transportation must also be covered in these contingency plans.[1214]

If a public water system is unable to prevent a drinking water emergency from occurring, Ohio law makes available several responses to address it. Ohio EPA can issue orders to respond to emergencies without prior hearing; however, if a water system applies for a hearing within 10 days of receipt of the order, a hearing will be held as soon as possible and not later than 20 days after the application is received.[1215] Water systems that respond to emergencies by activating their contingency plans must notify the Ohio EPA of that within 24 hours, and must maintain a written after-action report that assesses the adequately of the plan.[1216]

Distinct from the state's general emergency response plan,[1217] the Ohio EPA has a two-volume *Drinking Water Supply Emergency Plan*. [1218] Volume I is an internal document aimed at state and local agencies; Volume II is a document intended for water systems.[1219] The Plan provides details that fill in gaps in the administrative rules. It also defines the Ohio EPA's role during a drinking water emergency as primarily an advisory one, as resource constraints may limit direct assistance.[1220]

Ohio has the capacity to financially assist water systems in the event of a drinking water emergency. Ohio makes available loans for "emergency remediation of threats of contamination to public water systems."[1221] A threat of contamination is "anything that prevents a public water system from supplying adequate quantities of safe, potable water to its existing water users."[1222] The loan amount cannot exceed $25,000 and must be repaid within one year of receipt.[1223] According to the latest fact sheet available online, each fiscal year, the Drinking Water Emergency Loan Fund is able to finance $200,000 interest free to public water systems.[1224] The maximum amount of money available to any single public water system is $25,000.[1225] Loans are processed on a first come, first serve basis and some water systems get priority. The criteria for priority are: (1) the public water system has no other source of potable drinking water and (2) the public water system was not able to secure other sources of funding.[1226]

Ohio empowers water systems to enter into MAAs to increase access to resources in the event of an emergency. Through the Ohio Water Agency Response Network (OHWARN), public and private water and wastewater utilities in Ohio can share resources concerning emergency response.[1227] OHWARN provides water and wastewater agencies with an MAA template that is written broadly enough to encompass various kinds of drinking water emergencies.[1228]

Pennsylvania

Pennsylvania does not specifically define what constitutes a drinking water emergency. However, it does provide a list of events that must be reported by the water system to the Pennsylvania DOH if they occur, including but not limited

to a disaster that disrupts the water supply or distribution system, the occurrence of a waterborne disease outbreak, or a chemical spill.[1229] Additionally, Pennsylvania's Emergency Management law broadly defines a "disaster emergency" to likely include drinking water-related emergencies.[1230]

Pennsylvania requires each community water supplier to develop an emergency response plan for the provision of safe and adequate drinking water under emergency circumstances.[1231] Pennsylvania requires its community water systems' plans to include an organization table, communication procedures and contact information, means of communication, summary description of the system, assessment of available sources, and corrective actions for probable emergency situations.[1232] Additionally, Pennsylvania has prepared a "Public Water Supply Manual," which contains guidelines regarding the development of emergency response plans.[1233] Each community water system shall review and update their plan at least annually and as necessary to reflect changes to communication procedures and contact information, and each community water system must record the date of an update on the plan.[1234]

If a public water system is unable to prevent a drinking water emergency from occurring, Pennsylvania provides for the ability to respond to a drinking water emergency. Pursuant to the state's Emergency Management law, Pennsylvania has an overall plan, called the Pennsylvania ERP to address various kinds of emergencies including those that involve drinking water.[1235] Pennsylvania grants general authority to the governor to respond to emergency situations including issuing, amending, and/or rescinding executive orders, proclamations and regulations.[1236] In Pennsylvania, a disaster emergency can only be declared by an executive order or proclamation of the governor.[1237]

In responding to and recovering from emergency situations, Pennsylvania has various financial assistance tools. One derives from the governor's general power to utilize all available resources to cope with the disaster emergency.[1238] Another derives from the Public Disaster Assistance Grant Program, which provides grants to political subdivisions and municipal authorities for assistance with repair of disaster-related damage in a disaster emergency area when the damages to public facilities are beyond the financial capabilities of the political subdivision or authority.[1239]

Pennsylvania empowers county and local coordinators of emergency management to enter into mutual aid agreements to increase access to resources in the event of an emergency.[1240] Through the Pennsylvania Water Agency Response Network (PaWARN), public and private water and wastewater utilities in Pennsylvania can share resources concerning emergency response.[1241] PaWARN provides water and wastewater agencies with an MAA template that is written broadly enough to encompass various kinds of drinking water emergencies.[1242]

Wisconsin

Wisconsin law does not define drinking water emergency. When discussing emergency operations, though, the rules refer to "all types of emergency situations, including terrorism, sabotage, natural disasters such as floods and tornadoes, loss of system-side pressure, and overfeed of chemicals."[1243]

Community water systems must develop ERPs.[1244] Elsewhere in the regulations, there is a requirement that community water systems have an emergency operation plan.[1245] While the wording is not clear, it appears that these plans are synonymous.

For emergency planning, Wisconsin distinguishes municipal systems from other-than-municipal systems. A municipal system's emergency plan must include a list of emergency contacts, a communication system, any mutual aid agreements, procedures for emergency water production, and public notification.[1246] An other-than-municipal system's plan only needs to have a list of contractors who can respond to emergencies, and procedures for obtaining an alternate water source.[1247] The reason for the distinction is not clear. There is no requirement in the law to update the plans periodically and no mention of agency review of them.

If efforts to avoid a drinking water emergency fail, Wisconsin law provides for the ability to respond to it. Wisconsin DNR has only general statutory authority to address drinking water emergencies. It can "do and perform any act deemed necessary for the safeguarding of public health" but the principal law on the matter never expressly defines or addresses drinking water emergencies from natural disasters or intentional acts.[1248]

Also, since water systems are often state-regulated public utilities in Wisconsin, the utility code instructs utilities to make reasonable provisions to meet an emergency.[1249] The code asks utilities to take immediate action where necessary, though the utility commission retains the ability to exercise after the fact oversight.[1250]

Pursuant to the state's Emergency Management law,[1251] Wisconsin has an overall plan, called the Wisconsin ERP, to address various kinds of emergencies including those that involve drinking water.[1252] Wisconsin DNR, in coordination with other agencies, is tasked with assisting communities that are suffering from a drinking water emergency, particularly to help procure short- and long-term alternate water supplies. However, there is no distinct state emergency management plan that exclusively addresses drinking water, nor is there any distinct source of financing to assist with emergency response efforts.

Wisconsin empowers water systems to enter into MAAs to increase access to resources in the event of an emergency.[1253]

Summary

All eight states encourage use of the WARN scheme and MAAs to promote resource efficiency for emergency responses.

In terms of express legal authority, most states do not expressly define what amounts to an "emergency" in the context of drinking water. Michigan's and Ohio's legal schemes define an emergency and communicate what the drinking water agency can do to respond to them. All other state's legal schemes are less clear on what constitutes an emergency and how the drinking water agency must or should react.

In terms of planning, New York, Ohio, and Pennsylvania have the most specific provisions. They clearly list water systems' obligations when it comes to developing and revising an emergency response plan and remaining prepared to implement. Additionally, New York requires water systems to make their emergency response plans available for public comment. Comparatively, other states are less clear or comprehensive when defining a system's obligations.

In terms of financial assistance, only Ohio has a well-defined financing mechanism expressly to aid a water system in responding to an emergency. Most states make funds available to systems confronting a drinking water emergency by issuing low-interest loans through their drinking water SRF programs.

Management of Algal Blooms and Their Consequences

Overview

Cyanobacteria are an ancient group of microorganisms that consist of unicellular and multicellular prokaryotes.[1254] According to the International Code of Botanical Nomenclature, there are approximately 150 genera with about 2,000 species of cyanobacteria.[1255] Some cyanobacteria produce a variety of toxins, collectively referred to as cyanotoxins, which can pose a health risk to wildlife and humans when present in sufficient concentrations. Extremely high concentrations of cyanotoxins can pose a hazard for recreational users of water. According to the World Health Organization (WHO), the risk of acute health effects during recreational exposure to microcystins is high when concentrations exceed 20 ug/L.[1256] Lower concentrations of cyanotoxins can pose a hazard for public water systems and the people that rely on those systems for their drinking water. According to the WHO, the risk of acute health effects due to ingesting microcystins in drinking water is high when concentrations exceed 1 ug/L.[1257] The EPA has also issued a 10-day drinking water advisory regarding microcystins. The EPA recommends healthy advisory levels at or below 0.3 ug/L for microcystins in drinking water for children pre-school age and younger and at or below 1.6 ug/L for school-aged children and adults.[1258]

Concerns regarding cyanobacteria blooms and their impact on drinking water supplies have increased given recent "do not drink" advisories in Salem, Oregon and Toledo, Ohio caused by high concentrations of cyanotoxins that resulted from cyanobacteria blooms. Additionally, there are concerns that increasingly warmer climates caused by climate change will provide better environmental conditions for cyanobacteria blooms, which may increase their frequency and intensity. However, since the occurrence of cyanobacteria blooms is dependent on a number of environmental factors, the risks posed by cyanobacteria to drinking water systems varies from state to state. While some states routinely experience cyanobacteria blooms that threaten drinking water systems, others may not. As such, states have taken a variety of different approaches depending on the perceived threat this emerging contaminant poses to public water supplies.

Numerous environmental factors can contribute to a cyanobacteria bloom. It is well established that cyanobacteria increase with eutrophication.[1259] As such, it was originally assumed that cyanobacteria blooms required high phosphorus and nitrogen concentrations.[1260] However, studies have shown that lower nitrogen and phosphorus concentrations may favor cyanobacteria blooms.[1261] Nonetheless, high concentrations of phosphorus and nitrogen, which may result from fertilizer runoff in agricultural operations, may indirectly lead to cyanobacteria blooms. High nitrogen and phosphorus concentrations can create higher carrying capacities for phytoplankton, which can lead to high turbidity and low light availability. While cyanobacteria are photosynthetic organisms, many cyanobacteria thrive in low light conditions enabling them to out-compete other species in waters with high turbidity.[1262] Many cyanobacteria also contain gas vesicles that allow cyanobacteria to adjust their vertical position in the water column, which allow cyanobacteria to optimize their position in regard to sunlight.[1263] Cyanobacteria have slower growth rates than most other algal species.[1264] Therefore, cyanobacteria require long water retention times in order to form a bloom.[1265] Temperature is another important factor for cyanobacterial growth. Maximum growth rates are attained for most cyanobacteria in waters above 77 degrees Fahrenheit.[1266] These optimal temperatures are higher than those normally associated with algae.[1267] As such, many cyanobacteria blooms in temperate climates typically occur in the late summer or early fall. Absent a change in

conditions, cyanobacteria blooms commonly reoccur in hospitable habitats.

Of the thousands of species of cyanobacteria, only 40 are known to be toxicogenic.[1268] Different species of cyanobacteria can produce different types of toxins. In general, the types of toxins produced by cyanobacteria are broadly classified as hepatotoxin (liver), neurotoxins (brain), and cytotoxins (cells).[1269] However, toxigenic and nontoxigenic strains of cyanobacteria can coexist within populations of the same species, and the proportion of toxigenic and nontoxigenic cells in a population can vary.[1270] Microcystins and nodularins are the most widespread cyanotoxins.[1271] Microcystins have been found to occur in a number of genera of cyanobacteria.[1272] The environmental conditions under which cyanobacteria produce cyanotoxins are largely unknown.[1273]

Cyanobacteria blooms and cyanotoxins present a number of challenges for water treatment systems. If cyanotoxins are present in a cyanobacteria bloom, those cyanotoxins are produced within cyanobacteria and are not released until the cell wall is broken as a result of cell death and lysis.[1274] While conventional water treatment systems are generally able to remove whole cyanobacterial cells, conventional water treatment systems are generally not able to remove extracellular cyanotoxins without the use of nonconventional treatment measures.[1275] There are a number of advanced treatment systems that are capable of removing extracellular cyanotoxins. The use of powdered activated carbon, granular activated carbon, ozonation, nanofiltration, and reverse osmosis have all been found to be effective treatment methods for the removal of extracellular cyanotoxins.[1276] However, the degree of the effectiveness of these treatment methods may vary based on the condition of the raw water, the point at which it is applied, and the dosage.[1277]

Based on the challenges described above, water treatment system operators must consider the following factors. The use of algaecides should be strictly controlled to avoid the killing of cyanobacteria, which would result in a mass release of cyanotoxins due to the death of otherwise healthy cyanobacteria cells. If healthy cyanobacteria cells can remain intact through the water treatment process, they can be effectively removed through the coagulation, flocculation, and sedimentation process.[1278] Water plant treatment operators must also take care to avoid the lysis of a cyanobacteria cell and the subsequent release of cyanotoxins within the water treatment system. Cell lysis may occur due to chlorination of water prior to filtration, mechanical or hydraulic disturbances during the rapid mix process, or from a failure to frequently remove cyanobacteria from filtration systems.[1279] If extracellular cyanotoxins are present in a water treatment system, they will not be removed by conventional treatment methods, but may be removed by a variety of advanced treatment methods that are sometimes utilized by systems that regularly face odor and taste issues due to their source water. However, the operation of these advanced treatment methods may need to be altered to adequately treat cyanotoxins.

In this section of the report, the main questions explored are as follows:

- How does the SDWA address algal blooms and the related bacteria and toxins?
- How does each state regulate the presence of bacteria and toxins related to algae in drinking water?
- How does each state address algal blooms with regard to source water detection and treatment?

Federal

The SDWA requires the EPA to publish a maximum contaminant level goal and promulgate a national primary drinking water regulation for a contaminant that it determines may have an adverse effect on the health of persons, is known to occur or there is a substantial likelihood to occur in public water systems with a frequency and at levels of public health concern, and the regulation of such contaminant presents a meaningful opportunity for health risk reduction for persons served by the public water system.[1280]

While there is currently no national drinking water regulation for cyanotoxins, the EPA has published a health advisory regarding microcystins, which is nonregulatory guidance for contaminants not subject to any national primary drinking water regulation.[1281] Additionally, the EPA has included cyanotoxins on all four Contaminant Candidate Lists, which consists of dozens of contaminants that are not subject to

federal drinking water regulations, but that are known or anticipated to occur in public water systems.[1282] The EPA has also utilized its authority under the SDWA to include cyanotoxins in its monitoring program for unregulated contaminants.[1283] Generally, large water systems that rely on surface water must conduct sampling twice a month for four consecutive months at the entry point for the public water system.[1284]

In 2015, the SDWA was amended to provide for an assessment and management of the risk of algal toxins in drinking water.[1285] The amendment required the EPA to develop and submit to Congress a strategic plan for assessing and managing risks associated with algal toxins in drinking water provided by public water systems.[1286] This report was submitted to Congress in November of 2015.[1287] Pursuant to the SDWA, the report addressed numerous topics relating to harmful algal blooms, including the development of health advisories by the EPA, treatment options for public water systems, and source water protection practices.[1288]

In addition to the legislative actions described above, the EPA has also developed a number of guidance documents in recent years focused on assisting public water system operators in managing cyanotoxins in drinking water.[1289]

Illinois

In 2013, the Illinois EPA initiated the Harmful Algae Bloom program. The program primarily exists to conduct routine monitoring of targeted sampling locations, and to respond to credible reports of cyanobacteria blooms.[1290]

The locations identified for sampling by the Illinois EPA include beaches along inland lakes, at public water supply intakes, and at locations along rivers. Regarding drinking water intakes, the Illinois EPA collects one sample at each of the five Lake Michigan public water system intakes, at each of the five Lake Michigan harbor stations, and at each of the five Lake Michigan nearshore stations. Samples are collected from these locations a total of three times between May and October.[1291] Additionally, the Illinois EPA collects one sample per month between June and October near six public water supply intakes in the southern region of Illinois, and three public water supply intakes in the northern region.[1292] Illinois also encourages the public to report the occurrence of a suspected cyanobacteria bloom through its Bloomwatch App.[1293] The app allows people to take pictures of suspected blooms to send to the Illinois EPA.

Action Levels, Monitoring, and System Design

Illinois has not adopted any maximum concentration limit or action level for cyanobacteria or any cyanotoxin. It also does not require water systems to monitor for cyanobacteria or any cyanotoxins in either raw water or finished water.

Illinois does not specify criteria for the design of community water supply treatment facilities; instead, it allows the applicant to utilize any design that it demonstrates will meet finished and raw water quality standards.[1294] However, since a water quality standard has not been created for either cyanobacteria or cyanotoxins, Illinois does not require any system design to account for the removal of extracellular microcystins.

Limiting Cyanobacteria Blooms in Source Waters

Illinois has enacted nutrient control criteria for phosphorus that applies to certain lakes and reservoirs. In any reservoir or lake with a surface area of 20 acres or more, phosphorus concentrations may not exceed 0.05 milligrams per liter.[1295] Additionally, in the open waters of Lake Michigan, phosphorus concentrations may not exceed 7 micrograms per liter, and nitrogen concentrations may not exceed 10 milligrams per liter.[1296]

Illinois has enacted effluent discharge limitations for phosphorus. Within the Lake Michigan basin, no effluent discharge may contain more than 1 milligram of phosphorus per liter.[1297] For discharges to a lake or reservoir with a surface area of 20 acres or more, or to any lake or reservoir whose untreated waste load is 2,500 or more population equivalents, no effluent discharge may exceed 1 milligram of phosphorus per liter.[1298]

Illinois has enacted effluent discharge limitations for nitrogen. For discharges to the Illinois River, the Des Plains River downstream of any confluence of the Chicago River System, or the Calumet River System, no effluent discharge may exceed 2.5 milligrams of total ammonia nitrogen per liter during the months of April through October, and 4 milligrams per liter at all other times if the water bodies untreated waste load is 50,000 or more population equivalents.[1299]

Illinois has not developed any regulations or guidance regarding the use of algaecides for severe cyanobacteria blooms.

Indiana

The Indiana Department of Environmental Management conducts regular sampling of several reservoirs and lakes from May until the end of August.[1300] The results of all sampling is publicly accessible on a website maintained by the Indiana Department of Environmental Management.[1301] If sampling results reveal high concentrations of cyanobacteria or cyanotoxins, then the Indiana Department of Environmental Management may issue either a human recreation advisory, or a dog recreation advisory.[1302] The Indiana Department of Environmental Management does not appear to consider potential impacts to drinking water in its cyanobacteria program.

Action Levels, Monitoring, and System Design

Indiana has not adopted any maximum concentration limit or action level for cyanobacteria or any cyanotoxin. It also does not require water systems to monitor for cyanobacteria or any cyanotoxins in either raw or finished water. Indiana has not developed system design requirements for the removal of extracellular microcystins.

Limiting Cyanobacteria Blooms in Source Waters

Indiana has not developed water quality criteria for nitrogen or phosphorus.

Indiana does require phosphorus removal or control facilities for a point source discharge where the daily discharge is located within the Lake Michigan or Lake Erie basins, and contains 10 pounds or more of total phosphorus.[1303] Where phosphorus removal is required for a publicly owned treatment works, the effluent discharge must be no more than 1 milligram per liter of phosphorus.[1304]

Indiana has not developed any regulations or guidance regarding the use of algaecides for severe cyanobacteria blooms.

Michigan

In response to the increasing presence of cyanobacteria blooms in the western basin of Lake Erie, the Water Resource Division of the MDEQ established an internal work group in 2013 to develop an approach to monitor, assess, and report on nuisance and harmful algal conditions and to improve its understanding of the nature, extent, and frequency of algal blooms in inland waters and along the shorelines of the Great Lakes.[1305] This group was convened voluntarily by the MDEQ and is not directed by any legislative mandate. It has produced a report that analyzes which water systems are likely at risk regarding cyanotoxins[1306] and it produces an annual algal bloom tracking report.

Action Levels, Monitoring, and System Design

Michigan has not adopted any maximum concentration limit or action level for cyanobacteria or any cyanotoxin. However, MDEQ has stated that it expects to develop a water quality standard for microcystins once the EPA establishes federal guidelines.[1307] While the EPA did produce nonregulatory health advisories for two cyanotoxins in 2015, to date the MDEQ has not developed any water quality standard for microcystins or any other cyanotoxins. Michigan does not require water systems to monitor for cyanobacteria or any cyanotoxins in either raw water or finished water. In regard to system design, the Michigan SDWA requires the MDEQ to approve plans and specifications submitted by a supplier of water of its entire waterworks system prior to construction.[1308] Michigan's administrative code also specifies that every treatment system must include a minimum of two units for coagulation, sedimentation, and filtration.[1309] Additionally, Michigan's administrative code instructs public water systems relying on surface water to install a minimum of two units for rapid mix, flocculation, sedimentation, filtration, and disinfection.[1310] Michigan has not developed any system design requirements for the removal of extracellular microcystins.

While the MDEQ has not established action levels, monitoring requirements, or design standards to address cyanobacteria or cyanotoxins, its harmful algal blooms working group has surveyed public water systems drawing from source waters that are susceptible to cyanotoxin contamination. Specifically, the MDEQ has conducted a survey of its public water systems that have one or more intakes in a Great Lake or one of its connecting channels, or an inland river or lake that may be impacted by a cyanobacteria bloom. This report assessed the systems that are susceptible to the risks posed by cyanobacteria blooms due to one or more factors.[1311]

Regarding systems that draw from the Great Lakes, the report noted that most systems have their intake located thousands of feet off-shore or buried beneath the lake bottom, which makes those systems less susceptible to contamination.[1312] However, there are some Great Lakes systems that are at-risk due to unique factors. Those systems are discussed below.

Regarding public water systems that draw from Great Lakes connecting channels, such as the Detroit, St. Clair, and St. Mary's Rivers, the report stated that such systems have the benefit of huge flows passing through those channels, which mitigates the risk of cyanobacteria blooms since they prefer stagnant water. Further, it stated that such systems have real-time monitoring of their source water, when necessary, so they have the ability to stop drawing water while a cyanobacteria bloom passes by its intake.[1313] However, Michigan regulations do not require cyanobacteria or cyanotoxin monitoring in raw water, so it is unclear which public water systems are conducting such monitoring.

Regarding public water systems that rely on inland lakes and streams for at least some of their source water, two systems utilize other water sources to supplement their surface water source, such as groundwater sources or well fields.[1314] However, it's unclear how much water is available from these alternative sources. Additionally, for public water systems that rely on inland lakes and streams for their source water but do not have permanent access to an alternative source, the MDEQ report indicates that such systems have advanced treatment systems.[1315] However, it's unclear what those advanced treatment systems consist of and whether they are capable of removing extracellular microcystins.

