Protecting Drinking Water in the Great Lakes

A Primer on Existing State Policies and Using the Safe Drinking Water Act
American Rivers would like to thank the Charles Stewart Mott Foundation for their generous support.

About American Rivers
American Rivers protects wild rivers, restores damaged rivers, and conserves clean water for people and nature. Since 1973, American Rivers has protected and restored more than 150,000 miles of rivers through advocacy efforts, on-the-ground projects, and an annual America’s Most Endangered Rivers® campaign. Headquartered in Washington, DC, American Rivers has offices across the country and more than 275,000 members, supporters, and volunteers.

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. Great Lakes Environmental Law Center does so in partnership with law student interns and with students from Wayne State University Law School’s Transnational Environmental Law Clinic.

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Have you ever wondered about the safety of your drinking water? Are you curious as to what the federal Safe Drinking Water Act 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 Safe Drinking Water Act (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 three Great Lakes states: Michigan, Ohio, and Wisconsin. This report is part of a broader effort to describe the way that 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.

After the drinking water crises in Toledo, Ohio and Flint, Michigan, 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. In total, we held six listening sessions, two 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 two issues including 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. 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 scheme. 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 Michigan, Ohio, and Wisconsin, 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 what the laws are currently. This report acts as a starting point and we hope that we have been able to provide this information for you.

This will be a dynamic, iterative process. We intend to expand the report to address Illinois, Indiana, Minnesota, New York, and Pennsylvania. That expanded version will also address any changes to Michigan’s, Ohio’s, and Wisconsin’s legal schemes. It may also expand into additional topic areas.

We would like to thank the many law student interns from Wayne State University Law School’s Transnational Environmental Law Clinic who helped with the research and writing of the report. We would like to thank all of our Great Lakes partners who participated in the six 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 also would 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 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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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 upon. 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 your 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: maximum contaminant levels, 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.

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. Where there exist formal agency policy documents that factor significantly into regulation, it references them.

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

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>CCR</td>
<td>Consumer confidence reports</td>
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<tr>
<td>EPA</td>
<td>Environmental Protection Agency</td>
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<td>LCR</td>
<td>Lead and copper rule</td>
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<tr>
<td>LSL</td>
<td>Lead service line</td>
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<tr>
<td>LSLR</td>
<td>Lead service line replacement</td>
</tr>
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<td>MCL</td>
<td>Maximum contaminant level</td>
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<tr>
<td>MCL</td>
<td>Michigan Consolidated Laws</td>
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<tr>
<td>MCLG</td>
<td>Maximum contaminant level goal</td>
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<tr>
<td>MDEQ</td>
<td>Michigan Department of Environmental Quality</td>
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<tr>
<td>mg/l</td>
<td>Milligrams per liter</td>
</tr>
<tr>
<td>Ohio EPA</td>
<td>Ohio Environmental Protection Agency</td>
</tr>
<tr>
<td>PLSLR</td>
<td>Partial lead service line replacement</td>
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<tr>
<td>Primary agency or responsible agency</td>
<td>EPA or the state, depending on which has primary enforcement responsibility to implement the SDWA in the relevant jurisdiction</td>
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<tr>
<td>SDWA</td>
<td>The federal Safe Drinking Water Act</td>
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<td>SRF</td>
<td>State Revolving Fund</td>
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<tr>
<td>State SDWA or state drinking water law</td>
<td>The state’s laws and regulations that implement the Safe Drinking Water Act</td>
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<tr>
<td>Wisconsin DNR</td>
<td>Wisconsin Department of Natural Resources</td>
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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, and 2016. Rather than examine the full history or undertake a comprehensive evaluation of the statute, this section briefly describes the key components to facilitate reading the more detailed report sections that follow.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 are systems that deliver drinking water to the public. Public water systems provide the public with “water for human consumption through pipes or other constructed conveyances, if such system 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.
Contaminants

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

For each regulated contaminant, the EPA sets a nonenforceable maximum contaminant level goal (MCLG) at a level at which no known or anticipated adverse health effects occur while allowing for a margin of safety. The EPA then must set a maximum contaminant level or MCL as close to the MCLG as possible. 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. Depending on the level of risk posed to the public, the form, manner, and frequency of notice will vary.