The MDEQ has identified two primary locations with public water system intakes that are most at-risk based on their history of cyanobacteria bloom. Those locations are the lower portions of the Saginaw Bay and the western portions of Lake Erie. There are two systems with intakes in lower Saginaw Bay—Bay City and Caseville.[1316] According to the report, the Bay City treatment system was specifically designed to deal with taste and odor problems that are frequently present in the lower Saginaw Bay as well as additional monitoring equipment.[1317] It is unclear whether the additional monitoring equipment is capable of detecting cyanobacteria and/or cyanotoxins. However, the Bay City system did switch its source water intake to a more northern portion of Saginaw Bay that is outside of the area that has traditionally experienced algal blooms.[1318] Caseville's intake is buried beneath the lake bottom, which insulates it from water quality issues.[1319]

According to the report, the most at-risk systems in Michigan are the Monroe and Frenchtown townships systems that draw water from two shared intakes in the western portion of Lake Erie. Both intakes have had real-time monitoring equipment installed since 2012, which can monitor for cyanobacteria.[1320] Additionally, the Monroe plant voluntarily follows the protocols established by Ohio regarding monitoring for microcystins in both their raw and treated water.[1321] The Frenchtown system includes two separate 4-million-gallon-per-day treatment plants. The original plant is a conventional treatment plant that utilizes a conventional treatment method of ozonation, coagulation, flocculation, sedimentation, and high rate filtration.[1322] The newer Frenchtown plant uses membrane microfiltration units for its filtration process.[1323]

Overall, while Michigan has done a thorough survey of its public water systems that rely on surface waters, it has not required its public water systems to assess their treatment systems for their capability of removing intact cyanobacteria cells or extracellular cyanotoxins. Michigan's report frequently noted that the public water systems at-risk for cyanotoxins already have advanced treatment systems such as ozonation in place to control odor and taste issues. While ozonation is capable of removing extracellular cyanotoxins, it's unclear whether Michigan's existing special treatment systems are capable of delivering the dosages required to remove microcystins. There are recent examples of cyanotoxins overwhelming conventional ozonation systems.[1324]

Limiting Cyanobacteria Blooms in Source Waters

Michigan has not taken any significant action to address cyanobacteria blooms in source waters. While it is a party to the Western Basin of Lake Erie Collaborative Agreement, it has not developed phosphorus or nitrogen water quality criteria. However, Michigan has established a standard that requires all point source discharges to achieve 1 milligram per liter of total phosphorus as a maximum monthly average effluent concentration.[1325] It has also not developed any guidance regarding the use of algaecides for severe cyanobacteria blooms.

Minnesota

The Minnesota Pollution Control Agency lake monitoring staff tracks reports of harmful algae blooms.[1326] However, it does not appear that Minnesota conducts any voluntary, programmatic sampling of water to determine concentrations of cyanobacteria.

Action Levels, Monitoring, and System Design

Minnesota has not adopted any maximum concentration limit or action level for cyanobacteria or any cyanotoxin. It does not require water systems to monitor for cyanobacteria or any cyanotoxins in either raw or finished water. It has not developed system design requirements for the removal of extracellular microcystins.

Limiting Cyanobacteria Blooms in Source Waters

Minnesota has developed water quality criteria for phosphorus and nitrogen for a number of different lakes and reservoirs, as well as streams and rivers.[1327] Additionally, Minnesota has enacted effluent discharge limitations for phosphorus. In general, discharges of total phosphorus in sewage, industrial waste, or other wastes must be controlled so that the water quality criteria are maintained.[1328] Specifically, no effluent discharges into specifically described water bodies may exceed 1 milligram of phosphorus per liter.[1329]

New York

The New York Department of Environmental Conservation has created the Harmful Algal Blooms program, the purpose of which is to monitor for the occurrence of cyanobacteria blooms and to conduct outreach to inform the public about bloom conditions when they are present. The program relies on a broad network of public and private parties to monitor for the occurrence of a cyanobacteria bloom. This may include reports from the Department of Environmental Conservation; New York State DOH; the local health department; the Office of Parks, Recreation, and Historic Preservation; or members of the public. If staff determines the bloom is "suspicious" based on the initial report, it may collect water samples to conduct a water quality analysis. The analysis assesses the total chlorophyll that can be fluoroscopically attributed to cyanobacteria (also known as blue-green chlorophyll, or BG Chl.a) and toxin concentration.[1330] If BG chlorophyll levels exceed 25 micrograms per liter, if the majority of the sample presents bloom-like densities, or if microcystin is present in concentrations greater than 4 micrograms per liter, but less than 10 micrograms per liter, then a bloom is confirmed.[1331] If a bloom is confirmed, and the microcystin concentrations exceed 20 micrograms per liter in a shoreline sample, 10 micrograms per liter in open water samples, or there is a known risk of exposure to anatoxin or another cyanotoxin, then the bloom is considered to be a "high toxins bloom."[1332] Determinations regarding the status of a potential cyanobacteria bloom are published online and are communicated via email to local stakeholders.[1333]

Action Levels, Monitoring, and System Design

New York has not adopted any maximum concentration limit or action level for cyanobacteria or any cyanotoxin. It does not require water systems to monitor for cyanobacteria or any cyanotoxins in either raw or finished water. It has not developed system design requirements for the removal of extracellular microcystins.

Limiting Cyanobacteria Blooms in Source Waters

New York identifies two specific cyanobacterium as invasive species: cylindrospermopsis raciborskii and grateloupia turuturu.[1334] It is unlawful for any person to knowingly introduce these cyanobacterium, or introduce by a means one knew or should have known would lead to the introduction of these cyanobacterium into water bodies.[1335]

Additionally, New York generally requires algae and aquatic vegetation to be controlled so that no hazard to bathers exists.[1336] However, it does not reference protection of source water intakes for drinking water systems from the potential hazards posed by cyanobacteria blooms.

New York does require that any chemical used to control vegetative and algae must not be capable of creating toxic reactions, or skin or membrane irritations when the beach is in operation.[1337] While this could be interpreted to restrict the use of algaecides on cyanobacteria blooms, it is more likely meant to regulate the contents of the algaecide itself rather than the release of toxins from a cyanobacteria killed by an algaecide.

Ohio

Among the states surveyed, Ohio has been the only state that has taken legislative and regulatory action specifically aimed at mitigating the risks of cyanotoxins contaminating drinking water distributed by public water systems. Ohio law requires the Ohio EPA to coordinate the state's management of and response to harmful algae.[1338] More specifically, Ohio law requires the Ohio EPA to develop and implement protocols for the monitoring of cyanobacteria and the establishment of public health advisory levels.[1339] Pursuant to this legislative mandate, the Ohio EPA has developed regulations specifically aimed at mitigating the risks cyanotoxins pose to public water systems.

Action Levels, Monitoring, and System Design

The focal point of Ohio's cyanotoxin regulations are the action levels for microcystins and its monitoring requirements.[1340] All surface water systems must conduct regular cyanobacteria and microcystin monitoring in both raw and finished water.[1341] For cyanobacteria monitoring, surface water systems must take a minimum of one sample from each raw water sampling point at least once every two weeks.[1342] For microcystin monitoring, surface water systems must take a minimum of one sample from each raw water and finished water sampling point at least weekly between May 1 and October 31.[1343] If a surface water system does not detect any microcystins in at least two consecutive weekly samples from both the raw water and finished water sampling points, then it may reduce its microcystins monitoring frequency to one sample from each raw water sampling point at least every two weeks between November 1 and April 30.[1344] Systems may be eligible for reduced monitoring. Routine cyanobacteria or microcystin monitoring frequency requirements may be revised at the discretion of the Ohio EPA.[1345] Systems may also be required to conduct increased monitoring. If any microcystins are detected in finished water, then the system must increase the frequency of its monitoring in both raw water and finished water to daily.[1346] If microcystin concentrations exceed 5 micrograms per liter at the raw water sampling point, then the frequency of monitoring at both raw water and finished water sampling points must be increased to three days per week.[1347] Ohio has established action levels of 0.3 micrograms per liter for vulnerable individuals and 1.6 micrograms per liter for all individuals.[1348] Additionally, Ohio requires all public water systems to develop and submit written treatment optimization protocols when microcystins are detected in a sample of either raw or finished water.[1349] In developing its protocols, the public water system must review and optimize its existing conventional treatment system to effectively remove cyanobacteria cells.[1350] If monitoring at a public water system indicates that microcystin concentrations exceed 1.6 micrograms per liter in a raw water sample more than once during a 12-month period, or if microcystins are detected in a finished water sample, then the public water system must submit a cyanotoxin general plan that includes long-term and short-term actions to prevent exceedances of the microcystin action level.[1351]

If the microcystin action level is exceeded in routine water samples collected at the finished water sampling point, then the public water system must take specified measures to address the exceedance. Within 24 hours upon receiving the result of action level exceedance, the public water system must collect one resample from each raw water sampling point and one resample from each finished water sampling point, and must conduct an analysis of the resamples within 24 hours of collection.[1352] Additionally, within 24 hours of collecting the resamples described above, the public water system must collect another repeat sample from each raw water and finished water sampling point and complete the analysis of the resamples within 24 hours of collection.[1353] If the microcystins concentration in any resample or repeat sample collected at any finished water sampling point exceeds the action level, the public water system must notify all consecutive water systems served by the water system within three hours of receiving the analytical results.[1354] Additionally, the water system, and all consecutive water systems served by the water system, must collect samples at representative distribution sampling points in accordance with the water system's contingency plan.[1355] The Ohio EPA may require additional distribution system monitoring based on sampling results and other relevant circumstances.[1356]

Additionally, Ohio requires public water systems to issue a public notification under specific circumstances, including an exceedance of the microcystin action level in a repeat sample.[1357] Each community system that exceeds a microcystin action level must also include microcystin-specific information in its consumer confidence report.[1358]

Overall, Ohio's cyanotoxins regulations operate to identify at-risk systems, require active monitoring, and require the optimization of existing treatment systems for the removal

of intact cyanobacteria cells as well as the development of in-plant treatment technologies to remove extracellular microcystins in at-risk systems.

Limiting Cyanobacteria Blooms in Source Waters

Ohio has developed a general National Pollutant Discharge Elimination System (NPDES) permit that restricts the application of algaecides to severe cyanobacteria blooms that cover more than 20% of the reservoir or that are within 500 feet of a drinking water system intake. It has also entered the Western Basin of Lake Erie Collaborative Agreement with Michigan and Ontario, which sets a goal of 40% total load reduction in the amount of total and dissolved phosphorus entering the Lake Erie Western Basin by the year 2025.[1359] In areas where the nuisance growth of algae, weeds, and slimes exists, phosphorus discharges from point sources determined to be significant by the Ohio EPA shall not exceed a daily average of 1 milligram per liter.[1360] In 2018, the Ohio EPA designated the open waters of western Lake Erie to be impaired due to cyanobacteria blooms.[1361] This action will trigger additional regulatory responses to reduce the amount of pollutants that cause cyanobacteria blooms from entering water bodies that feed into the western basin of Lake Erie.[1362] However, Ohio has not developed water quality criteria for phosphorus or nitrogen.

Pennsylvania

According to a report prepared by the Pennsylvania Department of Environmental Protection, Department of Conservation and Natural Resources, and the Erie County DOH, while toxic cyanobacteria blooms are not common in the central basin of Lake Erie, such a bloom was documented in 2013 in Presque Isle Bay.[1363] Specifically, microcystin concentrations during the Presque Isle Bay bloom exceeded 50 ppb.[1364] Significant cyanobacteria blooms have also been observed on inland lakes in northwestern Pennsylvania, but their toxicity was not confirmed.[1365]

In response to these events, Pennsylvania has created the Lake Erie Harmful Algal Bloom Monitoring and Response Strategy. Its focus is primarily on recreational waters rather than drinking water.[1366] Pursuant to its strategy, Pennsylvania conducts routine monitoring for cyanobacteria cell counts and cyanotoxin levels in Presque Isle Bay. In other waters, Pennsylvania largely relies on citizens to identify potential cyanobacteria blooms.[1367]

If a cyanobacteria bloom is identified, then Pennsylvania's strategy identifies a variety of public advisory responses, which largely consist of warning the public of potential recreational hazards in water bodies that are experiencing a cyanobacteria bloom through the posting of signage.[1368]

Action Levels, Monitoring, and System Design

Pennsylvania has not adopted any maximum concentration limit or action level for cyanobacteria or any cyanotoxin. It does not require water systems to monitor for cyanobacteria or any cyanotoxins in either raw or finished water. It has not developed system design requirements for the removal of extracellular microcystins.

Limiting Cyanobacteria Blooms in Source Waters

Pennsylvania has developed water quality criteria for nitrogen, but not for phosphorus.[1369]

It does require effluent discharges that contribute to or threaten to impair existing or designated uses in free flowing surface water limited to an average monthly concentration of 2 milligrams of phosphorus per liter.[1370] The state has not developed any regulations or guidance regarding the use of algaecides for severe cyanobacteria blooms.

Wisconsin

Wisconsin has not taken any legislative or regulatory action specifically aimed at addressing the risks posed by cyanotoxins to public water systems. While the Wisconsin DNR has monitored suspected bloom sites to determine whether a bloom is actually occurring,[1371] its analysis and identification of at-risk systems does not appear to be as thorough as that conducted by the MDEQ.

Action Levels, Monitoring, and System Design

Wisconsin has not developed any maximum concentration limit or action level for cyanobacteria or any cyanotoxin. While it has not taken any legislative or regulatory action, Wisconsin has developed the Harmful Algal Blooms Surveillance program. This program is a citizen-based surveillance system for cyanobacteria blooms. Citizens are encouraged to report suspected cyanobacteria blooms by calling a telephone number. Once reported, the Wisconsin DNR prioritizes its investigational resources to confirm whether a cyanobacteria bloom has actually occurred.[1372]

Similar to other states, Wisconsin requires public water systems that draw from surface waters to utilize conventional treatment methods that include coagulation, sedimentation, filtration, and disinfection.[1373] Conventional treatment plants must provide a minimum of two units each for rapid mix, flocculation, and sedimentation processes.[1374]

Limiting Cyanobacteria in Source Waters

In an effort to reduce the amount of nutrients entering surface waters, Wisconsin promulgated water quality standards for the discharge of phosphorus to surface waters. Specifically, Wisconsin has established an effluent limitation of 1 milligram of phosphorus per liter of discharge from all publicly owned treatment works and privately owned domestic sewage works.[1375] Additionally, Wisconsin has developed statewide water quality criteria for phosphorus for lakes and reservoirs.[1376]

Wisconsin has not developed any regulations regarding the use of algaecides on severe cyanobacteria blooms.

Summary

While the federal EPA has developed a health advisory regarding microcystins, health advisories do not create enforceable standards that apply to water systems throughout the country. Similarly, while the EPA has listed microcystins on its Contaminant Candidate List, it has never made a determination regarding whether to formally regulate it through a national primary drinking water regulation or not. As such, water systems are only subject to their respective state regulations regarding the control of cyanobacteria as well as cyanotoxins in the drinking water treatment and distribution system.

All of the states surveyed have at least formed some type of task force or program to address the threats posed by cyanobacteria blooms. These efforts largely focus on the state monitoring for cyanobacteria blooms, investigating suspected blooms, and responding to confirmed blooms by issuing public advisories.

Of the eight states surveyed, Ohio has been the most aggressive in developing regulations specifically aimed at managing the risks that cyanobacteria and cyanotoxins present to drinking water systems. It is the only state that has developed regulations regarding concentration limits for microcystins. It is also the only state that has developed regulations requiring water systems to monitor for cyanobacteria and microcystins. Lastly, it is the only state that has developed regulations regarding the process a public water system must use to prepare for and respond to harmful algal blooms of cyanobacteria that may cause the release of dangerous cyanotoxins into the public water system.

States efforts to limit the occurrence of cyanobacteria blooms by addressing nutrient pollution varies widely. A few states have developed water quality criteria regarding nitrogen or phosphorus for specific water bodies. All control phosphorus discharges from point sources into water bodies to a certain degree.

Private Water Supplies: Well Construction and Protection from Pollution

Overview

The SDWA scheme only regulates drinking water from public water systems. There is no unified formal federal scheme to protect individual private water supplies, which are usually in the form of water wells. Given how many people in the Great Lakes rely on private wells for their drinking water, it is difficult to evaluate drinking water protection schemes without also addressing private water well protection.

Each state protects private drinking water wells in its own way. First, it is common for a state to regulate the construction of private drinking water wells. Although states rarely impose drinking water quality standards on private wells, they do take an interest in who drills and constructs the wells, how to properly abandon them, and where to place them.

Second, when states regulate industrial activities, the regulations often expressly protect private wells from contamination by those activities. Because there are so many environmental regulatory schemes, this report surveys the regulation of two kinds of industrial activity to provide examples of private well protection schemes: oil and gas drilling and livestock agriculture. Also, because so many regulatory schemes address groundwater protection quite generally, the focus in this section is on protections that apply expressly to private drinking water wells.

In this section of the report, the main questions explored are as follows:

- How do states regulate the construction of private water wells?
- How do states regulate oil and gas drilling in terms of express protection of private water wells?
- How do states regulate agricultural activity, mostly livestock farming, in terms of express protection of private water wells?

Regulation of Private Water Well Construction

There is no formal federal scheme that regulates the construction and protection of private water supplies. The U.S. EPA devotes a webpage to private water wells and provides basic tips there,[1377] but does not regulate private water well construction.

Illinois

Private water well construction is governed in Illinois by the Water Well Construction Code.[1378] This construction code applies to water wells, monitoring wells, and closed loop wells.[1379] The Illinois Department of Public Health has general supervision and authority over the location, construction, and modification of water wells.[1380] However, a local government can enact its own regulatory scheme requiring the issuance of a water well construction permit and a system for the inspection of water well construction, so long as any such ordinance is approved by the Illinois Department of Public Health.[1381] If a local ordinance is approved, then it is applied in lieu of the state regulatory scheme.[1382]

In general, all well construction contractors must hold a valid license as a Water Well and Pump Installation Contractor from the Department of Public Health before drilling, installing, or repairing any water well or associated equipment.[1383] In order to obtain a license, a contractor must have at least two years of experience working under the supervision of a licensed contractor and must pass an examination.[1384] All licenses must be renewed annually, and all licensed contractors are required to attend at least one approved continuing education session in the past two years to be eligible for renewal.[1385] Each continuing education session consists of at least six classroom contact hours, and is approved by the Department of Public Health.[1386] Illinois does allow for an individual to drill a water well on one's own property for personal or agricultural use without obtaining a license.[1387]

Illinois specifies several standards for the construction of private wells in its construction code. In general, these standards include well construction materials and methodology, distance from contamination sources, and abandoned well plugging. It also requires that a person obtain a permit to construct, deepen, modify, or seal a water well from the Department of Public Health prior to the start of work.[1388]

Illinois does not require new or modified wells to be tested for water quality upon completion. Instead, it only requires the contractor to give the owner information prepared by the Department of Public Health explaining the importance of water well sampling, procedures for sampling, and how the water can be tested to assure a safe supply of water.[1389]

Illinois also specifies the minimum distance that new wells must be from existing wells and contamination sources. For example, a new well must be 150 feet from cesspools, 75 feet from a manure pile, and 25 feet from a lake, pond, or stream.[1390]

Indiana

The Indiana DNR is the main agency tasked with regulating well construction. It regulates both the issuance of licenses to water well contractors, and establishes substantive standards regulating water well installation.

Indiana prohibits any person from operating well drilling and driving equipment unless that person is a licensed water well driller.[1391] Any person who wants to drill a well or install a pump must obtain a license from the Indiana DNR.[1392] In order to obtain a license, a person must provide three references, two of which must be water well drillers familiar with the applicant's work, and must pass an examination.[1393] All licenses must be renewed annually, and all licensed contractors are required to receive six contact hours of continuing education every 2 years.[1394] Indiana does allow a person to install a well that is for personal use and is not greater than 1.25 inches in diameter and not greater than 24 feet deep without obtaining a license.[1395]

There are detailed standards and procedures described in the Indiana Administrative Code regarding well drilling. These regulations address the following issues: well drilling procedures and locations, well equipment and installation specifications, the grouting of wells, and minimum construction standards.[1396] While Indiana does not require a person to obtain a permit before beginning the construction of a new well, a licensed water well driller must submit accurate records of each well drilled within 30 days after completion of the well.[1397]

The Indiana DNR has the authority to observe the installation of a water well, and inspect equipment used to drill a well.[1398] It can also inspect the records maintained by a licensed water well driller, and suspend or revoke the license of a water well driller.[1399] The attorney general or local prosecuting attorney has the authority to prosecute violations, which are mostly regarded as civil infractions.[1400]

Indiana does not require new or modified wells to be tested, or for any information to be provided to the owner of the well.

In terms of distances from contamination sources, Indiana only requires a new well to be located as far as practicable from any known contamination source.[1401]

Michigan

The Water Well Construction and Pump Installation Code, found at Part 127 of Michigan's Public Health Code, is the principal law that governs water well construction in the state.[1402] It applies to wells used for potable water, and to some extent to irrigation, heat exchange (or geothermal), and industrial wells.[1403] MDEQ is the main agency tasked with regulating well construction, but the local health departments also play certain roles, such as record retention and site inspection (together, the "responsible agencies").[1404]

To assist with the development of rules and standards, MDEQ has appointed an advisory board with representation from four different Michigan regions.[1405] The Water Well Advisory Committee has its own webpage and posts meeting minutes.[1406] The Committee advises MDEQ on development of the administrative rules that regulate water well construction.[1407]

Any person who wants to drill a well or install a pump must obtain a certificate of registration annually as a drilling contractor or pump installer.[1408] In order to receive a certificate, a person must have at least 2 years of experience and have completed not less than 20 wells under the supervision of a registered well driller.[1409] Additionally, Michigan requires a well driller to have completed high school and to pass a certification exam.[1410] The certificate is not transferable and expires annually with opportunities for renewal.[1411] The certification and substantive standards generally do not apply to those who place water wells intended for their own permanent single-family residences or intended for farming purposes on their own farms.[1412]

MDEQ or the local health department has the authority to inspect well installations.[1413] MDEQ and the local health department can investigate potential violations of the construction code and order any necessary corrections.[1414] They can also suspend a certificate of registration.[1415] The attorney general or local prosecuting attorney has the authority to prosecute violations, which are considered misdemeanors.[1416] The law itself does not define any specific enforcement role for citizens, but MDEQ outlines a formal complaint process administered by the local health departments.[1417]

The standards from the construction code are numerous and detailed. In general, the code addresses the following categories of issues: well construction materials and methodology, distances from contamination sources, pump installation, abandoned well plugging, certification, and dewatering.

Regarding post-construction testing, Michigan law requires subdivision developers to test drinking water wells. The Michigan Land Division Act gives the MDEQ the authority to review and approve the suitability of groundwater for onsite water supply for those subdivisions that are not served by public water systems.[1418] In order to determine whether onsite groundwater is suitable for use, the MDEQ requires subdivision developers to install water wells or test wells, to conduct water sampling, and to submit the results to the MDEQ,[1419] or to use water wells or test wells in the vicinity or hydrogeological information that demonstrates that the onsite groundwater is suitable for use.[1420] Specifically, the MDEQ requires samples to be tested for chloride, fluoride, hardness, iron, nitrate, sodium, sulfate, and coliform bacteria. The MDEQ must reject proposed development sites that are less than 1 acre in size and subdivisions if the water sample analysis detects contaminants in concentrations that exceed the primary MCL, or if the sample analysis detects a contaminant in a concentration that is more than 50% of the MCL and the MDEQ determines that the contaminant is likely to exceed the MCL in the future.[1421] If a water well or test well exceeds any secondary maximum contaminant level, the MDEQ may require the developer to disclose the exceedance by a recorded deed restriction and advisory.[1422]

Michigan has also created more protective rules for nursing homes utilizing private wells. Specifically, nursing homes must take at least one water sample for bacteriologic testing once every three months and submit the sample to the MDEQ for examination.[1423]

In terms of distances from contamination sources, there are various kinds of standards. Where possible, the general rule is that water wells should be located upgradient from potential contamination sources.[1424] There are more specific horizontal setbacks, such as but not limited to 800 feet from the active work area of a landfill; 300 feet from an oil and gas well; 150 feet from a fertilizer storage area; 50 feet from septic tanks, cesspools, and poultry yards; and 10 feet from a surface water body.[1425]

Minnesota

Minnesota's DOH is the primary state agency in charge of regulating the drilling, construction, modification, repair, and sealing of wells.[1426] Minnesota has created an advisory council on wells and borings to assist the DOH in the regulation of private wells. The council consists of 18 voting members.[1427] Additionally, the DOH may delegate all or part of its inspection, reporting, and enforcement duties to a community health board pursuant to a delegation agreement.[1428]

In general, Minnesota requires any person constructing, repairing, modifying, or sealing a well to hold a well

contractor license.[1429] However, a person can construct a water supply well on land that they own or lease without a contractor license if it will solely be used for agricultural or personal use.[1430] In order to obtain a well contractor license, an applicant must have four years of experience and have passed an examination.[1431] Minnesota also requires each licensee to submit a corporate surety bond for $10,000. Each bond must be conditioned to pay the state on performance of work not in compliance with Minnesota's laws and regulations.[1432] Each well contractor license must be renewed annually.[1433] In order to be eligible for renewal, a well contractor must have completed at least six contact hours of continuing education each year.[1434]

Before any person constructs a water well, they must first file a notification of the proposed well with the DOH, unless the Department has delegated notification authority to a local authority.[1435] Minnesota's administrative code contains detailed regulations for the construction and use of wells. These include regulations regarding the location of wells, casing requirements, grouting, pumps, labeling, and sealing.[1436]

Minnesota requires a person who constructs a water well to submit a water sample collected from the well to a laboratory certified to analyze total coliform bacteria, nitrate-nitrogen, and arsenic within 30 days of completion for analysis.[1437] It must also notify the owner of the well that until the analysis has been completed, the well must not be used for human consumption.[1438] Once the person who constructed the water well receives the results, they must be provided to the proper owner and the DOH.[1439] If the sample results indicate the presence of total coliform bacteria, the person constructing the well is responsible for actions needed to eliminate the possible causes of total coliform bacteria, re-disinfect the well, and resample for total coliform bacteria.[1440]

The Minnesota DOH has the general authority to inspect all wells.[1441] If it determines that a violation exists, it has numerous options for enforcement action including the following: issuing an administrative penalty; issuing a cease and desist order; suspending, revoking, or imposing limitations on a well contractor's license; using the license bond to compensate persons injured or suffering financial loss because of the failure of the licensee to perform work in compliance with Minnesota laws and regulations; or impounding a drilling machine used by a person who is not licensed in accordance with Minnesota law.[1442] Additionally, the Department can request prosecution by the county attorney in the county where the violation occurred.[1443]

In terms of distances from contamination sources, Minnesota generally requires that water supply wells should not be located downslope or downgradient from a contamination source.[1444] Additionally, Minnesota contains very detailed distance requirements for several specific contamination sources. These include, but are not limited to, the following: 300 feet from any landfill; 150 feet from any tank or container holding 25 gallons or more of an agricultural chemical; 100 feet from any solid manure storage area not covered by a roof; 75 feet from a cesspool; 35 feet from the ordinary high water level of a water body; 20 feet from a sewage sump with a capacity of less than 100 gallons; and 10 feet from a fire hydrant.[1445] If a water supply well is classified as a "sensitive water-supply well" based on its design, then it must comply with more stringent distance requirements.[1446]

New York

The New York DOH is the main agency tasked with regulating well construction. While the Department enacts rules regulating the construction of water wells, and issuing certificates of registration to well contractors, local governments are largely responsible for receiving and processing applications to construct new water wells in their jurisdictions.

New York prohibits any person from engaging in the business of water well drilling without first obtaining a certificate of registration from the DOH.[1447] In order to obtain a certificate of registration, a person must pass an exam.[1448] Every certificate of registration must be renewed annually. New York does not require continuing education for licensed well contractors.

Any person who wants to construct a water well must submit an application to the permit issuing official.[1449] In cities with a population of 50,000 or more, the permit issuing official is the health officer of the city.[1450] New York has detailed regulations for well construction. These regulations address the following issues: water well location and construction, water yield, water pumps, and abandonment.[1451] Additionally, New York requires licensed well contractors to deliver a

water well completion report to both the Department and to the well owner once well construction is completed.[1452]

New York does not require new or modified wells to be tested, but does recommend owners of private water wells to test the quality of water provided by their wells, and it provides recommended MCLs for private water wells.[1453]

New York allows the DOH to revoke any certificate of registration for a violation of any law or rule regulating private well construction.[1454] Otherwise, the attorney general has the authority to prosecute and enjoin violations.[1455]

In terms of distances from contamination sources, New York has enacted detailed requirements for several specific contamination sources. These include, but are not limited to, the following: 300 feet from chemical storage sites not protected from the elements and landfills; 200 feet from storage areas for manure piles and cesspools; 150 feet from fertilizer and/or pesticide mixing and/or clean up areas; 100 feet from septic system components; 50 feet from septic tanks; 25 feet from water bodies; and 100 feet from all sources of contamination not specifically listed.[1456]

Ohio

Ohio's DOH and its local health districts (or boards of health) administer the private water system scheme.[1457] Private water systems in Ohio include wells, springs, ponds, cisterns, and hauled water storage tanks where those water sources provide potable water for human consumption and supply water to fewer than 15 service connections, and do not regularly serve an average of at least 25 individuals daily at least 60 days each year.[1458]

There was a council advising the DOH and the local health agencies on private water systems called the Private Water Systems Advisory Council.[1459] However, in 2015, based on the fact that from the Council's perspective there were other stakeholder input mechanisms in place that obviated the need for it, the Council itself requested that it be eliminated.[1460] The legislature accomplished that in 2016.[1461] Currently, any rules adopted to implement the relevant statute must be approved by the board of health commissioners.[1462] The DOH retains oversight over local health agencies' implementation of the scheme.[1463]

Most private water system contractors must register annually, obtain general business liability insurance, and comply with surety bond requirements.[1464] Ohio does not require a person to pass any exam or have any specific level of experience to be eligible for registration. Volunteers and those working on systems that serve only their own homes need not register or be bonded.[1465] Those who own homes that they rent to others must register but need not be bonded.[1466]

As part of the registration and bonding scheme, there is an extensive dispute resolution process. Parties who allege they are aggrieved by a violation of the private water well system code can complain to the relevant board of health, which will investigate the complaint and decide whether to hold the contractor liable for addressing the violations.[1467] Addressing the violation may include making repairs to the system or paying for a replacement system.[1468]

Ohio requires the local health agency to issue permits prior to construction, alteration, or sealing of a private water system.[1469] Applications for permits must describe location, design, construction, installation, and development of the system, and must include a site plan.[1470] Once construction or alteration occurs pursuant to a permit, there must also be approval of the water system.

Ohio requires the owner of a new or altered private water well to contact the DOH for the collection of water samples when work has been completed.[1471] The DOH must collect water samples and analyze the samples for nitrates, E. coli, and coliform.[1472] If the sample obtained from the private water well exceeds the MCL for microbiological contaminants, it shall not be approved unless effective remediation measures to eliminate the coliform, E. coli, or any primary pathogenic organism are implemented.[1473] If the sample indicates that the MCL for nitrates has been exceeded, the DOH shall provide information to the private water system owner on the health risks of nitrates and the options for the treatment to reduce nitrates to acceptable levels.[1474]

Additionally, Ohio requires certain types of facilities that are served by private wells and which are not qualified as noncommunity water systems to conduct regular water quality sampling. This is required for, among other facilities, adult care facilities, agricultural labor camps, foster homes, and day camps.[1475] These facilities must have water that is provided by their private wells for human consumption sampled and analyzed annually for the presence of coliform, E. coli, or other primary pathogenic organisms.[1476]

The standards from the construction code are numerous and detailed. In general, the code addresses the following categories of issues: well construction materials and methodology, isolation distances from contamination sources, pump installation, abandoned well plugging, certification, and dewatering.

In terms of isolation distances from contamination sources, there are various kinds. The general rule is that private water systems should be located upgradient and as far away as possible from potential or known contamination sources.[1477] There are more specific horizontal isolation distances, such as but not limited to the following: 300 feet from a human waste management facility, 100 feet from an oil and gas well, 25 feet from permanent surface water bodies, 10 feet from an established road right of way, and outside of a floodway all together.[1478] Regarding agricultural facilities, depending on the kind and size, the isolation distances range from 5 feet to 300 feet.[1479]

Pennsylvania

In Pennsylvania, the Bureau of Topographic and Geologic Survey in the State Planning Board is largely responsible for regulating the construction of private wells through the issuance of licenses to well contractors and the creation of regulations.

In general, Pennsylvania law prohibits any person from drilling a water well unless they have first secured a license from the Bureau.[1480] However, any person may drill a water well on property that the person owns or leases for agricultural or personal use.[1481] In order to obtain a license, a person must apply to the Bureau.[1482] However, an applicant is not required to pass an exam or have any specific experience in order to obtain a license. Each license must be renewed every year.[1483] Pennsylvania does not require licensed well contractors to meet any continuing education requirements in order to be eligible for license renewal.

Before a licensed well contractor begins construction, the contractor must file a notice of intention to drill with the Bureau.[1484] However, Pennsylvania does not have any laws or regulations governing the design of private wells. Enforcement of the laws and regulations governing the drilling of private wells is largely done by the attorney general or local prosecuting attorney.[1485]

Pennsylvania does not require the water quality from new or modified wells to be tested before use. The Department of Conservation and Natural Resources may require a well contractor to save samples of cuttings for studies.[1486] Additionally, the Department may require the well contractor to take samples as it deems necessary.[1487]

Pennsylvania's laws and regulations do not contain any requirements regarding the minimum distance a new well may be from potential contamination sources.

Wisconsin

Wisconsin's DNR outlines the standards that regulate the location, construction, and abandonment of private water wells, and counties are expected to adopt them through ordinance.[1488] This scheme applies to private systems that provide water for human consumption.[1489] It includes "[d]rilled, driven point, dug, bored, and jetted wells" but not springs, high capacity water systems, and other water resources that require approval from the Wisconsin DNR.[1490]

Counties apply for authorization to administer the scheme.[1491] Delegation to counties is broken down into five distinct levels.[1492] Under Level 1, a county can regulate well location; under Level 2, a county can regulate both well location and pump installation; under Level 3, a county can regulate inspection and remediation of existing water systems; under Level 4, a county can regulate private well construction; and under Level 5, a county can regulate abandonment and plugging.[1493]

Through ordinances, counties implement their level of delegation. At whatever level, counties must be able to inspect sites and operations, order systems to address violations or if necessary suspend a system, and prohibit health hazard risks to users or the wider community.[1494] Counties must do a certain amount of reporting to the Wisconsin DNR to allow the agency to exercise oversight, and generally cooperate with state agencies as it relates to private systems.[1495]

Counties must be prepared to advise private well system owners to not drink the water in the event of certain kinds of contamination.[1496] While private systems do not need to satisfy SDWA-based standards, the Wisconsin DNR reserves the right to deem supplies contaminated that do not meet those standards.[1497]

The standards from the construction code are numerous and detailed. There is no advisory body that assists with development of the standards. In general, the code addresses the following categories of issues: well construction materials and methodology, isolation distances from contamination sources, pump installation, abandoned well plugging, and certification.[1498] The well contractor must collect water samples to be analyzed for coliform bacteria and nitrate no later than 30 days following completion of the well.[1499] The contractor must provide the well owner with a copy of each laboratory report once it is received.[1500]

Counties are expected to authorize the location of private water systems. The general rule is that private water systems should be located upgradient and as far away as possible from potential or known contamination sources.[1501] There are prescribed minimum distances from buildings and floodplains.[1502] In terms of distances from contamination sources, there are various kinds such as but not limited to 1,200 feet from a coal storage area in excess of 500 tons, 500 feet from a quarry, 200 feet from a manure stack, 100 feet from a stormwater infiltration basin, 50 feet from a grave site, 20 feet from a septic tank, and 8 feet from a swimming pool.[1503]

There is a process of licensure and business registration for both well drillers and pump installers.[1504] For well drillers, there are extensive licensure requirements that address minimum experience and supervision and history of compliance with relevant laws.[1505] Wisconsin also requires applicants for licenses to pass an exam.[1506] The licensure requirements for pump installers are relatively fewer.[1507]

No water well drilling license is necessary for, among others, those performing work on property they own or lease and those constructing nonpotable wells.[1508] No pump installation license is necessary for, among others, those who install pumps on nonpotable wells.[1509] There are also various exceptions to the requirement for drillers and installers to register.[1510]

While not directly related to the construction of private wells, Wisconsin law provides an important program that is specifically focused on ensuring that people who receive their drinking water from private wells will have assistance if contamination issues arise. Specifically, Wisconsin law allows for any landowner or lessee of a property who has a contaminated water supply to submit a claim for "eligible costs," which include, among other things, the cost of obtaining an alternate water supply, treatment equipment, construction of a new well, and costs related to providing a connection to an existing public or private water supply.[1511] A person may receive an award that covers up to 75% of eligible costs and is capped at a total of $9,000.[1512] Additionally, neither fault nor negligence is considered when issuing an award.[1513] However, there are some key limits on the program. First, the annual family income of the landowner or lessee must be $65,000 or less to be eligible for financial assistance under this program.[1514] Ultimately, the amount of the award is determined by the claimant's family income.[1515] Second, under specified circumstances, the DNR must deny a claim for financial assistance, including for claims regarding residential wells that are contaminated by only bacteria or nitrates, unless the well is in an area of special eligibility designated by the DNR.[1516]

Summary

All states require commercial well drillers to obtain some type of license prior to constructing any wells. However, the requirements that must be satisfied by a contractor to obtain and renew such a license vary. At a minimum, most states require license applicants to pass some type of examination, and some require applicants to have a specified amount of experience. Only Pennsylvania does not require a person to pass an exam before receiving a well contractor license. Most states also require licensed contractors to undergo a specific number of hours of continuing education in order to be eligible for renewal. However, most states allow homeowners to drill their own wells without any certification.

Regarding the construction of wells, most states have developed detailed standards. Some states also require preconstruction permits. Only Pennsylvania has not developed detailed substantive requirements for the construction of wells.

States vary widely in regard to their requirements for sampling and testing private wells. Indiana and New York do not require any sampling or testing of water quality from private wells. Illinois only requires well contractors to provide basic information regarding sampling and testing water from private wells, but nothing more. Michigan, Minnesota, Ohio, and Wisconsin require some degree of sampling and

testing of water from private wells, although the specifics vary. Wisconsin only requires sampling and testing for informational purposes. Michigan, Minnesota, and Ohio require the state to prohibit the use of a private well if testing reveals levels of contaminants above MCLs.

Wisconsin's no-fault program to provide financial assistance to private well users who are confronting contamination issues is unique.

Oil and Gas Drilling

Oil and gas activity can be broken down into three segments: upstream, midstream, and downstream. Upstream activity describes the fuel extraction phase, which includes development of the well location, extracting the fuel from the subsurface, and onsite waste management practices. Midstream activity describes the conveyance of the fuel to end-users through pipelines. Downstream activity describes end-uses of the fuel, such as delivery to homes, use by natural gas-fired power plants, and liquefaction for export. Most states provide for some degree of private well protection for upstream activity, so this section of the report focuses on this aspect.

All oil and gas development activities can affect drinking water sources, but the recent development of high-volume hydraulic fracturing (HVHF) has increased concerns about drinking water in previously undeveloped areas. Hydraulic fracturing involves the underground injection of fluids at pressures significant enough to crack shale rock formations that contain oil or gas. If the mechanical integrity of a fracking well fails, it may allow gases or liquids to move into groundwater resources.[1517] Additionally, if the fracking well is not a sufficient distance from nearby groundwater resources, hydraulic fracturing liquids may be introduced into groundwater, and eventually into drinking water wells.[1518] While the SDWA does instruct the EPA to create regulations for the underground injection of fluids in order to protect drinking water sources, the phrase "underground injection" has been defined to exclude the underground injection of fluids or propping agents (other than diesel fuels) pursuant to hydraulic fracturing operations related to oil or gas production.[1519] There are no federal requirements that specify how states must protect private wells from contamination due to oil and gas development activities. This section presents information about states that have attempted to ensure that such wells are protected from contamination resulting from traditional oil and gas development as well as HVHF development.

Illinois

The primary law that regulates oil and gas drilling in Illinois is the Oil and Gas Act and the related administrative rules.[1520] For the most part, the Illinois DNR has the authority to implement the Illinois Oil and Gas Act.[1521] Illinois has also created an Oil and Gas Board, which consists of 7 members.[1522] The Board meets quarterly and, among other things, advises and consults the DNR regarding the adoption of rules pertaining to oil and gas drilling.[1523]

The Illinois Oil and Gas Act prohibits "waste."[1524] Waste is defined to include the following: locating, drilling, and producing any oil or gas well drilled contrary to the valid order, rules, and regulations adopted by the Department, and the unreasonable damage to underground, fresh, or mineral water supply in the operations for the discovery, development, production, or handling of oil and gas.[1525] There is no guidance in law or policy that defines what kind of damage is "unreasonable."

Illinois requires any person who wants to drill, deepen, or convert any well into an oil or gas producing well to first obtain a permit from the DNR.[1526] In order to obtain a permit, a person must submit an application and satisfy bond requirements.[1527] In its permit application, the applicant must include a map showing the exact location of the well proposed to be drilled, and the location of other producing wells that are nearby.[1528]

The Illinois DNR has the authority and duty to make any inquiries it deems is necessary to determine whether or not waste exists or is imminent.[1529] In the exercise of this power, the Department may collect data; make investigations and inspections; examine properties; examine, check, and test oil and gas wells; and take other actions it determines to be reasonably necessary.[1530]

There are relatively few provisions that expressly address private water wells. A person who wants to establish a Class II Underground Injection Control well, which involves the injection of fluids for oil and natural gas production, must submit a statement certifying that there are no potable water

wells located within 200 feet of the proposed well with the permit application.[1531]

Illinois has also enacted more stringent laws and regulations for HVHF operations, which is defined as operations that intend to use more than 80,000 gallons per stage, or more than 300,000 gallons total of hydraulic fracturing fluid and proppant in the fracturing process.[1532] In general, HVHF operations cannot be located within 500 feet from the surface location of any existing water well unless the owner of the well expressly agrees to a closer well location.[1533] Additionally, Illinois requires each applicant for an HVHF permit to conduct baseline water quality sampling of all water sources within 1,500 feet of the proposed HVHF well site prior to any fracturing activities.[1534] A minimum of three samples must be collected from each water source, and each sample must be analyzed for pH, total dissolved solids, dissolved methane, dissolved propane, dissolved ethane, alkalinity, specific conductance, chloride, sulfate, arsenic, barium, calcium, chromium, iron, magnesium, selenium, cadmium, lead, manganese, mercury, silver, BTEX, and gross alpha and beta particles.[1535] Baseline sampling results must be provided to the Department or to the owner of the water source.[1536] The Department must post all results on its website within 7 calendar days of receipt.[1537] All water sources subjected to baseline sampling must be sampled again 6 months, 18 months, and 30 months after the HVHF operations have been completed.[1538] The results must be submitted to the Department or to the owner of the water source.[1539]

Indiana

Article 37 of the Natural and Cultural Resources statutory code, and the implementing regulations, comprise Indiana's principal laws that regulate oil and gas drilling. The Division of Oil and Gas within the Indiana DNR implements the laws.[1540]

Indiana law prohibits "waste" in the context of oil and gas drilling.[1541] Waste is not defined in a manner that provides protection for water supplies. Instead, it mostly focuses on maximizing the efficiency of oil and gas extraction.[1542]

Indiana requires any person who wants to drill, deepen, operate, or convert a well for oil or gas purposes to first obtain a permit from the Division of Oil and Gas.[1543] In order to receive a permit, a person must submit an application and satisfy bond requirements.[1544] In the permit application, the applicant must include a map showing the exact location of the well to be drilled.[1545] An oil and gas inspector has the general authority to enter upon property where an oil or gas well is located to determine whether there is a violation of Indiana laws or regulations.[1546] Additionally, upon the request of an affected person, the Division of Oil and Gas may hold an informal hearing to consider the issuance of a notice of violation.[1547] The Division of Oil and Gas may revoke a permit for an oil or gas well if it finds that the well is polluting the waters or land of Indiana.[1548]

There are relatively few provisions that expressly address private water wells. If the oil or gas well involves the use of 5,000 barrels (approximately 210,000 gallons) or more of well stimulation treatment fluid into a formation that is within 500 vertical feet of any aquifer currently being used for domestic water supply from a water well located within 0.25 miles of the surface well location, then the permittee must collect baseline water samples from water wells within a 0.25-mile radius of the well surface location.[1549] Water sampling must be conducted not less than seven days and not more than three years prior to the initiation of the well stimulation.[1550] Samples must be analyzed for pH, total dissolved solids, specific conductance, chloride, iron, sulfate, manganese, phosphorus, magnesium, benzene, toluene, ethylbenzene, xylenes, dissolved methane, and sodium.[1551]

Additionally, Indiana requires certain oil and gas drilling activities to be a minimum distance from water wells. Any land application sites for drilling and completion fluid waste must be at least 100 feet from any water well.[1552] Any new production fluid storage pits or new fluid storage structures must be at least 200 feet from any water well.[1553] Lastly, any person seeking a permit for a Class II well, which is a well that involves the injection of fluids for oil or gas extraction, must identify nearby water wells in the permit application.[1554]

Michigan

The primary law that regulates oil and gas drilling in Michigan is Part 615 of the Natural Resources and Environmental Protection Act (NREPA) and the related administrative rules.[1555] For the most part, implementation of Part 615 is done by the Supervisor of Wells within the Oil, Gas, and Minerals Division of Michigan MDEQ.[1556]

There is a prohibition against "underground waste," which is defined as "[u]nreasonable damage to underground fresh

or mineral waters" and other substances.[1557] There is no guidance in law or policy that defines what kind of damage is "unreasonable."