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.

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 waterbodies. 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.” A national primary drinking water regulation must either specify a MCL or, if it is economically or technologically infeasible to ascertain a maximum contaminant level, must require a treatment technique which leads to an equivalent reduction of the contaminant. Whenever a national primary drinking water regulation is proposed, a maximum contaminant level goal for such contaminant must be proposed simultaneously. A maximum contaminant level 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.” 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.

The SDWA also allows for the EPA to create secondary drinking water regulations. These regulations specify the maximum contaminant levels which are needed to protect the public welfare, and specifically account for aesthetic factors such as odor and appearance of drinking water. Secondary maximum contaminant levels are not federally enforceable but are meant to serve as guidelines for states and public water systems. While the SDWA does not create enforceable regulations regarding secondary maximum contaminant levels, some states have established secondary...
maximum contaminant levels and require water systems to conduct monitoring to ensure compliance, and require specific responses when a secondary maximum contaminant level is exceeded. Additionally, the SDWA permits the EPA to establish nonbinding health advisories for contaminants not subject to any national primary drinking water regulation.  

MCLs promulgated by the EPA are codified in the code of federal regulations. 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, the EPA, or private person. While nonbinding, maximum contaminant level goals and secondary drinking water regulations are also codified in the code of federal regulations.

For each MCL, the EPA must also describe monitoring and analytical procedures to insure compliance with the standard. 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.

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. Revisions to any national primary drinking water regulation must be at least as protective of public health as the existing standard. 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. 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. 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. To date, the EPA has conducted three Six-Year Reviews, the results of which are published in the Federal Register. 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. In the most recent Six-Year Review, the EPA decided that eight national primary drinking water standards were candidates for regulatory revision.

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 a maximum contaminant level for E. coli and the replacement of the total coliform maximum contaminant level with treatment technique regulations. 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. In order to be granted primary enforcement responsibility by the EPA, the state must have adopted drinking water regulations which 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. 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 maximum contaminant levels that are stricter than federal standards.

Michigan

Michigan has not adopted any MCL that is more stringent than the federal MCL for any microbiological contaminants,36 organic contaminants,37 inorganic contaminants,38 disinfection byproducts,39 or residual disinfectants,40 and radionuclides.41 Michigan has also not established its own MCL for any pollutant that is not currently regulated by the SDWA.

Michigan has adopted secondary maximum contaminant levels that are more stringent than federal secondary maximum contaminant levels and has adopted secondary maximum contaminant levels for additional contaminants that lack a corresponding federal standard, as described by Table 1 below.42

<table>
<thead>
<tr>
<th>Contaminant</th>
<th>Michigan Secondary Maximum Contaminant Level (Milligrams per Liter)</th>
<th>Federal Secondary Maximum Contaminant Level (Milligrams per Liter)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chloride</td>
<td>2 mg/L</td>
<td>250 mg/L</td>
</tr>
<tr>
<td>Calcium Carbonate</td>
<td>250 mg/L</td>
<td>N/A</td>
</tr>
<tr>
<td>Iron</td>
<td>0 mg/L</td>
<td>0.3 mg/L</td>
</tr>
<tr>
<td>Sodium</td>
<td>2 mg/L</td>
<td>N/A</td>
</tr>
<tr>
<td>Sulfate</td>
<td>2 mg/L</td>
<td>250 mg/L</td>
</tr>
<tr>
<td>Corrosivity</td>
<td>Noncorrosive</td>
<td>Noncorrosive</td>
</tr>
</tbody>
</table>

Table 1 Comparison of Michigan Secondary Maximum Contaminant Levels to Corresponding Federal Secondary Maximum Contaminant Levels43