The Supervisor of Wells has the authority to license well operations and enforce the law.[1558] Part of that authority involves locating wells in a manner that prevents pollution of water supplies and ordering suspension or alteration of activity if there is a threat to public health, safety, or property.[1559] Based on the Supervisor's own initiative or a verified complaint, he or she may call a hearing to determine whether unlawful waste is taking place or is reasonably imminent, and if it is, decide what to do about it.[1560]

There are relatively few provisions that expressly address private water wells. Applicants must identify fresh water wells utilized for human consumption within 600 feet of the proposed oil and gas well location. Absent consent from the landowner, oil and gas wells must be located at least 300 feet from fresh water wells utilized for human consumption.[1561]

Michigan has slightly different standards for HVHF operations, defined as operations that intend to use more than 100,000 gallons of drilling fluids in the fracturing process.[1562] While these rules apply more standards with regard to private water wells, most of those standards relate to water volume not water quality.[1563] However, for HVHF operations, applicants or permittees at their own expense must collect "baseline samples from all available water sources, up to a maximum of 10, within a ¼-mile radius of the well location."[1564] Initial sampling must take place between seven days and six months before initiation of drilling operations.[1565] Regarding additional wells, that initial sampling satisfies the sampling requirement for up to three years so long as those additional wells are drilled on the same or contiguous drilling sites.[1566] Samples must be analyzed for benzene, toluene, ethylbenzene, xylene, total dissolved solids, chloride, and methane.[1567] The applicant or permittee must provide the results to the Supervisor and water well owners within 45 days of collecting the samples,[1568] however, inform the Supervisor immediately if benzene, toluene, ethylbenzene, or xylene is detected at all.[1569]

Through informal guidance, the Supervisor in 2015 began to also require monitoring where HVHF operations take place in high population density areas, defined to include wells that are in counties with a population of 750,000 or more; in areas zoned exclusively for residential use; and are in areas where there are 40 or more structures used for public or private occupancy in any 90-degree quadrant within 1,320 feet of the well location.[1570] Based on the Instruction, a permittee must install at least one groundwater monitoring well close to and downgradient of the well location.[1571] The monitoring well samples must be analyzed for a different set of parameters than the water wells: benzene, toluene, ethylbenzene, xylene, chloride, and specific conductance (not total dissolved solids or methane).[1572] Samples must be collected prior to drilling operations, and at approximately three and six months after drilling completion (but not well completion).[1573]

Other than bringing a verified complaint to the Supervisor's attention and asking for a hearing, there is no administrative process in law or policy in Michigan that addresses contamination of private water supplies.

Minnesota

Minnesota does not have any crude oil reserves or production.[1574] As such, Minnesota has only very basic laws and regulations that regulate oil and gas drilling. The DNR is invested with the authority to adopt rules relating to the space of oil and gas wells to prevent economic wastes of products from wells.[1575] While the term "waste" is undefined, its context suggests that "waste" refers not to environmental harm, but to the inefficient extraction of gas or oil resources.

Minnesota has developed rules to regulate "exploratory boring," which includes surface drilling done to explore or prospect for oil or natural gas.[1576] Minnesota requires any person who wants to drill an exploratory boring to possess a valid explorer's license.[1577] A person may obtain a license by submitting an application to the DNR, and each license must be renewed annually.[1578]

New York

In New York, the Department of Environmental Conservation regulates the drilling of oil and gas wells.[1579] New York has also established a state oil, gas, and solution mining advisory board, which consists of 13 members.[1580] The board's role is to assist the Department of Environmental Conservation in the development of new rules, regulations, and policies.[1581]

New York law requires all oil and gas wells to be developed and operated in a manner that prevents "waste."[1582] The term

"waste" has been defined, and exclusively addresses issues related to the inefficient extraction of oil or gas rather than the protection of natural resources.[1583]

New York requires any person who wants to drill a well for exploration or production to first obtain a permit from the Department of Environmental Conservation.[1584] It also expressly prohibits the pollution of land and/or surface or ground fresh water resulting from exploration or drilling.[1585] Whenever it appears that any person is violating any provision of New York's oil and gas law, the Department, acting by the attorney general, may bring suit to restrain such person from continuing the violation.[1586] Additionally, if the state fails to bring suit to enjoin any such violation, any person may bring suit on their own behalf to restrain such violation, so long as it provides 10-days written notice to the Department.[1587] Lastly, on its own initiative or upon the application of any interested person, the Department may call a hearing on any matter within its jurisdiction.[1588]

In 2015, New York prohibited HVHF.[1589] It is one of three states, including Vermont and Maryland, that have banned hydraulic fracturing.

Ohio

Chapter 1509 of the statutory code and the implementing regulations comprise Ohio's principal laws that regulate oil and gas drilling.[1590] For the most part, the Division of Oil & Gas Resources within the Ohio DNR implements the laws.[1591] The Chief of the Division administers the regulatory scheme.[1592]

Ohio's scheme expressly addresses protection of private water supplies in various ways. The Chief has the authority to specify minimum distances from water wells,[1593] although other than what is in the legislature-passed statute, the Chief has not used that authority in the form of formal rulemaking. Based on the statute, unless the Chief makes an exception for specified reasons, new wells cannot be located within 50 feet of a water well.[1594] In an application for a license to drill a new well in an urbanized area, the applicant must sample water wells within 300 feet of the proposed well prior to commencement of drilling.[1595] In an application to drill a new horizontal well, the applicant must sample water wells within 1,500 feet of the proposed well prior to commencement of drilling.[1596] In each instance, the procedure for pre-drill sampling is outlined in a guidance document called Best Management Practices for Pre-Drilling Water Sampling.[1597] At the time of publication of this report, the guidance document version available on the website was dated 2012. Ohio DNR may require that some or all of the following parameters be analyzed in a sample: barium, calcium, iron, magnesium, potassium, sodium, chloride, conductivity, pH, sulfate, alkalinity, and total dissolved solids.[1598]

Ohio broadly prohibits the discharge of brine, crude oil, natural gas, or other fluids associated with the exploration, development, well stimulation, product operations, or plugging of oil and gas resources into groundwater, the land, or surface water in a manner that could reasonably be anticipated to cause damage or injury to public health or safety, or the environment.[1599]

Additionally, it provides a remedy for persons who have their drinking water contaminated by oil and gas activity. In situations where a person's supply of water for domestic, agricultural, industrial, or other legitimate uses is substantially disrupted by contamination, diminution, or interruption resulting from an oil or gas operation, then the owner of the oil or gas operation must replace the person's water supply.[1600] Alternatively, the owner of the oil or gas operation may elect to compensate the person for the difference between the fair market value of the property before the damage occurred to the water supply, and the fair market value to the property after the damage occurred, but only if the cost to replace the water supply exceeds the difference in fair market value.[1601]

Pennsylvania

In Pennsylvania, the DEP has the power and duty to implement the Oil and Gas Conservation Law.[1602]

Pennsylvania law prohibits the "waste" of oil and gas.[1603] Waste is defined in a manner that focuses exclusively on maximizing the efficiency of oil and gas extraction, rather than the protection of other natural resources.[1604]

Pennsylvania requires any person who wants to drill a well to obtain a permit.[1605] Additionally, the DEP can bring a suit against any person who is violating or threatening to violate any provision of Pennsylvania's laws or regulations in order to restrain such person from the violation.[1606] If the Department fails to bring such a suit, then any person who

is adversely affected by the violation may bring suit on one's own behalf to restrain the violation, so long as that person provides 10-days' written notice to the Department.[1607]

In general, Pennsylvania requires a well operator to control and dispose drilling wastes in a manner that prevents the pollution of the waters of the state.[1608] If a well operator detects a release, it must comply with reporting and corrective action requirements.[1609] Pennsylvania regulations specifically require a well operator who affects a public or private water supply by pollution or diminution to restore or replace the affected supply with an alternate supply.[1610] Any landowner whose water supply is affected by an oil or gas well may notify the Department and request an investigation be conducted.[1611] Within 45 days, the Department must make a determination as to whether the pollution or diminution was caused by the drilling.[1612]

There are relatively few provisions that expressly address private water wells. A person may not dispose of residual waste or drill cuttings by land application if the waste application area is within 200 feet of a water supply.[1613] While a well operator may conduct a predrilling survey of water quality in areas nearby an oil or gas well to support any future claim that drilling did not affect a person's water supply, it may but is not required to do so.[1614]

Wisconsin

Wisconsin has a relatively simple set of laws that regulate oil and gas drilling.[1615] The Wisconsin DNR implements the laws.[1616]

Wisconsin prohibits any person from committing "waste," though "waste" is not defined in the relevant statute or set of regulations.[1617] Read in context, the term "waste" refers not to environmental harm or harm to private water supplies, but instead to the inefficient production of gas.[1618]

The statute requires the Wisconsin DNR to develop regulations that will "protect the waters of the state, air, soil, plants, fish and wildlife from the adverse effects" of oil and gas activity.[1619] The regulations are to address siting, construction, operation, maintenance, disposal of waste, proper abandonment of wells, reclamation of affected land, and operator competence.[1620] However, while Wisconsin has a regulatory scheme for oil and gas exploration,[1621] it does not have one for oil and gas production. The scheme for exploration has a few general provisions that aim to protect aquifers generally,[1622] but nothing that expressly protects private water supplies or provides for restoration or replacement of them in case of harm. Since there is no scheme that regulates production, there is nothing that regulates production in terms of protection of private water supplies.

Summary

State laws and regulations to ensure that private water wells are adequately protected from contamination caused by oil and gas drilling and extraction activities vary widely. This is partially because different states have varying levels of oil and gas reserves. Some states, including Illinois and Wisconsin, have very limited oil and gas reserves, and therefore have relatively few laws and regulations protecting private water wells from activities related to oil and gas extraction. However, most Great Lakes states do have a significant amount of oil and gas reserves, and therefore have developed some laws and regulations to address this issue.

In general, most Great Lakes states do not require conventional oil and gas wells to be set back specified distances from private water wells. Only Michigan has setback requirements that apply to such wells.

Most states have more robust requirements for wells that involve the underground injection of fluids to extract oil and gas. These requirements commonly apply to what are referred to as "high volume hydraulic fracturing" operations, and thus typically depends on the number of gallons of hydraulic fracturing fluid that the operation will involve. This number varies from state to state, and ranges from 100,000 total gallons of drilling fluids used in the fracturing process (Michigan) to 300,000 total gallons of drilling fluids (Illinois). State requirements for HVHF operations also vary. Illinois requires such operations to be set back a specific distance from any water well, as well as pre- and post-operation water quality testing at nearby water sources. Michigan and Indiana only require pre-operation water quality testing at a nearby water source.

Ohio and Pennsylvania have taken a different approach. While neither state has developed setback or testing requirements for HVHF operations, they do provide remedial

measures. Specifically, both states require well owners or operators to restore, replace, or compensate persons who have their water supply polluted or diminished by an oil or gas well.

Lastly, New York has notably banned HVHF operations, and is the only Great Lakes state to have done so.

Agriculture

Whether agriculture involves growing crops or raising animals, the principal threats to private drinking water wells from agriculture come from application of manure, fertilizers, and pesticides to the ground and the contaminants from those substances reaching aquifers that feed wells. State laws typically address the pollution risk in terms of aquifers generally, but there are various ways in which they specifically try to protect individual wells.

Indiana

Indiana has enacted regulations to address private well contamination from livestock operations. It requires that any person who wants to construct or expand a confined feed operation must first obtain the approval of the Indiana DNR.[1623] A confined feeding operation is defined as an operation with at least 300 cattle, 600 swine or sheep, 30,000 fowl, or 500 horses.[1624] Waste management systems associated with a confined feeding operation must be at least 300 feet from offsite water wells.[1625] Offsite manure storage structures must identify all private wells within 500 feet.[1626] Additionally, manure may not be applied to land within 50 feet of any known private well.[1627]

Illinois

Illinois regulates runoff pollution from various agricultural facilities. It does so mostly through requiring the implementation of best management practices.[1628]

Illinois has enacted laws and regulations to specifically address livestock facilities and their proximity to nearby homes. A livestock management facility serving between 50 and 1,000 animals must be set back at least 0.25 miles from the nearest occupied residence.[1629] A livestock management facility that serves over 1,000 animals must be set back at least 0.5 miles from the nearest residence, with increasing setback requirements depending on the total number of animals.[1630] All temporary manure stacks must be located at least 75 feet from any water well.[1631] Additionally, livestock waste must not be applied to land within 150 feet of any water well.[1632]

Illinois has also developed a groundwater protection scheme that requires agriculture-related activities to be located a specific distance from drinking water wells. Specifically, the commercial fertilizer storage and handling and commercial pesticide storage and handling facilities must be a minimum of 200 feet from any potable water supply well.[1633] These facilities must also conduct groundwater monitoring to establish background levels of water quality.[1634]

Michigan

Michigan addresses protection of groundwater generally through its Right To Farm Act and the "generally accepted agricultural management practices" or GAAMPs.[1635] Like many right to farm laws, Michigan's allows farmers to implement certain management practices—the GAAMPs—in exchange for a defense from claims of nuisance liability.[1636] The GAAMPs exist entirely in informal guidance documents, not formal statutes or regulations.

There are GAAMPs manuals for manure management, site selection, care of animals, nutrient utilization, irrigation water use, pesticide utilization, cranberry production, and farm markets. Only two of them expressly address private water wells.

First, the GAAMPs manual on site selection states that livestock production facilities should not be constructed within 75 feet of any known existing private domestic water supply.[1637] For manure storage facility plans, which are the construction plans that detail the design of manure storage components submitted to Michigan Department of Agriculture and Rural Development for review and approval, the plans must include isolation distances to private water wells.[1638]

Second, the GAAMPs manual on nutrient utilization states that existing bulk fertilizer storage areas should be located at least 50 feet from any single family residential water well, and that new areas should be located at least 150 feet away.[1639] It also states that byproducts (such as food waste) should not be applied to land within 50 feet of a residential single family well.[1640]

Minnesota

Minnesota regulates agricultural runoff primarily through the development of best management practices.[1641] The use of best management practices is largely voluntary, but Minnesota attempts to incentivize the adoption of best management practices through low or zero interest financing to farmers for the implementation of best management practices that reduce environmental pollution.[1642]

Minnesota has enacted a number of specific setback requirements for agricultural-related activities. These setback requirements are described as follows:[1643]

- 300 feet from a liquid manure storage basin or lagoon that is unpermitted or noncertified
- 150 feet from a tank or container holding 25 gallons or more, or 100 pounds or more, of an agricultural chemical
- 150 feet from an area used to fill or clean agricultural chemical application equipment
- 150 feet from a liquid manure storage basin or lagoon that does not have a concrete or composite liner
- 100 feet from a solid manure storage area not covered by a roof
- 100 feet from a safeguarded area used to store agricultural chemicals, or clean or fill agricultural chemical application equipment
- 100 feet from a liquid manure storage basin with a concrete or composite liner
- 100 feet from an unroofed animal feedlot holding 300 or more animal units
- 50 feet from a safeguarded area used to store agricultural chemicals, or fill or clean agricultural chemical application equipment that is covered with a permanent, watertight roof
- 50 feet from an animal feedlot holding more than one animal unit
- 50 feet from a feeding or watering area within a pasture holding more than one animal unit
- 50 feet from an animal or poultry building holding more than one animal unit
- 50 feet from an animal rendering plant

New York

New York regulates runoff from agricultural operations through the State Soil and Water Conservation Committee. Its focus is on the general protection of environmental resources of the state. This is accomplished through mandatory programs, such as the requirement that concentrated animal feeding operations obtain a state pollutant discharge elimination system permit[1644] and for land application facilities to obtain a permit for the application of organic waste onto soil.[1645]

New York has a few specific requirements that regulate how far an agricultural activity must be from a private well. These setback requirements are described as follows:[1646]

- 200 feet from land surface spreading or subsurface injection of liquid or solid manure
- 200 feet from storage areas for manure piles
- 150 feet from fertilizer and/or pesticide mixing and/or cleanup areas
- 100 feet from a barnyard, silo, barn gutters, and animal pens

Ohio

Ohio regulates runoff from agricultural operations through the Ohio DNR.[1647] Ohio's regulation is generally focused on protection of "waters of the state," which include wells.[1648] It does so through the use of best management practices, setbacks, and prohibitions. However, Ohio's scheme does not expressly address private water wells distinctly from other waters of the state.

Pennsylvania

Similar to other states, Pennsylvania requires concentrated animal feeding operations to limit runoff pollution through national pollution discharge elimination system permits[1649] and nutrient management plans.[1650]

Pennsylvania does have a few specific requirements that regulate how far an agricultural activity must be from a private well. These setback requirements are described as follows:

- 100 feet from any land surface where manure is mechanically applied[1651]
- 100 feet from manure storage facilities[1652]

Wisconsin

Wisconsin regulates runoff pollution from various agricultural facilities.[1653] It does so mostly through requiring implementation of best management practices.[1654]

There are various provisions that expressly address private water wells. Related to Wisconsin's regulation of nonpoint source pollution management, the runoff regulations define "water quality management area" to include a "site that is susceptible to groundwater contamination or that has the potential to be a direct conduit for contamination to reach groundwater."[1655] A "[s]ite that is susceptible to groundwater contamination" can be an area within 250 feet of a private well.[1656] Those definitions help to define how the Wisconsin DNR regulates runoff from different agricultural industries. For example, when considering the prohibition against livestock producers causing a "significant discharge of process wastewater to waters of the state," one of the factors the Wisconsin DNR takes into account is whether the discharge affects a site that is susceptible to groundwater contamination.

Also, generally, livestock producers with a "water quality management area" must divert runoff away from contacting feedlots, manure storage areas, and barnyard areas.[1657] However, if the diversion is to protect a private water well, the diversion need only happen when the feedlot, manure storage area, or barnyard area is upgradient from the well.[1658]

Wisconsin also regulates certain animal feeding operations or AFOs.[1659] There are two standards that apply to AFOs that expressly address private water wells through setbacks. AFOs that need a Clean Water Act permit and that land-apply manure or process wastewater must not apply them within 100 feet of a private well.[1660] Also, barnyards, feedlots, and certain other systems must not be located within 250 feet of a private well.

Summary

As to agricultural activities, the states differ dramatically in terms of how they expressly address protection of private water wells. While Ohio's scheme attempts to protect groundwater generally, it has nothing specific to private wells. Michigan's scheme relies on voluntary compliance through its right-to-farm law and has all of its protection standards in guidance, not law. Most states have developed some specific setback requirements that limit how close certain agriculture activities may be to private wells.

Per- and Polyfluoroalkyl Substances (PFAS) and Drinking Water

Pursuant to the federal SDWA, the U.S. Environmental Protection Agency has established dozens of MCLs for a wide variety of organic and inorganic chemicals that may have an adverse effect on human health. These MCLs establish the maximum concentrations that are allowable in the drinking water delivered to consumers by tens of thousands of public water systems that exist around the country. However, new contaminants are constantly being discovered. Sometimes, a new contaminant uniquely impacts a limited number of water systems. Other times, a new contaminant impacts several water systems.

One drinking water contaminant that is drawing an ever-increasing amount of attention is per- and polyfluoroalkyl substances (PFAS). PFAS are a large group of man-made chemicals that include perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS).[1661] PFAS have been used in a wide variety of industries around the globe, and the earliest usage in the United States dates back to the 1940s.[1662] It has been used in everyday products such as carpets, clothing, and other materials. It has also been used for firefighting and in several industrial processes.[1663] Exposure to PFAS in drinking water can cause serious adverse health effects, including prenatal effects and cancer.[1664] As a result of these hazards, certain PFAS are no longer manufactured in the United States. However, some PFAS do not break down over time, and can build up in the environment and in the human body.[1665] As such, the release or disposal of PFAS several decades ago may still present a hazard to drinking water today and into the future. PFAS contamination is common at chemical manufacturing and disposal sites, and at military bases where it was commonly an ingredient in firefighting foam used by the U.S. military.

In this section of the report, the main questions explored are as follows:

- How are PFAS regulated under the SDWA?
- How are states addressing PFAS and the risks it poses to drinking water?

Federal

The SDWA requires the U.S. EPA to publish an MCL goal and promulgate a national primary drinking water regulation for a contaminant that it determines may have an adverse effect on the health of persons, is known to occur or there is a substantial likelihood to occur in public water systems with a frequency and at levels of public health concern, and the regulation of such contaminant presents a meaningful opportunity for health risk reduction for persons served by the public water system.[1666]

There is currently no national drinking water regulation for any PFAS. The SDWA requires the U.S. EPA to develop a list of contaminants every five years that are not subject to any proposed or promulgated national primary drinking regulation, which are known or anticipated to occur in public water systems, and which may require regulation.[1667] This list is commonly referred to as the contaminant candidate list (CCL).[1668] The EPA first included PFOA and PFOS on the third CCL in 2009.[1669] While it has been included on each subsequent CCL, the EPA has not made a determination of whether to regulate it as a primary drinking water contaminant or not. Additionally, the U.S. EPA has utilized its authority under the SDWA to include six PFAS in its 2012 monitoring program for unregulated contaminants.[1670] Lastly, the EPA has developed drinking water health advisories for PFOA and PFOS.[1671] Drinking water health advisories are non-regulatory guidance for contaminants that are not subject to any national primary drinking water regulation. They are meant to assist drinking water systems

in protecting public health when a given contaminant may be present in the system by identifying the concentrations at which the contaminant may present adverse health effects. In 2016, the U.S. EPA lowered its advisory level to 0.07 ppb, or 70 parts per trillion, for both PFOA and PFOS.[1672] The U.S. EPA published its PFAS Action Plan in February 2019.[1673] While the Plan did not include a commitment to develop a national drinking water regulation for PFAS, it did state that EPA plans to propose a national drinking water regulatory determination for PFOA and PFOS in 2019.[1674] However, it's unclear what that determination will be, or exactly when it will be made.

Illinois

Illinois has not created any interagency team to coordinate its PFAS response efforts. Additionally, relatively few PFAS contamination sites have been identified in Illinois. The Department of Defense has identified the former Chanute Air Force Base as a site highly contaminated with PFAS.[1675]

Pursuant to PFOS and PFOA monitoring required by the EPA, Illinois detected PFOS above the Health Advisory Level in the Freeport community water system.[1676] In response, Freeport shut down the contaminated wells.[1677] Additionally, perfluorochemicals were detected in an Albany community water system well at a concentration above the EPA Health Advisory Level.[1678] Based on these results, the Illinois EPA initiated a special sampling project for the Freeport and Albany community water systems.[1679]

Illinois has not enacted any state-specific advisory levels or enforceable regulations regarding PFAS in drinking water.

Indiana

Indiana has not created an interagency team to coordinate its PFAS response efforts. Additionally, relatively few contaminated sites have been identified in Indiana. The Department of Defense has identified the former Grissom Air Force Base as a site highly contaminated with PFAS.[1680]

Indiana has not enacted any state-specific advisory levels or enforceable regulations regarding PFAS in drinking water.

Michigan

In response to PFAS contamination throughout Michigan, Governor Snyder signed Executive Directive 2017-4, which established the Michigan PFAS Action Response Team (MPART).[1681] MPART is a multi-agency team consisting of the Department of Health and Human Services, the Department of Military and Veteran Affairs, the Department of Environmental Quality, and the Department of Agriculture and Rural Development.[1682] It is tasked with directing the implementation of Michigan's strategy to address PFAS contamination, which includes research, identifying PFAS contamination, and establishing response actions.[1683] MPART publishes a list of PFAS sites being investigated, as well as sampling results.[1684]

PFAS have been found at several industrial and military sites throughout Michigan. Regarding military sites, PFAS levels above the EPA's advisory level have been found either onsite or nearby at the Belmont Armory, the Camp Grayling Joint Maneuver Training Center, the former K.I. Sawyer Air Force Base, and the former Wurtsmith Air Force Base.[1685] Additionally, PFAS have been detected at Selfridge Air National Guard Base.[1686] There are also several industrial sites that have been connected to PFAS contamination, including a former licensed disposal facility owned and operated by Wolverine Worldwide in Plainfield Township. In regard to public water systems, Plainfield Township[1687] and Ann Arbor[1688] have detected PFAS, but at concentrations below U.S. EPA's advisory level. Plainfield Township has removed the contaminated wells from service, and has installed a granular activated carbon filtration system.[1689] Ann Arbor has not removed any wells from service, but it has installed a granular activated carbon filtration system on 10 of its 26 filters.[1690]

In 2018, Michigan adopted cleanup criteria for drinking water for PFOA and PFOS. Cleanup criteria require the owners or operators of a contaminated site to meet certain cleanup standards.[1691] The cleanup criteria require the sum of PFOA and PFOS in groundwater to be less than 0.07 ppb.[1692] Michigan has not taken any legislative or regulatory action to regulate PFAS in public water systems.

Michigan legislators have submitted several bills to address PFAS contamination. Two bills have been introduced that would specifically address PFAS in public water systems. On December 13, 2017, a bill was introduced to amend the Michigan SDWA to adopt a drinking water standard of 5 parts per trillion for both perfluorooctane and perfluorooctanoic acid, which would apply to each public water system.[1693] On September 5, 2018, a bill was introduced to amend the

Michigan SDWA to require public water suppliers to annually collect and analyze samples of water for the presence of PFAS, and to issue a public advisory if the presence of PFAS in a public water supply is detected.[1694] Neither of the two bills described above were enacted into law.

Minnesota

Since 2002, the Minnesota DOH has partnered with the Minnesota Pollution Control Agency to investigate PFAS in Minnesota. The Minnesota DOH has assisted in investigating potential PFAS contamination at firefighting training areas and near chrome-plating facilities, which are known sources of PFAS contamination, and has sampled fish and garden produce for PFAS levels in specific areas.[1695]

PFAS has been detected at two primary sites in Minnesota: the Bemidji Regional Airport and 3M PFAS manufacturing and disposal sites in the eastern Twin Cities metropolitan region. PFAS have been detected at measureable amounts at several public water systems near the 3M PFAS disposal sites, with the primary systems being Cottage Grove, Hastings, and Oakdale. Cottage Grove has removed 8 of their 11 wells from service due to PFOS concentrations in excess of Minnesota's Health Risk Limits, which are discussed below.[1696] The system has installed a granular activated carbon filtration system, which has enabled it to bring some of the previously deactivated wells back into use.[1697] The concentration of PFAS in the Woodbury[1698] and Oakdale[1699] systems have remained below state and federal advisory levels. The Oakdale system has installed a granular activated carbon filtration system.[1700]

Minnesota has taken a number of different approaches in responding to PFAS contamination. Upon request, the Minnesota DOH conducts sampling at private drinking water wells for residents who live within the "priority sampling area."[1701] The Minnesota DOH has also developed Health Risk Limits for four PFAS. Health Risk Limits are guidance levels for groundwater contaminants that pose a potential threat to human health if used for drinking water.[1702] They are used by public agencies and private entities in determining whether groundwater is subject to regulatory or advisory actions based on human health concerns.[1703] Minnesota has established the following Health Risk Limits for PFAS: perfluorobutane sulfonate (PFBS) limit of 7 parts per million; perfluorobutanoate (PFBA) limit of 7 parts per million; PFOA limit of 0.035 parts per million; PFOS limit of 0.3 parts per million.[1704] The Minnesota DOH has also developed a Health Based Value, which are the concentrations at which a chemical will pose little or no risk to human health.[1705] It has established the following Health Based Values for PFAS: PFBS value of 3 parts per million, and PFOS value of 0.027 parts per million.[1706] However, Minnesota has not enacted any enforceable regulations regarding PFAS in drinking water.

New York

In 2016, New York created a Water Quality Rapid Response Team, which is led by the Department of Environmental Conservation and the DOH.[1707] While the team is not exclusively focused on PFAS contamination, part of its responsibilities does include sampling public and private water wells around facilities that are suspected or known to have used PFAS.[1708]

PFAS have been detected at several military sites throughout New York. Specifically, elevated levels of PFAS have been detected at the former Griffiss Air Force Base in Rome, Defense Fuel Support Point Verona in Verona, the Seneca Army Ammunition Plant in Seneca County, Fort Drum in Jefferson County, and the Air National Guard Base in Stewart.[1709] The PFAS contamination in Stewart caused the presence of PFAS in the Newburgh and New Windsor Water Supplies, as well as the Fort Drum supply.[1710] New York provided funding for the Newburgh and New Windsor systems to connect to an alternative water source, and to install granular activated carbon filtration systems.[1711]

The most prominent incident of PFAS contamination in New York occurred in Hoosick Falls. High levels of PFAS have been identified at numerous industrial sites in the Hoosick Falls area.[1712] For example, at a chemical manufacturing facility, PFOA has been detected in groundwater at the site at concentrations up to 18,000 parts per trillion.[1713] In 2014, Hoosick Falls also detected elevated levels of PFOA in its drinking water wells and finished water.[1714] Test results in 2015 revealed PFOA concentrations above 600 parts per trillion at customer taps.[1715]

In response, the U.S. EPA recommended that an alternative water supply be provided to the users of the Hoosick Falls public water supply.[1716] Soon after, New York instituted a bottled water program through which a household could obtain a maximum of 5 gallons of water per day from a local

grocery store at no cost.[1717] In early 2016, the Hoosick Falls public water system installed two granular activated carbon filters to remove PFOA. After those filtration systems were installed, the New York State DOH in April 2016 confirmed they were effectively reducing PFOA concentrations to safe levels.[1718] The New York State DOH has also offered free blood testing and private well testing for Hoosick Falls residents.[1719] Lastly, New York provided Hoosick Falls with funds to reimburse local residents for past usage of contaminated water.[1720]

New York has specifically listed PFOA and PFOS as hazardous substances.[1721] This enables the Department of Environmental Conservation to pursue cleanup of future PFOA or PFOS contamination under its environmental remediation program.[1722] Additionally, in 2017, New York amended its SDWA to require all public water systems to test drinking water for the presence of PFOA and PFOS at least once every three years.[1723] Lastly, in 2017 New York passed the Clean Water Infrastructure Act, which appropriated $2.5 billion for municipal drinking water and wastewater infrastructure. This includes $185 million for water treatment system updates to combat emerging contaminants such as PFOA and PFOS.[1724] However, New York has not enacted any additional advisory levels or enforceable regulations regarding PFAS in drinking water.

Ohio

The Ohio EPA has conducted some PFAS sampling, with an initial focus on air force bases due to the occurrence of fire training activities at such sites.[1725] However, there is not a significant amount of publicly accessible detail regarding what proactive steps the Ohio EPA has taken to identify and address PFAS contamination in drinking water. Ohio has not created an interagency team to coordinate its PFAS response efforts.

PFAS has been detected at the Wright-Patterson Air Force Base and the Dayton Fire Training Center near Dayton. The nearby public water systems operated by Dayton and Montgomery County have both tested PFAS in finished drinking water that is supplied to customers, but at levels below the EPA advisory limit.[1726] In response, the systems have ceased operating the production well near Tait Hill, which was suspected to be the source of the contamination. No PFAS were detected in finished drinking water in 2017, and monitoring for PFAS continued through 2018.[1727]

Ohio has not enacted any additional advisory levels or enforceable regulations regarding PFAS in drinking water.

Pennsylvania

In September 2018, Governor Tom Wolf formed the PFAS Action Team.[1728] The team consists of the Department of Environmental Protection, the Department of Health, the Department of Military and Veteran Affairs, the Department of Community and Economic Development, the Department of Transportation, the Department of Agriculture, and the State Fire Commissioner.[1729] It is tasked with identifying impacted locations and resources, and creating an action plan to assist state and local authorities and public water systems in delivering safe drinking water.[1730]

PFAS has been detected at numerous military and industrial sites throughout Pennsylvania, particularly in Southeast Pennsylvania. Specifically, PFAS has been detected at the North Penn U.S. Army Reserve Center, the Naval Air Warfare Center in Warminster, the Willow Grove Naval Air Station Joint Reserve Base, the Air National Guard Base in Harrisburg, and the Air Guard Station in Horsham.[1731] This has contributed to PFAS contamination in the Horsham, Warminster, and Warrington public water supplies. In 2013, PFOS was detected in six public wells and PFOA was detected in eight public wells in the Warminster public water system.[1732] At one of the wells, the PFOS concentration was more than three times the public health advisory level.[1733] That well was shut down in 2014.[1734] In 2014, PFOS and PFOA were detected at three wells at concentrations exceeding the EPA health advisory at wells in the Warrington public water system.[1735] Upon receiving the results, the three wells were shut down.[1736] Additionally, Warrington shut down two additional wells in 2016 when the EPA revised its public advisory.[1737]

In response to PFAS contamination in drinking water, the Pennsylvania DOH has undertaken the PFAS Exposure Assessment Technical Tools Pilot Project. The project consisted of performing blood tests on residents living in communities exposed to PFAS in their drinking water in the areas of Bucks and Montgomery counties.[1738] However, Pennsylvania has not enacted any additional advisory levels or enforceable regulations for PFAS in drinking water.

Pennsylvania legislators have submitted numerous bills to address PFAS contamination. In 2018, a bill was introduced

to require each school to test for PFOS and PFOA in the water, paint, dust, and soil at the start of the school year, and to implement a plan to ensure that no child or adult is exposed to PFOS or PFOA if the test levels exceed 5 parts per trillion.[1739] In 2017, a bill was introduced to amend the Pennsylvania Hazardous Sites Cleanup Act to specifically list PFOS and PFOA as hazardous substances, and to grant the governor broader emergency powers to address PFAS contamination in drinking water.[1740] Neither of these bills have become law.

Wisconsin

Wisconsin has not created an interagency team to coordinate its PFAS response.

In Wisconsin, there are over a dozen identified sites that are contaminated with PFAS, with the majority being identified in 2017 or 2018. Three military sites have been identified as contaminated sites: the General Mitchell Air Reserve Station in Milwaukee, Fort McCoy in Monroe County, and Wisconsin Air National Guard base at Truax Field.[1741] In 2017, Madison detected PFAS at two of its drinking water wells at levels below the EPA health advisory level.[1742] Both wells have remained in use. Additionally, the West Bend water system has detected levels of PFAS below the EPA health advisory level.[1743] Samples from the drinking water wells that supply the La Crosse public water system exceeded the EPA health advisory level for PFOS.[1744]

The Wisconsin DNR has adopted PFAS soil cleanup standards for industrial direct contact uses, but it has not adopted any cleanup criteria regarding drinking water.[1745] It has not enacted any state-specific advisory levels or enforceable regulations for PFAS in drinking water.

In 2018, a bill was introduced to require the DOH to establish state health-based groundwater quality standards for PFOA and PFOS.[1746] That bill was not enacted into law.

Summary

PFAS contamination in drinking water is exclusively caused by contamination leaching from nearby sites where the chemical was improperly used or disposed of. As such, the extent of PFAS contamination, as well as the governmental response, varies from state to state. Since PFAS is an emerging, largely unregulated contaminant, many states are currently formulating and revising their methods of response to PFAS as a drinking water contaminant.

Four states (Minnesota, Michigan, New York, and Pennsylvania) have organized some type of interagency team to coordinate their PFAS response efforts. All states generally take the U.S. EPA's health advisory level into account when making determinations regarding whether PFAS-contaminated water is safe. Only Minnesota has developed its own state-specific advisory levels for PFAS that are more stringent than those set by the EPA. No state has developed an MCL or treatment technique to formally regulate the amount of PFAS that are allowable in a public water system. Michigan, New York, and Wisconsin have addressed PFAS through their hazardous waste cleanup laws. Of these three states, Michigan's action most directly addresses PFAS in drinking water by enacting PFOA and PFOS cleanup criteria for drinking water.

Conclusion

Drinking water challenges in the Great Lakes states and across the nation continue to put public health at risk. With increased media attention on the latest crises, the public has become more aware of local contaminants such as PFAS and seasonal challenges including algal blooms. National, regional, state, and local advocates who traditionally work on clean water issues are connecting with communities all over the Great Lakes states to understand local drinking water issues and together are developing frameworks to improve state drinking water policies. With continued mistrust of how governments at all levels regulate contaminants in drinking water and protect the public, there is a need to act.

This report is meant to be a guide in understanding existing state policies in Illinois, Indiana, Michigan, Minnesota, Ohio, Pennsylvania, New York, and Wisconsin; how they compare to federal SDWA regulations; and how they compare to each other. It is meant to be a starting point in understanding what regulations currently exist and where improvement can be made. There have been legislative attempts to improve federal, state, and local regulations with some victories. Where there have been failures, there is a need to modify language and try again until people in the Great Lakes and nationwide are provided clean and safe drinking water.

The endnotes provide references to the existing state policies, regulations, and reports noted throughout the report. These references are available for readers in efforts to dive deeper into how these regulations could affect their community and local decision-making in protecting drinking water safety and human health.

Endnotes

Safe Drinking Water Act Basics

[1] For a comprehensive introduction and history of the SDWA, see Congressional Research Service (Mary Tiemann, auth.), *Safe Drinking Water Act (SDWA): A Summer of the Act and Its Major Requirement* (Mar. 1, 2017) and EPA (Office of Water), *25 Years of the Safe Drinking Water Act: History and Trends*, EPA 816-R-99-007 (Dec. 1999).

[2] The SDWA also regulates the protection of underground sources of drinking water through Underground Injection Control waste management, wellhead protection areas, and sole source aquifer designations. 42 USC 300h to 300h-8. This report version does not address those topics.

[3] 42 USC 300f(4).

[4] 42 USC 300f(15).

[5] 40 CFR 141.2.

[6] Ibid.

[7] The EPA also has unenforceable national secondary drinking water regulations for contaminants that primarily affect aesthetic qualities of drinking water, such as odor and taste. 40 CFR Part 143.

[8] 40 CFR Part 141 Subpart Q.

[9] 40 CFR Part 141 Subpart O.

Maximum Contaminant Levels, Treatment Techniques, and Monitoring Standards

[10] 42 USC 300g-1(b)(1)(A).

[11] 42 USC 300f(1)(C).

[12] 42 USC 300g-1(a)(3).

[13] 42 USC 300g-1(b)(4)(A).

[14] 42 USC 300g-1(b)(4)(B), (D).

[15] 42 USC 300g-1(c).

[16] 42 USC 300f(2).

[17] 40 CFR 143.1.

[18] 42 USC 300g-1(b)(2)(F); The EPA has published dozens of health advisories. Health advisories exist for contaminants that are listed contaminants under the SDWA. U.S. Environmental Protection Agency, 2012 Edition of the Drinking Water Standards and Health Advisories (2012), available at https://rais.ornl.gov/documents/2012_drinking_water.pdf.

[19] *See* 40 CFR 141.11, 141.13, 141.61-66.

[20] Under the SDWA, a state can assume the primary enforcement responsibility under the Act if it satisfies the requirements described in 42 USC 300g-2. The EPA's enforcement authority is described in 42 USC 300g-3. Additionally, any person may institute a citizen suit to enforce a violation of the SDWA pursuant to 42 USC 300j-8.

[21] 40 CFR 141.50-55; 40 CFR 143.3.

[22] 42 USC 300f(1)(D).

[23] 40 CFR 141.27.

[24] 40 USC 300g-1(b)(9).

[25] Ibid.

[26] 75 Fed Reg 591,5500 (Mar. 29, 2010).

[27] 67 Fed Reg 19,030 (2002).

[28] 82 Fed Reg 3523 (2017).

[29] 8 Fed Reg 42908 (2003); 75 Fed Reg 15500 (2010); 82 Fed Reg 3518 (2017).

[30] 75 Fed Reg 15500 (2010).

[31] The eight contaminants identified for review are chlorite, cryptosporidium, haloacetic acids, heterotrophic bacteria, giardia lamblia, legionella, total trihalomethanes, and viruses. 82 Fed Reg 3518 (2017).

[32] 78 Fed Reg 10270 (2013).

[33] 42 USC 300g-2(a)(1).

[34] 42 USC 300g-2(a)(2); 40 CFR 142.10(a)-(c).

[35] 42 USC 300g-3(e); 40 CFR 142.4.

[36] *Compare* 35 Ill. Adm. Code 611.301 with 40 CFR 141.62.

[37] *Compare* 35 Ill. Adm. Code 611.312 with 40 CFR 141.64.

[38] *Compare* 35 Ill. Adm. Code 611.313 with 40 CFR 141.65.

[39] *Compare* 35 Ill. Adm. Code 611.325 with 40 CFR 141.63.

[40] *Compare* 35 Ill. Adm. Code 611.330 with 40 CFR 141.66.

[41] 35 Ill. Adm. Code 611.310.

[42] Ibid.

[43] 35 Ill. Adm. Code 611.300(a).

[44] 35 Ill. Adm. Code 611.300(e).

[45] *Compare* 327 IAC 8-2-5, 327 IAC 8-2-5.4 with 40 CFR 141.61.

[46] *Compare* 327 IAC 8-2-4 with 40 CFR 141.62(b).

[47] *Compare* 327 IAC 8-2-7 with 40 CFR 141.63.

[48] *Compare* 327 IAC 8-2.5-2 with 40 CFR 141.64.

[49] *Compare* 327 IAC 8-2.5-3 with 40 CFR 141.65.

[50] *Compare* 327 IAC 8-2-9 with 40 CFR 141.66.

[51] 327 IAC 8-2.1-13.

[52] *Compare* Mich. Admin. Code R. 325.10602 with 40 CFR 141.63.

[53] *Compare* Mich. Admin. Code R. 325.10604d with 40 CFR 141.61.

[54] *Compare* Mich. Admin. Code R. 325.10604c with 40 CFR 141.62.

[55] *Compare* Mich. Admin. Code R. 325.10610 with 40 CFR 141.64.

[56] *Compare* Mich. Admin. Code R. 325.10610a with 40 CFR 141.65.

[57] *Compare* Mich. Admin. Code R. 325.10604 with 40 CFR 141.66.

[58] *Compare* Mich. Admin. Code R. 560.415 to 40 CFR 143.3.

[59] *Compare* Mich. Admin. Code R. 560.415 to 40 CFR 143.3; Note that there are additional contaminants for which the EPA has established secondary MCLs.

[60] MCL 560.105(g).

[61] Minn. R. 4720.0350.

[62] Minn. R. 4720.0030.

[63] *Compare* 10 NYCRR 5-1.52, Table 3.

[64] 10 NYCRR 5-1.52, Table 3.

[65] 10 NYCR 5-1.1(dg).

[66] 10 NYCR 5-1.52, Table 3.

[67] 10 NYCR 5-1.1(bw).

[68] *Compare* 10 NYCRR 5-1.52, Table 3 with 40 CFR 141.61.

[69] Ibid.

[70] 10 NYCRR 5-1.52, Table 3.

[71] *Compare* 10 NYCRR 5-1.52 Table 1 with 40 CFR 143.3.

[72] *Compare* 10 NYCRR 5-1.52 Table 1 with 40 CFR 141.62.

[73] *Compare* 10 NYCRR 5-1.52 Table 6 with 40 CFR 141.63.

[74] *Compare* 10 NYCRR 5-1.52 Table 1 with 40 CFR 141.64.

[75] *Compare* 10 NYCRR 5-1.52 Table 3A with 40 CFR 141.65.

[76] *Compare* 10 NYCRR 5-1.52 Table 7 with 40 CFR 141.66.

[77] *Compare* OAC 3745-81-12 with 40 CFR 141.61(a).

[78] *Compare* OAC 3745-81-10 with 40 CFR 141.65(a).

[79] *Compare* OAC 3745-81-14 with 40 CFR 141.63(a).

[80] *Compare* OAC 3745-81-15 with 40 CFR 141.66.

[81] *Compare* OAC 3745-81-11(C), (D) with 40 CFR 141.64.

[82] OAC 3745-90-02.

[83] *Compare* OAC 3745-82-02 with 40 CFR 143.3.

[84] Ohio's secondary MCL for pH is 7.0–10.5 while the EPA's secondary MCL is 6.5–8.5. Ibid.

[85] OAC 3745-82-01.

[86] OAC 3745-82-03.

[87] OAC 3745-81-32(D)(1)(b).

[88] OAC 3745-91-09.

[89] ORC 106.3.

[90] ORC 119.04(A)(1)(B).

[91] ORC 106.03(A).

[92] ORC 106.03(B).

[93] OAC 3745-81-27.

[94] 25 Pa. Code 109.202(a).

[95] 25 Pa. Code 109.203.

[96] Pennsylvania Department of Environmental Protection, State MCL Considerations, https://www.dep.pa.gov/Citizens/My-Water/drinking_water/Perfluorinated%20Chemicals%20%E2%80%93PFOA%20and%20PFOS%20%E2%80%93%20in%20Pennsylvania/Pages/Establishing-a-State-MCL.aspx.

[97] 25 Pa. Code 109.202(b).

[98] Ibid.

[99] *Compare* Wis. Admin. Code NR 809.20, 809.24 with 40 CFR 141.61.

[100] *Compare* Wis. Admin. Code NR 809.30 with 40 CFR 141.63.

[101] *Compare* Wis. Admin. Code NR 809.561 with 40 CFR 141.65.

[102] *Compare* Wis. Admin. Code NR 809.50 with 40 CFR 141.66.

[103] *Compare* Wis. Admin. Code NR 809.561 with 40 CFR 141.64.

[104] *Compare* Wis. Admin. Code NR 809.24 with 40 CFR 141.61.

[105] Wisconsin DNR, Drinking Water & Groundwater Quality Standards/Advisory Levels, available at http://dnr.wi.gov/topic/drinkingwater/documents/haltable.pdf.

[106] Ibid.

[107] *Compare* Wis. Admin. Code NR 809.70 with 40 CFR 143.3.

[108] Wis. Admin. Code NR 809.70.

[109] Wis. Admin. Code NR 809.70(3).

[110] 42 USC 300f(1)(D).

[111] 78 Fed Reg 10270.

[112] Ibid.

[113] Ibid.

[114] U.S. Environmental Protection Agency, National Primary Drinking Water Regulations (May 2009), available at https://www.epa.gov/sites/production/files/2016-06/documents/npwdr_complete_table.pdf.

[115] 78 Fed Reg 10270.

[116] Ibid.; Note that in the revised total coliform rule, the E. coli MCL replaced the total coliform MCL. The EPA's stated reasoning for this change was that total coliform is a less precise indicator of fecal contamination.

[117] 40 CFR 141.854(b).

[118] 40 CFR 141.855(b).

[119] 40 CFR 141.856(b).

[120] 40 CFR 141.857(b).

[121] 40 CFR 141.854(e).

[122] 40 CFR 141.854(b).

[123] 40 CFR 141.855(d).

[124] 40 CFR 141.856(b).

[125] 40 CFR 141.857(d).

[126] 40 CFR 141.853(a)(1).

[127] Ibid.

[128] 40 CFR 141.858(a)(1).

[129] 40 CFR 141.858(a)(3).

[130] 40 CFR 141.858(b).

[131] 40 CFR 141.859(a).

[132] 40 CFR 141.859(a)(1).

[133] EPA, Revised Total Coliform Rule Assessments and Corrective Actions Guidance Manual, Interim Final (Sept. 2014).

[134] 40 CFR 141.859(a)(2).

[135] U.S. EPA, Revised Total Coliform Rule Assessments and Corrective Actions Guidance Manual, Interim Final (Sept. 2014).

[136] Ibid.

[137] Ohio EPA, Volatile Organic Chemicals in Drinking Water (April 2014), available at http://epa.ohio.gov/Portals/28/documents/pws/Volatile Organic Chemicals in Drinking Water.pdf.

[138] Ibid.

[139] Ibid.

[140] Volatile organic contaminants and their corresponding MCLs are listed in 40 CFR 141.61(a) while synthetic organic contaminants and their corresponding MCLs are listed in 40 CFR 141.61(c).

[141] 40 CFR 141.24(f)(4).

[142] 40 CFR 141.24(f)(5).

[143] 40 CFR 141.24(f)(6).

[144] 40 CFR 141.24(f)(9).

[145] 40 CFR 141.24(f)(11)(i).

[146] 40 CFR 141.24(f)(12).

[147] *See,* 40 CFR 141.24(f)(4).

[148] 40 CFR 141.24(f)(11)(v).

[149] Ibid.

[150] 40 CFR 141.24(h)(1).

[151] 40 CFR 141.24(h)(2).

[152] While the EPA has established an MCL and MCLG for aldicarb, aldicarb sulfoxide, and aldicarb sulfone, the effective date of these regulations has been indefinitely postponed. These regulations were initially postponed in 1992. 57 FR 22178 (May 27, 1992). Since postponing the effectiveness of the regulations in 1992, the EPA has not taken any final action. 68 FR 31108 (May 27, 2003), 70 FR 27501 (May 16, 2005); Given the indefinite postponement of the effective date of these regulations, no monitoring is required for aldicarb, aldicarb sulfoxide, or aldicarb sulfone. 40 CFR 141.24(h)(4)(i); 40 CFR 141.24(h).

[153] 40 CFR 141.24(h)(4)(ii).

[154] 40 CFR 141.24(h)(4)(iii).

[155] 40 CFR 141.24(h)(5).

[156] 40 CFR 141.24(h)(6).

[157] 40 CFR 141.24(h)(5).

[158] 40 CFR 141.24(h)(7)(i); Detection limits vary for each synthetic organic contaminant and are listed in 40 CFR 141.24(h)(18).

[159] 40 CFR 141.24(h)(8).

[160] 40 CFR 141.23(a)(1).

[161] 40 CFR 141.23(a)(2).

[162] 40 CFR 141.23(b)-(e).

[163] 40 CFR 141.23(b)(2).

[164] 40 CFR 141.23(b)(3).

[165] These contaminants are antimony, arsenic, barium, beryllium, cadmium, chromium, cyanide, fluoride, mercury, nickel, selenium, and thallium. 40 CFR 141.23(c).

[166] 40 CFR 141.26.

[167] Yuefeng F. Xie, *Disinfection Byproducts in Drinking Water: Formation, Analysis, and Control* (Lewis Publishers, 2004).

[168] Ibid.

[169] Ibid.

[170] 40 CFR 141.620(b).

[171] 40 CFR 141.621(a)(2).

[172] Ibid.

[173] Ibid.

[174] 40 CFR 141.621(a)(1).

[175] 40 CFR 141.623(a).

[176] Ibid.

[177] Ibid.

[178] Ibid.

[179] 40 CFR 141.625(a)

[180] World Health Organization, *Chlorite and Chlorate in Drinking-water* (2005), available at http://www.who.int/water_sanitation_health/dwq/chemicals/chlorateandchlorite0505.pdf.

[181] Ibid.

[182] 40 CFR 141.132(b)(2)(i)(A).

[183] Ibid.

[184] Ibid.

[185] Ibid.

[186] Ibid.

[187] 40 CFR 141.132(c)(2)(i).

[188] 40 CFR 141.132(c)(2)(ii).

[189] 40 CFR 141.132(c)(2)(iii).

[190] Bromate in Drinking-water, World Health Organization (2005), available at http://www.who.int/water_sanitation_health/dwq/chemicals/bromate260505.pdf.

[191] 40 CFR 141.132(b)(3)(i).

[192] 40 CFR 141.132(b)(3)(ii)(B).

[193] 40 CFR 141.132(e).

[194] EPA, *EPA Drinking Water Guidance on Disinfection By-Products Note No. 4 Version 2. Disinfection By-Products in Drinking Water*, available at https://www.epa.ie/pubs/advice/drinkingwater/DrinkingWaterGuide4_v8.pdf.

[195] Ibid.

[196] 40 CFR 141.132(d).

[197] Ibid.

[198] 40 CFR 141.132(c)(1)(i).

[199] 40 CFR 141.132(c)(1)(ii).

[200] 40 CFR 141.26(a)(1)(i).

[201] 40 CFR 141.26(a)(3).

[202] 40 CFR 141.26(b)(1), (2).

[203] 40 CFR 141.26(b)(1).

[204] 40 CFR 141.26(b)(2).

[205] *Compare* 35 Ill. Adm. Code 611. Tab. A with 40 CFR 141.21(a)(2); 40 CFR 141.857(b).

[206] *See* 40 CFR 141.854.

[207] 35 Ill. Adm. Code 611. Tab. A.

[208] *Compare* 40 CFR 141.24(f)(4) with 35 Ill. Adm. Code 611.646(d).

[209] *Compare* 40 CFR 141.24(f)(6) with 35 Ill. Adm. Code 611.646(f).

[210] *Compare* 40 CFR 141.24(f)(7) with 35 Ill. Adm. Code 611.646(g).

[211] *Compare* 40 CFR 141.24(h)(4)(i) with 35 Ill. Adm. Code 611.646(d).

[212] *Compare* 40 CFR 141.24(h)(4)(ii)-(iii) with 35 Ill. Adm. Code 611.646(d).

[213] *Compare* 40 CFR 141.24(h)(5) with 35 Ill. Adm. Code 611.646(e).

[214] *Compare* 40 CFR 141.23(c) with 35 Ill. Adm. Code 611.603.

[215] *Compare* 40 CFR 141.621(a)(2) with 35 Ill. Adm. Code 611.971(a)(2).

[216] *Compare* 40 CFR 141.623 with 35 Ill. Adm. Code 611.973.

[217] *Compare* 40 CFR 141.132(b)(2) with 35 Ill. Adm. Code 611.382(b)(2).

[218] *Compare* 40 CFR 141.132(b)(3) with 35 Ill. Adm. Code 611.382(b)(3).

[219] *Compare* 40 CFR 141.132(c)(1) with 35 Ill. Adm. Code 611.382(c)(1).

[220] *Compare* 40 CFR 141.132(c)(2) with 35 Ill. Adm. Code 611.382(c)(2).

[221] *Compare* 40 CFR 141.26(c) with 35 Ill. Adm. Code 611.731, 611.603; *Compare* 40 CFR 141.26(d) with 35 Ill. Adm. Code 611.604; *Compare* 40 CFR 141.26(e) with Ill. Adm. Code 611.605.

[222] 327 IAC 8-2.4-1.

[223] *Compare* 40 CFR.24(f) with 327 IAC 8-2-5.5.

[224] *Compare* 40 CFR 141.24(h) with 327 IAC 8-2-5.1.

[225] *Compare* 40 CFR 141.23 with 327 IAC 8-2-4.1.

[226] 327 IAC 8-2-21(a).

[227] Ibid.

[228] Ibid.

[229] *Compare* 40 CFR 141.132(b)(1) with 327 IAC 8-2.5-6(b)(1).

[230] *Compare* 40 CFR 141.132(b)(2) with 327 IAC 8-2.5-6(b)(2).

[231] *Compare* 40 CFR 141.132(b)(3) with 327 IAC 8-2.5-6(b)(3).

[232] *Compare* 40 CFR 141.132(c)(1) with 327 IAC 8-2.5-6(c)(1).

[233] *Compare* 40 CFR 141.132(c)(2) with 327 IAC 8-2.5-6(c)(2).

[234] *Compare* 40 CFR 141.26 with 327 IAC 8-2-10.2.

[235] *Compare* 40 CFR 141.854 with Mich. Admin Code R. 325.10704d.

[236] *Compare* 40 CFR 141.856 with MACR 325.10704f.

[237] *Compare* 40 CFR 141.857 with MACR 325.10704g.

[238] *Compare* 40 CFR 141.855(d) with MACR 325.10704e(2).

[239] *Compare* 40 CFR 141.141(f)(4) with MACR 325.10716(6).

[240] *Compare* 40 CFR 141.24(h) with MACR 325.10717(1).

[241] *Compare* 40 CFR 141.23 with MACR 325.10710.

[242] *Compare* 40 CFR 141.621(a)(2) with MACR 325.10719h.

[243] *Compare* 40 CFR 141.623(a) with MACR 325.10719j.

[244] *Compare* 40 CFR 141.132 with MACR 325.10719e.

[245] *Compare* 40 CFR 141.26 with MACR 325.10725, 10726, 10728, 10730.

[246] Minn. R. 4720.2300.

[247] Minn. R. 4720.0350.

[248] Ibid.

[249] 40 CFR 141.858(a)(1).

[250] 40 CFR 141.21(e)(2); 40 CFR 141.858(b)(2).

[251] Minn. R. 4720.0550.

[252] Minn. R. 4720.0350.

[253] Ibid.

[254] Ibid.

[255] Ibid.

[256] *Compare* 40 CFR 141.854-57 with 10 NYCRR 5-1.52, Table 11.

[257] *Compare* 40 CFR 141.24(f)(4) with 10 NYCRR 5-1.52, Table 9B; *Compare* 40 CFR 141.24(h)(4) with 10 NYCRR 5-1.52, Table 9C.

[258] 10 NYCRR 5-1.52, Table 9B.

[259] *Compare* 40 CFR 141.24(f)(6) with 10 NYCRR 5-1.52, Table 9B.

[260] *Compare* 40 CFR 141.24(f)(7) with 10 NYCRR 5-1.52, Table 9B.

[261] *Compare* 40 CFR 141.24(h)(4) with 10 NYCRR 5-1.52, Table 9C.

[262] *Compare* 40 CFR 141.23 with 10 NYCRR 5-1.52, Tables 8A, 8B, 8C.

[263] *Compare* 40 CFR 143.3 with 10 NYCRR 5-1.52, Table 1.

[264] 10 NYCRR 5-1.52 Table 8D.

[265] *Compare* 40 CFR 141.621, 141.623 with 10 NYCRR 5-1.52, Table 9A.

[266] *Compare* 40 CFR 141.61 with 10 NYCRR 5-1.52, Table 12.

[267] *Compare* 40 CFR 141.854 with OAC 3745-81-51(B)(4).

[268] *Compare* 40 CFR 141.856(b) with OAC 3745-81-51(D)(1).

[269] *Compare* 40 CFR 141.857 with OAC 3745-81-51(E).

[270] OAC 3745-81-24(A).

[271] OAC 3745-81-24(B).

[272] This scrivener's error appears to have occurred because of an amendment to OAC 3745-81-12 in 2016, which reduced the number of subsections from five to four. OAC 3745-81-24 was not updated to reflect the amendments made to OAC 3745-81-12.

[273] OAC 3745-81-24(A).

[274] OAC 3745-81-24(A)(4)-(5).

[275] OAC 3745-81-24(A).

[276] *Compare* 40 CFR 141.24(h) with OAC 3745-81-24(B).

[277] *Compare* 40 CFR 141.23(c)(7) with OAC 3745-81-23(E)(8).

[278] *Compare* 40 CFR 141.23(c)(9) with OAC 3745-81-23(B)(2).

[279] *Compare* 40 CFR 141.621(a)(2) with OAC 3745-81-24(C)(6).

[280] *Compare* 40 CFR 141.623(a) with OAC 3745-81-24(C)(13).

[281] *Compare* 40 CFR 141.132(c)(1) with OAC 3745-81-70(E).

[282] *Compare* 40 CFR 141.132(c)(2) with OAC 3745-81-70(F).

[283] *Compare* 40 CFR 141.132(b)(2) with OAC 3745-81-23(M).

[284] *Compare* 40 CFR 141.132(b)(3) with OAC 3745-81-23(L).

[285] *Compare* 40 CFR 141.132(d) with OAC 3745-81-77(B).

[286] *Compare* 40 CFR 141.26(b)(2) with OAC 3745-81-26(B)(2)(a).

[287] Ibid.

[288] *Compare* 40 CFR 141.857(b) with 25 Pa. Code 109.301(3).

[289] *Compare* 40 CFR 141.854(b) with 25 Pa. Code 109.301(3).

[290] *Compare* 40 CFR 141.855(d) with 25 Pa. Code 109.301(3).

[291] *Compare* 40 CFR 141.24(f)(4) with 25 Pa. Code 109.301(5)(iii)(A).

[292] *Compare* 40 CFR 141.24(f)(9) with 25 Pa. Code 109.301(5)(viii).

[293] *Compare* 40 CFR 141.24(h)(4) with 25 Pa. Code 109.301(6)(ii)(A).

[294] *Compare* 40 CFR 141.24(h) with 25 Pa. Code 109.301(6).

[295] *Compare* 40 CFR 141.23(b), (c), (d), (e) with 25 Pa. Code 109.301(7).

[296] *Compare* 40 CFR 141.132; 141.621; 141.623 with 25 Pa. Code 109.301(9).

[297] *Compare* 40 CFR 141.26(a)(3)(iii) with 25 Pa. Code 109.301(14)(i)(B).

[298] *Compare* 40 CFR 141.26(b) with 25 Pa. Code 109.301(14)(ii).

[299] *Compare* 40 CFR 141.855(b) with WAC NR 809.31(b).

[300] *Compare* 40 CFR 141.855(d) with WAC NR 809.31.

[301] *Compare* 40 CFR 141.24(f)(4) with WAC NR 809.245.

[302] *Compare* 40 CFR 141.24(h) with WAC NR 809.205.

[303] *Compare* 40 CFR 141.23 with WAC NR 809.115.

[304] *Compare* 40 CFR 141.621(a)(2) with WAC NR 809.61.

[305] *Compare* 40 CFR 141.623(a) with WAC NR 809.63.

[306] *Compare* 40 CFR 141.132(b)(2) with WAC NR 809.565(3)(a).

[307] *Compare* 40 CFR 141.132(b)(3) with WAC NR 809.565(3)(b).

[308] *Compare* 40 CFR 141.132(c)(1) with WAC NR 809.565(4)(a).

[309] *Compare* 40 CFR 141.132(c)(2) with WAC NR 809.565(4)(b).

[310] *Compare* 40 CFR 141.132(d) with WAC NR 809.565(5).

[311] Wis. Admin. Code NR 809.53(2)(a)(3).

Lead as a Drinking Water Contaminant

[312] Although the law regulates both lead and copper, this report will focus on lead.

[313] 42 USC 300g-6. The statute provides a definition of lead free: "Not containing more than 0.2% lead when used with respect to solder and flux" and "not more than a weighted average of 0.25% lead when used with respect to the wetted surfaces of pipes, pipe fittings, and fixtures." 42 USC 300g-6(d). Actual implementation of the lead-free standards has often come years after establishing the lead-free definitions based on how the effective dates were set for the standards. See EPA, *Regulations Implementing Section 1417 of the SDWA: Prohibition on Use of Lead Pipes, Solder and Flux (Public Webinar)* (Apr. 14, 2015), available at https://www.epa.gov/sites/production/files/2015-08/documents/implsdwasection1417.pdf. In early 2017, EPA published a proposed rule to implement the prohibition on plumbing materials that are not lead free. 82 FR 4805 (Dkt Nos. EPA-HQ-OW-2015-0680 & FRL-9958-23-OW).

[314] Safe Drinking Water Act Amendments of 1986, 99 P.L. 339, 100 Stat. 642 (Enacted Jun. 19, 1986).

[315] Reduction of Lead in Drinking Water Act, 111 P.L 380, 124 Stat. 4131 (Enacted Jan. 4, 2011).

[316] 42 USC 300j-21 to 300j-23.

[317] 42 USC 300j-24(b).

[318] 42 USC 300j-24(d)(2)(A).

[319] Transient noncommunity water systems are not subject to the LCR.

[320] 40 CFR 141.51(b).

[321] 40 CFR 141.2.

[322] 42 USC 300f(1).

[323] 40 CFR 141.80(b).

[324] 40 CFR 141.80(c).

[325] 40 CFR 141.80(c)(3).

[326] 40 CFR 141.80(e)-(g).

[327] 40 CFR 141.80(h).

[328] 40 CFR 141.80(i).

[329] 40 CFR 141.80(d)(2).

[330] 40 CFR 141.80(a).

[331] 40 CFR 141.81(a)(2).

[332] Ibid.

[333] 40 CFR 141.80(b).

[334] 40 CFR 141.82(a).

[335] 40 CFR 141.82(c).

[336] 40 CFR 141.82(d).

[337] 40 CFR 141.83(b)(2).

[338] 40 CFR 141.83(a).

[339] 40 CFR 141.84(a).

[340] 40 CFR 141.84(a)(1).

[341] 40 CFR 141.84(c).

[342] 40 CFR 141.84(d).

[343] See Letter from Jennifer C. Chavez, Staff Attorney, Earthjustice, to EPA, *Lead and Copper Rule Long-Term Revisions: Issues Regarding Lead Service Line Replacement* (Nov 11, 2014), available at https://www.eenews.net/assets/2016/06/30/document_daily_01.pdf. The LCR's standard used to be "control" not ownership. Using literal ownership as the narrow standard ignores the fact that the entire service line, including the part of the line that runs through private property, is implicated in the action level assessment and LCR compliance more generally since lead risk exists throughout the line. Also, as the Earthjustice letter explains, it is unclear whether water systems are legally responsible or not for the service line portions that run through private property.

[344] 40 CFR 141.84(d).

[345] EPA, *Lead and Copper Rule Revisions White Paper*, 8-10 (Oct. 2016), available at https://www.epa.gov/sites/production/files/2016-10/documents/508_lcr_revisions_white_paper_final_10.26.16.pdf.

[346] 40 CFR 141.84(d).

[347] 40 CFR 141.84(f).

[348] 40 CFR 141.85.

[349] Ibid.

[350] Ibid.

[351] Ibid.

[352] 40 CFR 141.85(a).

[353] Ibid.

[354] Ibid.

[355] 40 CFR 141.85(a)(2).

[356] 40 CFR 141.85(b)(2); 40 CFR 141.85(b)(4).

[357] 40 CFR 141.85(b).

[358] 40 CFR 141.201(b).

[359] 40 CFR 141.203.

[360] 40 CFR 141.204.

[361] 40 CFR 141.86-88.

[362] 40 CFR 141.86(a).

[363] Ibid.

[364] There are similar but less stringent pool composition requirements for nontransient, noncommunity water systems. 40 CFR 141.86(a)(7).

[365] 40 CFR 141.86(a)(3).

[366] Ibid.

[367] 40 CFR 141.86(a)(4).

[368] 40 CFR 141.86(a)(5).

[369] Ibid.

[370] 40 CFR 141.86(b)-(c).

[371] 40 CFR 141.86(b). Notably, there is a minimum amount of stagnation time, but not a maximum amount, which could allow for a sampling site system to go unused for days on end before sampling.

[372] Ibid.

[373] 40 CFR 141.86(b)-(c).

[374] 40 CFR 141.86(f).

[375] Natural Resources Defense Council, *What's in Your Water: Flint and Beyond* (June 2016), available at https://www.nrdc.org/sites/default/files/whats-in-your-water-flint-beyond-report.pdf; Ben Paynter, *Ripple Effect: The Crisis in Flint Isn't Over. It's Everywhere*, Wired (June 2016), available at https://www.wired.com/2016/06/flint-water-marc-edwards/.

[376] EPA, Memorandum by Stephen Heare, Director of Drinking Water Protection Division of the Office of Ground Water and Drinking Water, to EPA Drinking Water Branch Chiefs Regions 1-10, *Management of Aerators during Collection of Tap Samples to Comply with the Lead and Copper Rule* (Oct. 20, 2006).

[377] EPA, Memorandum by Peter C. Grevatt, Director of Office of Ground Water and Drinking Water, to Water Division Directors in Regions 1-10, *Clarification of Recommended Tap Sampling Procedures for Purposes of the Lead and Copper Rule* (Feb. 29, 2016), available at https://www.epa.gov/sites/production/files/2016-02/documents/epa_lcr_sampling_memorandum_dated_february_29_2016_508.pdf.

[378] 40 CFR 141.86(d).

[379] 40 CFR 141.86(c).

[380] Ibid.

[381] 40 CFR 141.86(d).

[382] Ibid.

[383] 40 CFR 141.86(g).

[384] 40 CFR 142.10(a).

[385] 40 CFR 142.19.

[386] Ryan T. Foley & Meghan Hoyer, US water systems repeatedly exceed federal standard for lead, AP News, Apr. 9, 2016, available at https://apnews.com/5aff8cb852c94585a85c9dc5fa32e9d8.

[387] Ibid.

[388] EPA asks Galesburg to help protect residents from lead in water, Chicago Tribune, Apr. 27, 2016, available at https://www.chicagotribune.com/news/local/breaking/ct-epa-galesburg-lead-met-20160427-story.html.

[389] Emily Boyer, Galesburg Replacing Private Lead Water Lines, Tri States Public Radio, Jun. 30, 2017, available at https://www.tspr.org/post/galesburg-replacing-private-lead-water-lines.

[390] *Compare* 40 CFR 141.82(g) with 35 Ill. Adm. Code 611.352(g).

[391] *Compare* 40 CFR 141.88(a)(2) with 35 Ill. Adm. Code 611.358(a)(2).

[392] 35 Ill. Adm. Code 611.355(b)(1).

[393] 415 ILCS 5/17.11(c).

[394] Ibid.

[395] 415 ILCS 5/17.11(e).

[396] 2015 Ill. P.A. 922 (Enacted Jan. 17, 2017), codified at 225 ILCS 320/35.5.

[397] 225 ILCS 320/35.5(c).

[398] Ibid.

[399] Ibid.

[400] 2017 Bill Text IL S.B. 3080 (Introduced Feb. 15, 2018); 2017 Bill Text IL H.B. 5044 (Introduced Feb. 14, 2018).

[401] Craig Lyons, 'It's a disaster': East Chicago still reeling from lead crisis, and EPA can't say if water is safe, Chicago Tribune, Jul. 21, 2017, available at https://www.chicagotribune.com/suburbs/post-tribune/news/ct-ptb-east-chicago-one-year-later-st-0723-20170721-story.html.

[402] Associated Press, Partial lead line replacements worry East Chicago residents, Aug. 10, 2018, available at https://www.apnews.com/5858ec0015f44d80b99f0d997c78b974.

[403] *Compare* 40 CFR 141.85(a)(iv) with 327 IAC 8-2-44(a)(1)(D)(v).

[404] 327 IAC 8-2-44(b)(1).

[405] 2019 Bill Text IN H.B. 1433 (Introduced Jan. 15, 2019).

[406] Ibid.

[407] 2019 Bill Text IN H.B. 1419 (Introduced Jan. 14, 2019).

[408] Ind. Code Ann. 8-1-31.6-7; Ind. Code Ann. 8-1-31-8.

[409] Mich. Admin. Code R. 325.10604f(1)(c).

[410] *Compare* 40 CFR 141.86(a) with Mich. Admin. Code R. 325.10710a(c)-(e).

[411] Mich. Admin. Code R. 325.10710a(c), (d).

[412] Mich. Admin. Code R. 325.10710a(2)(a), (b).

[413] Mich. Admin. Code R. 325.10710a(2)(b)(i)(C).

[414] 40 CFR 141.86(a)(1).

[415] Mich. Admin. Code R. 325.11604(c).

[416] Mich. Admin. Code R. 325.10604f(6).

[417] Mich. Admin. Code R. 325.10604f(6)(e).

[418] Ibid.

[419] *Compare* 40 CFR 141.85 with Mich. Admin. Code R. 325.10410(1).

[420] *See,* Mich. Admin. Code R. 325.10410(2).

[421] *See,* Mich. Admin. Code R. 325.10410(3).

[422] Ibid.

[423] Mich. Admin. Code R. 325.10710b(4), (5).

[424] Mich. Admin. Code R. 325.10604f(1)(l).

[425] MCL 325.1019; Mich. Admin. Code R. 325.10410(1).

[426] 40 CFR 141.85(b).

[427] Mich. Admin. Code R. 325.10410(2).

[428] Mich. Admin. Code R. 325.10410(6)(a).

[429] Mich. Admin. Code R. 325.10410(6)(j).

[430] Mich. Admin. Code R. 325.10410(7)(a).

[431] Mich. Admin. Code R. 325.10410(7)(f).

[432] Mich. Admin. Code R. 325.10410(3)(a).

[433] 2019 Bill Text MI H.B. 4064 (Introduced Jan. 17, 2019).

[434] Michigan Department of Environmental Quality, School Drinking Water Training Program, available at https://www.michigan.gov/deq/0,4561,7-135-3313_3675_3691-474608--,00.html.

[435] Minn. R. 4720.0350.

[436] Minn. Stat. 121A.335.

[437] Ibid.

[438] Ibid.

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[454] *Compare* 40 CFR 141.85 with OAC 3745-81-85.

[455] 40 CFR 141.85(d).

[456] ORC 6109.121(C)(1).

[457] OAC 3745-81-85(A)(4).

[458] Ibid.

[459] Ibid.

[460] *Compare* 40 CFR 141.85(b)(2) with OAC 3745-81-85(G)(3).

[461] Ibid.

[462] Ibid.

[463] *Compare* 40 CFR 141.85(a)(iv) with OAC 3745-81-85(F)(1)(d).

[464] OAC 3745-81-85(F)(1)(d).

[465] *See,* 40 CFR 141.85(b)(4); OAC 3745-81-85(G)(5).

[466] Ibid.

[467] OAC 3745-81-85(G)(2).

[468] OAC 3745-81-85(C).

[469] OAC 3745-81-85(D).

[470] 40 CFR 141.85(b)(2).

[471] *See,* 40 CFR 141.86; OAC 3745-81-86(A)(1).

[472] OAC 3745-81-86(A)(9)(a).

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[481] *Compare* 40 CFR 141.88(e) with 25 Pa. Code 109.1103.

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[483] Ibid.

[484] Ibid.

[485] Wis. Admin. Code NR 809.54-55.

[486] Wis. Admin. Code NR 809.546(2).

[487] 2017 Bill Text WI A.B. 249 (Introduced Apr. 14, 2017).

[488] 2017 Bill Text WI S.B. 526 (Introduced Nov. 8, 2017); 2017 Bill Text WI A.B. 298 (May 4, 2017).

Consumer Confidence Reporting

[489] 42 USC 300g-3(4). Regulations followed in 1998. In 2010, the EPA authored a guidance document to assist states with implementation. *Revised State Implementation Guidance for the Consumer Confidence Report (CCR) Rule*, EPA 816-R-09-010 (Apr. 2010), available at https://www.epa.gov/sites/production/files/2014-05/documents/guide_ccr_stateimplement.pdf.

[490] For general information on CCRs, the EPA maintains a helpful website: https://www.epa.gov/ccr.

[491] 40 CFR Part 141 Subpart O.

[492] 40 CFR 142.10(b)(6)(vii).

[493] 42 USC 300g-3(4)(B); 40 CFR 141.152; 40 CFR 141.153.

[494] 42 USC 300g-3(4)(A).

[495] 42 USC 300g-3(4)(C)&(D).

[496] 40 CFR 141.155.

[497] Ibid.

[498] Minn. R. 4720.0350.

[499] 40 CFR 141.153(e)(3).

[500] Ibid.

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[502] Mich. Admin. Code R. 325.10413(9)(d). For sodium monitoring requirements, see Mich. Admin. Code R. 325.10717b.

[503] 10 NYCRR 5-1.72(f)(15).

[504] 10 NYCRR 5-1.72(f)(8).

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[506] 35 Ill. Adm. Code 611.883(e)(3); 25 Pa. Code 109.416(3).

[507] Ibid.

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[509] 40 CFR 141.153(h)(3).

[510] Ibid.

[511] 327 IAC 8-2.1-3(h)(3).

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[516] 25 Pa. Code 109.416(3)(iii).

[517] Ibid.

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[520] 40 CFR 141.154(b)-(e).

[521] Ibid.

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[526] Mich. Admin. Code R. 325.10413(12)(h).

[527] 40 CFR 141.155(g).

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[529] 327 IAC 8-2.1-5.

[530] 327 IAC 8-2.1-5(d).

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[532] Mich. Admin. Code R. 325.10415(4).

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[534] *Compare,* 10 NYCRR 5-1.72(h)(6) with 40 CFR 141.155(c).

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[536] 10 NYCRR 5-1.72(g)(2)(ii).

[537] 10 NYCRR 5-1.72(g)(2)(iii).

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Loans and Grants

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[552] 42 USC 300j-12(a)(1)(D).

[553] 42 USC 300j-12(h).

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[557] 42 USC 300j-12(a)(1)(A).

[558] 42 USC 300j-12(e); 40 CFR § 35.3550(g).

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[622] Ibid.

[623] US EPA, *Drinking Water SRF Program Information for the State of Minnesota*, available at https://www.epa.gov/sites/production/files/2018-11/documents/minnesotta_dwsrf_nims_rpt_2018.pdf.

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[633] U.S. Environmental Protection Agency, Drinking Water Infrastructure Needs Survey and Assessment, EPA 816-K-17-002, at 36, March 2018, available at https://www.epa.gov/sites/production/files/2018-10/documents/corrected_sixth_drinking_water_infrastructure_needs_survey_and_assessment.pdf.

[634] "The corporation shall undertake and provide assistance in support of the program to make financial assistance available to recipients to encourage and support the planning, development and construction of water supply facilities in accordance with the provisions of this section and title four of article eleven of the public health law." N.Y. Pub. Auth. Law § 1285-m(a) (Consol., Lexis Advance through 2018 Chapters 1-263). *See also* New York Environmental Facilities Corporation, *Drinking Water State Revolving Fund* (website), available at https://www.efc.ny.gov/DWSRF.

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[638] Ibid.

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[645] Ohio EPA, *Drinking Water Assistance Fund: 2017 Program Management and Intended Use Plan* (May 25, 2016), available at http://www.epa.ohio.gov/Portals/29/documents/ofa/2017 DRAFT WSRLA PMP_2016-05-25.pdf.

[646] Community water systems is defined as a public water system that has at least 15 service connections used by year-round residents or that regularly serves at least 25 year-round residents. ORC 6109.01(E).

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[654] PA Department of Environmental Quality, Drinking Water State Revolving Fund Intended Use Plan FY, at 1 (2018), available at http://files.dep.state.pa.us/Water/BPNPSM/InfrastructureFinance/StateRevolvFundIntendUsePlan/2018/DW%20IUP%202018%20DRAFT.pdf (hereinafter, "Pennsylvania 2018 IUP").

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[656] Ibid. at 11.

[657] Ibid.

[658] Pennsylvania 2018 Intended Use Plan, Attachment 1, available at http://files.dep.state.pa.us/Water/BPNPSM/InfrastructureFinance/StateRevolvFundIntendUsePlan/Drinking Water Ranking Final.pdf.

[659] Ibid.

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[680] Minnesota 2019 IUP at 5. *See also* Minnesota Public Facilities Authority, *Water Infrastructure Fund* (website), available at https://mn.gov/deed/pfa/funds-programs/wastewater.jsp.

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[691] Ibid. at 2.

[692] Ibid.

[693] Article XVII-A §1774.1-A of the April 9th, 1929, P.L. 343 + 58 Pa.C.S. §2315. The Marcellus Legacy Fund is a fund created out of excess revenue of the Unconventional Gas Well Fund, which is made up of fees collected from Unconventional Gas Well Drillers in the state. 58 Pa.C.S. §23.

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[698] Act of Jul 9, 2008 (H2O Act) P.L. 908 Sect. 301.

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[702] 42 USC 300j-12(g)(2)(C).

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[704] Ibid.

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[706] Indiana 2019 IUP at 14.

[707] Ibid.

[708] Ibid.; *See also* Indiana 2019 IUP, Exhibit B.

[709] Michigan 2019 IUP at 9.

[710] Ibid. at 15.

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[712] Ibid.

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[731] Illinois 2018 IUP, at 5.

[732] Indiana 2018 IUP, Exhibit H.

[733] Ibid.

[734] Indiana 2018 IUP, Exhibit D.

[735] Michigan 2019 IUP, at 12.

[736] Ibid. at 11.

[737] Ibid. at 13.

[738] MCL 324.5406(1)(b)(i)(E).

[739] MCL 324.5406(1)(f).

[740] Minnesota 2019 IUP at 7.

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[742] Ibid at 8.

[743] *See,* 40, CFR 141.32(a)(1)(iii)(C).

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[748] 6 NYCRR 649.13.

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[754] Ibid.

[755] Ibid at 8.

[756] Ibid.

[757] Ibid. at Appendix D.

[758] Pennsylvania 2018 IUP, at 2.

[759] Ibid.

[760] Pennsylvania 2018 IUP, Attachment 1.

[761] Wisconsin 2019 IUP, at 11.

[762] Wis. Admin. Code NR 166.24(2)(d).

[763] 35 Ill. Adm. Code 662.210(d)

[764] Illinois 2018 IUP, at 10.

[765] Indiana 2019 IUP at 2.

[766] Ibid at 10.

[767] Ibid. at 4.

[768] Ibid at Exhibit I.

[769] Ibid. at 13

[770] Ibid. at 4.

[771] Michigan 2019 IUP at 13.

[772] Ibid.

[773] Ibid.

[774] Michigan Department of Environmental Quality, *Drinking Water Revolving Fund Final Intended Use Plan Fiscal Year 2018*, at 7 (2017), available at https://www.michigan.gov/documents/deq/deq-ess-mfs-DWRF-DWiupppl2018_578978_7.pdf.

[775] Michigan 2019 IUP at 3.

[776] New York 2019 IUP at I-5.

[777] 2017 N.Y. SB 2007 (Enacted Apr. 20, 2017).

[778] Ibid.

[779] New York State Association of Counties, Clean Water Infrastructure in New York State (Dec. 4, 2017), available at http://www.nysac.org/files/WaterWhitePaper.pdf.

[780] Ohio 2018 IUP, at 1.

[781] Ibid.

[782] Ohio 2019 Intended Use Plan at 3.

[783] Sub. House Bill No. 390 of 2016.

[784] Ibid.

[785] Ohio 2018 IUP, Appendix D.

[786] Ibid.

[787] 72 P.S. 1719-E.

[788] Ibid.

[789] 25 PA Code 963.12(a)(1).

[790] Pennsylvania 2018 IUP, at 3.

[791] Wisconsin 2019 IUP at 6.

[792] Ibid.

[793] Ibid at 9.

[794] Ibid.

[795] Ibid.

[796] Wisconsin 2019 IUP at 2.

[797] Wis. Admin. Code NR 166.24(2)(e).

[798] 42 USC 300j-12(d)(1).

[799] 42 USC 300j-12(d)(3).

[800] 42 USC 300j-12(d)(2).

[801] 35 Ill. Adm. Code 662.210(c).

[802] Ibid. at 10.

[803] Ibid.

[804] Ibid.

[805] Indiana 2019 IUP, Exhibit D.

[806] Ibid.

[807] Indiana 2019 IUP, at 15.

[808] Ibid.

[809] Michigan 2018 Intended Use Plan, at 4.

[810] Michigan 2019 IUP at 15.

[811] MCL 324.5402(g).

[812] Michigan 2019 IUP at 14.

[813] Ibid at 15.

[814] MCL 324.5406(1)(d).

[815] 42 USC 300j-12(f)(1)(B); Michigan 2019 IUP at 15.

[816] MCL 324.5404(3)(C).

[817] Minnesota 2018 Intended Use Plan, at 5.

[818] Minn. Stat. 446A.072.5a

[819] Ibid.

[820] New York 2018 Intended Use Plan, at 18.

[821] Ibid. at 19.

[822] Ibid. at 19-20.

[823] 10 NYCRR 53.4(b)(2).

[824] New York 2019 IUP, at 19.

[825] Ibid. at 20.

[826] A political subdivision is defined in ORC 6119.011(B). It includes, among others, departments, divisions, authorities, municipal corporations, counties, townships, and special water districts, including county and regional water and sewer districts.

[827] Ohio Admin. Code 3745-88-01(E).

[828] Ohio Admin. Code 3745-88-02(B)(1).

[829] Ibid.

[830] Ohio Admin. Code 3745-88-02(B)(2).

[831] Ohio 2018 IUP, at Appendix F.

[832] Ohio Admin. Code 3745-99-02(C)(2).

[833] Ohio Admin. Code 3745-99-02(D)(1).

[834] Pennsylvania 2018 Intended Use Plan, at 16-17.

[835] Ibid. at 13-14.

[836] Ibid.

[837] Wisconsin 2019 IUP at 9.

[838] Ibid.

[839] Ibid.

[840] Ibid.

[841] Ibid. at 2.

Public Participation in Standards, Permits, and Enforcement

[842] 42 USC 300g-1(b)(3)(C).

[843] 42 USC 300g-4(a)(1)(G) and 300g-5(c).

[844] 42 USC 300j-8.

[845] Generally, there have been relatively few SDWA citizen suits. See Christine L. Rideout, *Where Are All The Citizen Suits?: The Failure of Safe Drinking Water Act Enforcement in the United States (Student Note)*, 21 Health Matrix 655 (2011), available at https://scholarlycommons.law.case.edu/cgi/viewcontent.cgi?article=1144&context=healthmatrix.

[846] Illinois Administrative Procedure Act, 5 ILC §§ 100/1-1 — 100/15-10. Rules are not valid if not open to public inspection (5 ILC §100/5-10). 5 ILC 100/5-40 outlines procedures for general rulemaking, which includes a 45-day notice preceding agency action. Within the first 14 days of that notice, the agency is to hold a public hearing if requested or "if it would facilitate views or comments that might otherwise not be submitted." 5 ILC 100/5-45 and 5-46.1 govern emergency rulemaking. 5 ILC 100/5-50 governs peremptory rulemaking.

[847] 415 ILC 5/17.5.

[848] *Id.*

[849] *Id.*

[850] 415 ILC 5/17.5.

[851] Ibid.

[852] 35 Ill. Adm. Code 602.300; 52 Ill. Adm. Code 602.200.

[853] 35 Ill. Adm. Code 602.200(b).

[854] 35 Ill. Adm. Code 602.200.

[855] 35 Ill. Adm. Code 602.300.

[856] 415 ILC §§ 5/30 — 5/34.

[857] 415 ILC 5/30.

[858] 415 ILC 3/31(c).

[859] Ibid.

[860] 415 ILC 5/32.

[861] 415 ILC 5/31(d).

[862] Ibid.

[863] 415 ILC 5/45(b).

[864] IC §§ 4-22-2-0.1 — 4-22-2-46.

[865] 327 IAC 8-3-2.

[866] Ibid.

[867] Ibid.

[868] Ibid.

[869] IC § 8-1-28-5.

[870] IC § 8-1-28-6.

[871] IC § 8-1-28-19.

[872] Act 306 of 1969; MCL 24.201-328. The Office of Regulatory Reinvention hosts the Michigan Register, published biweekly, on its site https://www.michigan.gov/opt/0,5880,7-338-35738_40280---,00.html. Among other things, administrative rules are published there (but not permits or enforcement actions).

[873] Michigan also has a curious open-ended drinking water rule that allows any person to request a public hearing. MACR 325.10202. It is not clear whether there is any limitation on what a public hearing request can relate to. Based on the rule, the "chief of the bureau of environmental and occupational health" decides whether to grant it, though it is not clear whether this position even exists any longer as the rule was promulgated in 1979. Ibid.

[874] MCL 325.1013.

[875] MCL 315.1013(6).

[876] MCL 325.1004.

[877] Ibid.

[878] MCL 325.1004(3). This is in line with Michigan's water withdrawal legislation found at MCL 324.32701-32730.

[879] MCL 325.1004(4).

[880] The law treats large withdrawals for bottled water in a similar fashion, providing public notice and a comment period of at least 45 days. MCL 325.1017.

[881] MACR 325.10203-10208.

[882] Minnesota Administrative Procedure Act, M.S.A. § 14.001-14.69. Members of the public can submit petitions for the adoption, amendment, or repeal of rules (M.S. § 14.09). Upon the proposal of a rule, the rulemaking agency must provide notice to the public (M.S. § 14.22); if 25 or more people submit a written request for a public hearing, the agency must conduct a public hearing (M.S. § 14.25). The agency may also choose to proceed directly to the public hearing stage.

[883] M.S.A. § 116A.02(1).

[884] M.S.A. § 116A.07.

[885] M.S.A. § 116A.08.

[886] Ibid.

[887] M.S.A. § 116A.09-10.

[888] M.S.A. § 116A.12.

[889] Ibid.

[890] M.S.A. § 116A.17.

[891] M.S.A. § 116A.24 (this statute makes no mention of public notice or comment).

[892] Minn. R. 4720.0010.

[893] M.S.A. § 116A.24(2)(b).

[894] M.S.A. § 116A.19. This appeal is tried by a court without a jury, and the court must make an order that the challenged order be justified if it finds that the order was arbitrary, unlawful, or not supported by the evidence.

[895] Minn. R. 4350.3100.

[896] M.S.A. § 14.58; M.S.A § 14.60; for a helpful guide to contested case proceedings in Minnesota, visit https://mn.gov/oah/self-help/administrative-law-overview/contested-case-hearing-guide.jsp#0.

[897] Operator Licensing is discussed in another chapter; system monitoring requirements are located at Minn. R. 4720.

[898] M.S.A. § 144.383.

[899] N.Y. A.P.A. Law § 202 governs rulemaking procedure. For rules and regulations that do not require public hearings by statute, the agency must provide 60 days' notice before the addition, amendment, or repeal. For the next 60 days, the public may submit comments on the proposed rule change. If the agency receives any comments objecting to the adoption of a consensus rule (rules with special expedited procedures based on the belief that no one will object, defined in N.Y. A.P.A. Law § 102), the agency must follow the normal rulemaking procedure.

[900] N.Y. Pub. Health Law § 1100(1) (McKinney).

[901] N.Y. Pub. Health Law § 1100(2) (McKinney).

[902] N.Y. A.P.A. Law § 202.

[903] 10 NYCRR 5-1.51.

[904] N.Y. A.P.A. Law § 202 says that some rulemaking requires public hearing by statute, and others do not. Nothing in N.Y. Pub. Health Law § 1100 or 10 NYCRR 5-1.51 (DOH rulemaking regulations) requires public hearings in the setting of drinking water standards.

[905] N.Y. ECL § 15-1502 (15) (McKinney).

[906] N.Y. ECL § 15-1501 (McKinney); *Water Withdrawal Permit Program*, NewYorkState.Gov. https://www.dec.ny.gov/permits/6036.html.

[907] 6 NYCRR 601.7(e).

[908] 6 NYCRR 601.10(o).

[909] 6 NYCRR 621.7.

[910] 6 NYCRR 621.4(b).

[911] 6 NYCRR 621.11.

[912] N.Y. PHL § 1102(2)(b) (McKinney).

[913] N.Y. PHL § 1102(2)(a)-(b) (McKinney).

[914] *Id.*

[915] ORC Ch. 119.

[916] ORC 6109.07; OAC Ch. 3745-91.

[917] ORC 6109.21; OAC Ch. 3745-84.

[918] On Ohio's public notice search website, a search for notices of final issuance of drinking water licenses yielded results, whereas searches for notices of proposed licenses yielded none. https://ebiz.epa.ohio.gov/Notices/noticeSearch.action.

[919] ORC 6109.11. There is a similar process outlined in the statute setting up the Environmental Review Appeals Commission, which is described elsewhere in greater length. ORC 3745.08.

[920] ORC 6109.14.

[921] ORC Ch. 119.

[922] ORC 119.06.

[923] ORC 3745.02-06; OAC Ch. 3746.

[924] Interestingly, Ohio has a broadly worded statutory provision about public participation as to certain kinds of proposed agency actions. Before issuing, modifying, or otherwise materially affecting a license or permit, the Ohio EPA may provide notice of the proposed action to the affected person but also to anyone who subscribes to the notifications. If any aggrieved party objects to the proposed action, an adjudication is held. This applies to air quality, water quality (pursuant to the Clean Water Act), construction and demolition debris, and waste management, but not to drinking water.

[925] 2 PS § 103(a).

[926] 35 PS § 721.4

[927] 25 Pa. Code § 109.202.

[928] 35 PS § 721.7(a). See also *Drinking Water Management*, Pennsylvania Department of Environmental Protection, DEP.PA.gov, http://www.dep.pa.gov/business/water/bureausafedrinkingwater/drinkingwatermgmt/pages/default.aspx

[929] 25 Pa. Code § 109.501(b): "A person may not substantially modify a permitted public water system without first obtaining an amended construction permit from the Department under § 109.503(b).";

§ 109.501(b): "A person may not operate a substantially modified facility without first obtaining an amended operation permit from the Department under § 109.504."

[930] *Id.*

[931] 35 PS § 721.7(c).

[932] 25 Pa. Code § 109.503(d).

[933] 25 Pa. Code 109.704.

[934] 35 PS § 721.7(j).

[935] 35 P.S. § 721.13.

[936] *Id.*

[937] 25 Pa. Code § 1021.51; 25 Pa. Code § 1021.52(a)(2). Pickford v. Dep't of Envtl. Prot. & Pa. Am. Water Co., 967 A.2d 414 (Pa. Commw. Ct. 2008). In that case, the customer seeking to appeal the issuance of construction and operating permits to the water supply lost on procedural grounds, since she did not file her notice of appeal within 30 days.

[938] WAC NR Ch. 227.

[939] WAC NR 809.73.

[940] WAC NR 809.90.

[941] WAC NR 809.90(7).

[942] WAC NR 108.04 and 811.08.

[943] WAC NR 811.08(1).

[944] Operation and maintenance requirements are at Ch. WAC NR 810.

[945] WAC NR 811.12.

[946] WAC NR 811.12(4)(c).

[947] Wis Stat 227.42.

[948] Wis Stat 227.42(3).

[949] Wis Stat 227.42(5)-(6).

Operator Certification

[950] 42 USC 300g-8.

[951] Ibid.

[952] U.S. EPA, Operator Certification Guidelines: Implementation Guidance, Doc. No. EPA 816-R-00-22 (Jan. 2000), available at https://www.epa.gov/sites/production/files/2015-11/documents/operator_certification_guidelines_-_implementation_guidance.pdf.

[953] 42 USC 300g-8.

[954] Ibid. *See also Building the Capacity of Drinking Water Systems: Information for States about Certifying Operators of Drinking Water Systems, EPA*: United States Environmental Protection Agency, https://www.epa.gov/dwcapacity/information-states-about-certifying-operators-drinking-water-systems.

[955] 64 Fed. Reg. 5,916 (Feb. 5, 1999).

[956] Ind. Code Ann. 13-18-11-4(a).

[957] Ind. Code Ann. 13-18-11-11(a).

[958] 327 IAC 8-12-2.

[959] 327 IAC 8-12-2(b).

[960] Ibid.

[961] 327 IAC 8-12-3.2(b)-(c).

[962] Ind. Code Ann. 13-18-11-11(a).

[963] 327 I.A.C. 8-12-4(a).

[964] Ibid.

[965] 327 IAC 8-12-3.2(a)(1).

[966] 327 IAC 8-12-3.2(b), (c); The Indiana Department of Environmental Management develops operator qualifications for WT 6 plants on a plant-by-plant basis due to the specialized nature of such plants. 327 IAC 8-12-3.2(c)(6).

[967] Ind. Code Ann. 13-18-11-9.

[968] Ibid.

[969] Ibid.

[970] Ibid.

[971] 327 IAC 8-12-7(c).

[972] Ibid.

[973] 327 IAC 8-12-7-7.5.

[974] 327 IAC 8-12-7-7.5(c).

[975] 35 Ill. Adm. Code 681.500.

[976] 35 Ill. Adm. Code 681.215.

[977] 35 Ill. Adm. Code 681.200.

[978] Ibid.

[979] 35 Ill. Adm. Code 681.205.

[980] 35 Ill. Adm. Code 681.215(c).

[981] In order to be eligible for an exemption for the requirement to have a certified operator, a community water supply must consist only of distribution and storage facilities and not have any collection and treatment facilities; obtain all of its water from a community water supply that does employ a certified operator, but not be owned or operated by that community water supply; not sell water to any person; and not be a carrier that conveys passengers in interstate commerce. 35 Ill. Adm. Code 681.215(d).

[982] 35 Ill. Adm. Code 681.300(b); 35 Ill. Adm. Code 681.210.

[983] 35 Ill. Adm. Code 681.305(a)(2); Evidence of poor character includes the applicant has been sanctioned by the Illinois EPA or has had her certificate of competency revoked or suspended, has been convicted of violation the Illinois Environmental Protection Act, or has been criminally convicted for terrorism, making terrorist threats, or causing a catastrophe. 35 Ill. Adm. Code 681.500(d).

[984] 35 Ill. Adm. Code 681.305(b).

[985] 35 Ill. Adm. Code 681.500(f)-(i).

[986] 415 ILCS 45/14 (a)-(d).

[987] 415 ILCS 45/15 (a).

[988] 415 ILCS 45/15 (b).

[989] 415 ILCS 45/14 (a).

[990] 415 ILCS 45/14 (b)-(c).

[991] 35 Ill. Adm. Code 681.400(a).

[992] 35 Ill. Adm. Code 681.405(a).

[993] 35 Ill. Adm. Code 681.600(a)-(b).

[994] 35 Ill. Adm. Code 681.600(a).

[995] 35 Ill. Adm. Code 681.600(a)(2); 35 Ill. Adm. Code 681.605(a).

[996] 35. Ill. Adm. Code 681.605(c).

[997] 35 Ill. Adm. Code 681.800.

[998] Ibid.

[999] 35 Ill. Adm. Code 681.815(b).

[1000] 35 Ill. Adm. Code 681.815.

[1001] Michigan Department of Environmental Quality, Drinking Water Operator Certification Program, available at http://www.michigan.gov/deq/0,4561,7-135-3308_3333_4171---,00.html.

[1002] MCL 325.1009; Mich. Admin. Code R. 325.11901-11918 (Part 19).

[1003] MCL 325.1009; Mich. Admin. Code R. 325.11907-11909.

[1004] Mich. Admin. Code R. 325.11905(1).

[1005] Mich. Admin. Code R. 325.11901.

[1006] A "complete treatment system" is a system that uses precipitative softening to produce finished water. Mich. Admin. Code R. 325.10103(j); A "limited treatment system" is a system that uses any methods other than precipitative softening to produce finished water. Mich. Admin. Code R. 325.10105(v).

[1007] Mich. Admin. Code R. 325.11901.

[1008] Mich. Admin. Code R. 325.11902.

[1009] Mich. Admin. Code R. 325.11905(2)(a).

[1010] Mich. Admin. Code R. 325.11905(2)(b).

[1011] Mich. Admin. Code R. 325.11912. See also MDEQ, *Drinking Water Operator Certification* (website), available at http://www.michigan.gov/deq/0,4561,7-135-3308_3333_4171-10155--,00.html.

[1012] Mich. Admin. Code R. 325.11912(1).

[1013] Mich. Admin. Code R. 325.11911 and 325.11912.

[1014] Mich. Admin. Code R. 325.11911 and 325.11912. See also MDEQ, *State of Michigan Requirements for Certification* (Rev. July 2015), available at http://www.michigan.gov/documents/deq/deq-ess-otu-dw-Requirements_257401_7.pdf.

[1015] Mich. Admin. Code R. 325.11911 and 325.11912.

[1016] Ibid.

[1017] Mich. Admin. Code R. 325.11914(1).

[1018] Ibid.

[1019] Mich. Admin. Code R. 325.11905.

[1020] Ibid.

[1021] Ibid.

[1022] Ibid.

[1023] Minn. R. 9400.0350(A).

[1024] Minn. R. 9400.0400.

[1025] Minn. R. 9400.0700.

[1026] Minn. R. 9400.0400(2).

[1027] Minn. R. 9400.0700.

[1028] Minn. R. 9400.0400.

[1029] Minn. R. 9400.1000.

[1030] Ibid.

[1031] Minn. R. 9400.0700.

[1032] Ibid.

[1033] Ibid.

[1034] Ibid.

[1035] Minn. R. 9400.0800.

[1036] Ibid.

[1037] Minn. R. 9400.1350.

[1038] Ibid.

[1039] Minn. R. 9400.1200.

[1040] Ibid.

[1041] Ibid.

[1042] 10 NYCRR 5-4.2(b).

[1043] 10 NYCRR 5-4.2(a)(2).

[1044] 10 NYCRR 5-4.2, Table 5-4.2.

[1045] Ibid.

[1046] 10 NYCRR 5-4.3.

[1047] 10 NYCRR 5-4.2(a)(2).

[1048] 10 NYCRR 5-4.5.

[1049] 10 NYCRR 5-4.3, Table 5-4.3.

[1050] 10 NYCRR 5-4.4(d).

[1051] Ibid.

[1052] Ibid.

[1053] Ibid.

[1054] 10 NYCRR 5-4.8(a)(1).

[1055] 10 NYCRR 5-4.8(a)(3).

[1056] ORC 6109.04(C)(1)(b); OAC 3745-7-01 to 3745-7-20.

[1057] OAC 3745.7-10 to 3745.7-11.

[1058] OAC 3745-7-03.

[1059] OAC 3745-7-03.

[1060] Ibid.

[1061] Ibid.

[1062] OAC 3745-7-05.

[1063] OAC 3745-7-05(B).

[1064] OAC 3745-7-06. Further information regarding the application process can be accessed at http://www.epa.ohio.gov/ddagw/opcert.aspx#178665150-ebusiness-center.

[1065] OAC 3745-7-06.

[1066] Ibid.

[1067] Ibid.

[1068] OAC 3745-7-07.

[1069] OAC 3745-7-13.

[1070] Ibid.

[1071] OAC 3745-7-15.

[1072] Ibid.

[1073] Ibid. See also *Certified Operators, Ohio: Ohio Environmental Protection Agency*, http://www.epa.ohio.gov/ddagw/opcert.aspx - 178665152-contact-hours-and-renewals.

[1074] Ibid.

[1075] OAC 3745-7-15. A list of approved courses can be viewed here: *List of Approved Courses for Water Certification as of August 23, 2017*, http://www.epa.ohio.gov/Portals/28/documents/opcert/ApprovedWaterCourses.pdf.

[1076] 25 Pa. Code 302.101 et seq.

[1077] 25 Pa. Code 302.1202(a)(2).

[1078] 25 Pa. Code 302.901(a).

[1079] Ibid.

[1080] Ibid.

[1081] 25 Pa. Code 302.901(c).

[1082] 25 Pa. Code 302.201(a).

[1083] 25 Pa. Code 302.603.

[1084] 25 Pa. Code 302.601(a).

[1085] 25 Pa. Code 302.601(b).

[1086] 25 Pa. Code 302.601(c).

[1087] 25 Pa. Code 302.601(e).

[1088] 25 Pa. Code 302.701(a); 25 Pa. Code 302.703.

[1089] 25 Pa. Code 302.701(b).

[1090] 25 Pa. Code 302.703(b)(2).

[1091] 25 Pa. Code 302.703(d).

[1092] 63 P.S. 1006(a).

[1093] 25 Pa. Code 302.1004.

[1094] 63 P.S. 1009.

[1095] Ibid.

[1096] Ibid.

[1097] 25 Pa. Code 302.301(f).

[1098] 25 Pa. Code 302.306(c).

[1099] 25 Pa. Code 302.803(a)(2).

[1100] Ibid.

[1101] See also Wisconsin DNR, *Waterworks Operator Certification* (website), available at http://dnr.wi.gov/regulations/opcert/muniWaterworks.html.

[1102] Wis. Admin. Code NR 114.02, 114.27-28.

[1103] Wis. Admin. Code NR 114.03(15).

[1104] Wis. Admin. Code NR 114.30.

[1105] Wis. Admin. Code NR 114.29.

[1106] Ibid.

[1107] Wis. Admin. Code NR 114.30

[1108] Ibid.

[1109] Wis. Admin. Code NR 114.32.

[1110] Wis. Admin. Code NR 114.35.

[1111] Ibid.

[1112] Ibid.

[1113] Ibid.

[1114] Wis. Admin. Code NR 114.04 to 114.11. Information concerning where and how to take the waterworks and water system operator exam can be found here http://dnr.wi.gov/regulations/opcert/forms.html.

[1115] Wis. Admin. Code NR 114.04 to 114.11.

[1116] Wis. Admin. Code NR 114.07.

[1117] Wis. Admin. Code NR 114.12.

[1118] Wis. Admin. Code NR 114.07. See also Wisconsin DNR, *Waterworks Operator Certification* (website), available at http://dnr.wi.gov/regulations/opcert/muniWaterworks.html.

[1119] Wis. Admin. Code NR 114.07.

[1120] Ibid.

Management of Drinking Water Emergencies

[1121] 42 USC 300i to 300i-4 ("Part D").

[1122] 42 USC 300i.

[1123] Ibid.

[1124] 42 USC 300i-1.

[1125] 42 USC 300i-3.

[1126] 42 USC 300i-2(a), (b).

[1127] 42 USC 300i-2(a).

[1128] 42 USC 300i-2(b).

[1129] U.S. EPA, Develop or Update a Drinking Water or Wastewater Utility Emergency Response Plan, available at, https://www.epa.gov/waterutilityresponse/develop-or-update-drinking-water-or-wastewater-utility-emergency-response-plan.

[1130] U.S. EPA, Mutual Aid and Assistance for Drinking Water and Wastewater Utilities, available at https://www.epa.gov/waterutilityresponse/mutual-aid-and-assistance-drinking-water-and-wastewater-utilities - 1.

[1131] Direct financial assistance is available for some drinking water emergencies, though not directly from the EPA. The Department of Agriculture Rural Development offers emergency community water assistance grants to help rural communities who have seen, or may imminently see, a significant decline in drinking water quantity or quality. 7 USC 1926(a); 7 CFR Part 1778.

[1132] 42 USC 300g-2(a)(5); 40 CFR § 142.10(e).

[1133] 35 Ill. Adm. Code 607.103(c).

[1134] 35 Ill. Adm. Code 652.702(b)(3).

[1135] 77 Ill. Adm. Code 900.45(c)(3).

[1136] Ibid.

[1137] 35 Ill. Adm. Code 607.103(c).

[1138] Ibid.

[1139] Ibid.

[1140] Illinois Environmental Protection Agency, Public Water Supply Loan Program: 2019 Intended Use Plan, at 8 (Aug. 2018), available at https://www2.illinois.gov/epa/Documents/iepa/grants-loans/state-revolving-fund/2019-pws-intended-use-plan.pdf.

[1141] Ibid.

[1142] Illinois Water/Wastewater Agency Response Network, www.ilwarn.org.

[1143] Illinois Water and Wastewater Mutual Aid and Assistance Agreement, available at http://www.ilwarn.org/documents/MAA%20final-2009.pdf.

[1144] Ind. Code. Ann. 13-14-10-1.

[1145] 327 IAC 8-2-8.2(7)(B)(i)(AA).

[1146] 327 IAC 8-2-8.2(7)(B)(ii).

[1147] 327 IAC 8-2-8.2(7)(C).

[1148] Ind. Cod. Ann. 13-14-10-1(a).

[1149] Ind. Code Ann. 13-14-10-1(b).

[1150] Ibid.

[1151] State of Indiana, Drinking Water State Revolving Fund Loan Program: Intended Use Plan, State Fiscal Year 2019, at 4 (Jul. 1, 2018), available at https://www.in.gov/ifa/srf/files/2018-09-14 DW 2019 IUP - Posted for Comment 2.pdf.

[1152] Ibid.

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[1165] Ibid.

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[1195] 10 NYCRR 5-1.33(f).

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[1218] Ohio EPA, Security and Emergency Preparedness, available at http://epa.ohio.gov/ddagw/security.aspx#115202878-resources.

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[1223] OAC 3745-86-01(c).

[1224] Ohio EPA, Drinking Water Emergency Loan Fund (Nov. 2008), available at http://epa.ohio.gov/Portals/28/documents/dwaf/DWELF_FactSheetRev_Nov2008.pdf.

[1225] Ibid.

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[1244] Wis. Admin. Code NR 810.26.

[1245] Wis. Admin. Code NR 810.23(2).

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[1247] Ibid.

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[1255] Ibid.

[1256] Cyanobacterial toxins: Microcystin-LR in Drinking-water, World Health Organization (2003).

[1257] Ibid. Note that this guideline value has been adopted by several countries, including Brazil, China, Czech Republic, Denmark, Finland, France, Germany, Italy, Japan, Korea, Netherlands, Norway, New Zealand, Poland, South Africa, and Spain. EPA, *Drinking Water Health Advisory for the Cyanobacterial Microcystin Toxins*, at Table 1-1 (June 2015), available at https://www.epa.gov/sites/production/files/2017-06/documents/microcystins-report-2015.pdf; Additionally, Australia has adopted a guideline of 1.3 ug/L for microcystin and Canada has adopted a guideline of 1.5 ug/L for microcystin. Ibid.

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[1259] Ibid.

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[1261] Ibid.

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[1263] Ibid at 33.

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[1265] Ibid.

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[1267] Ibid.

[1268] Bettina C. Hitzfeld, Stefan J. Hoger, and Daniel R. Dietrich, Cyanobacterial Toxins: Removal during Drinking Water Treatment, and Human Risk Assessment, Environmental Health Perspectives, at 113 (Mar. 2000), available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1637783/pdf/envhper00310-0118.pdf.

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[1270] Andrew M. Dolman et al., *Cyanobacteria and Cyanotoxins: The Influence of Nitrogen versus Phosphorus Nitrogen, Phosphorus, Cyanobacteria, and Cyanotoxins*, PLoS one 7(6): e38757, 1 (2012).

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[1273] Bettina C. Hitzfeld, Stefan J. Hoger, and Daniel R. Dietrich, Cyanobacterial Toxins: Removal during Drinking Water Treatment, and Human Risk Assessment, Environmental Health Perspectives, at 114 (Mar. 2000), available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1637783/pdf/envhper00310-0118.pdf.

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[1280] 42 USC 300g-1(b)(1)(A).

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[1328] Minn. R. 7053.0205(7)(C).

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[1341] OAC 3745-90-03.

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[1388] 77 Ill. Adm. Code 920.130.

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[1392] Ind. Code Ann. 25-39-3-1.

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[1463] OAC 3701-28-05.

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[1465] OAC 3701-28-18(A)(2).

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[1468] Ibid.

[1469] OAC 3701-28-03.

[1470] OAC 3701-28-03(B).

[1471] OAC 3701-28-04.

[1472] Ibid; OAC 3701-28-03.

[1473] OAC 3701-28-03(T).

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[1475] OAC 3701-28-03(Z).

[1476] Ibid.

[1477] OAC 3701-28-07(B).

[1478] OAC 3701-28-07(D)-(J).

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[1481] 32 P.S. 645.4(b).

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[1483] 32 P.S. 645.7.

[1484] 17 Pa. Code 47.5.

[1485] 32 P.S. 645.11.

[1486] 17 Pa. Code 47.6.

[1487] 32 P.S. 645.10.

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[1498] Wis. Admin. Code NR Ch. 812.

[1499] Wis. Admin. Code NR 812.22(6)(a).

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[1501] Wis. Admin. Code NR 812.08.

[1502] Wis. Admin. Code NR 812.08(2), (3).

[1503] Wis. Admin. Code NR 812.08(4).

[1504] Wis. Admin. Code NR 146.01.

[1505] Wis. Admin. Code NR 146.04(2).

[1506] Ibid.

[1507] Wis. Admin. Code NR 146.04(3).

[1508] Wis. Admin. Code NR 146.03.

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[1512] Wis. Stat. 281.75(7)(a); Wis. Adm. Code NR 123.24.

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