Michigan’s secondary maximum contaminant levels apply in the context of wells used to provide on-site water supply for developments less than 1 acre in size or subdivisions that are not served by the public water system.44 The Michigan Land Division Act regulates the separation of land into two or more parcels and sets standards for creating subdivision lots. Regarding the development of subdivisions, the Michigan Department of Environmental Quality (MDEQ) is given the authority to review and approve the suitability of groundwater for on-site water supply for those subdivisions that are not served by public water systems.45 In order to determine if on-site 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 MDEQ46 or to use water wells or test wells in the vicinity or hydrogeological information that demonstrates that the on-site groundwater is suitable for use.47 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.48 Depending on how the subdivision water supply operates, the subdivision water supply may still be regarded as a public water supply pursuant to the Michigan SDWA. For example, if the subdivision provides water through a centralized system, most likely through a community well, it would likely be regarded as a public water supply for the purposes of the Michigan SDWA.49 However, if a subdivision provided water exclusively through individual, on-lot wells, those wells would not be regarded as community water systems and would not be regulated by the Michigan SDWA. As such, the drinking water regulations regarding subdivision development largely exist to provide some measure of drinking water quality assurance prior to the development of water supply systems that may or may not be regulated by the Michigan SDWA.

Michigan does not prescribe specific procedures for the review and promulgation of MCLs. Therefore, the existing MCLs described in Michigan’s administrative code remain in place until they are amended by the general procedures described in the Michigan Administrative Procedures Act.50
Michigan has adopted the analytical methods and sample collection procedures promulgated by the EPA by reference and without alteration.\textsuperscript{51}

**Ohio**

Ohio has not adopted any state MCL that is more stringent than the federal MCL for organic contaminants,\textsuperscript{52} residual disinfectants,\textsuperscript{53} microbiological contaminants,\textsuperscript{54} radionuclides,\textsuperscript{55} or disinfection byproducts.\textsuperscript{56} Ohio has not developed a 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.\textsuperscript{57}

Ohio’s secondary maximum contaminant levels are mostly the same as the standards established by the EPA.\textsuperscript{58} However, the pH secondary MCL established by Ohio is less stringent than the federal secondary MCL.\textsuperscript{59} Similar to the EPA, Ohio expressly states that its secondary MCLs are advisable maximum levels of contaminants in water which is delivered to the free-flowing outlet of the ultimate user of the public water system.\textsuperscript{60} A public water system must monitor for parameters associated with secondary MCLs.\textsuperscript{61} 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.\textsuperscript{62} 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.\textsuperscript{63}

According to the Ohio Agency Rule Development Act, existing rules are subject to a regular review by the adopting agency.\textsuperscript{64} 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.\textsuperscript{65} 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.”\textsuperscript{66} On the basis of the review, the reviewing agency must determine whether the rule needs to be amended or rescinded.\textsuperscript{67}

Ohio’s analytical requirements largely mirror the regulations promulgated by the EPA.\textsuperscript{68}

**Wisconsin**

Nearly all of Wisconsin’s MCLs are just as stringent as the federal MCLs for organic contaminants,\textsuperscript{69} microbiological contaminants,\textsuperscript{70} residual disinfectants,\textsuperscript{71} radionuclides,\textsuperscript{72} and disinfection byproducts.\textsuperscript{73} The one exception is that Wisconsin has established a MCL of 0.0002 mg/L for vinyl chloride, which is more stringent than the corresponding federal MCL of 0.002 mg/L.\textsuperscript{74} The Wisconsin Department of Health Services does regularly publish health advisory levels for contaminants that are not regulated in public water supplies.\textsuperscript{75} However, advisory levels are guidelines for water systems and are not enforceable.\textsuperscript{76}

Wisconsin’s secondary MCLs are identical to the federal secondary MCLs except that it has not adopted the federal secondary MCL for pH.\textsuperscript{77} Additionally, Wisconsin has established a secondary MCL for hydrogen sulfide.\textsuperscript{78} 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.\textsuperscript{79}

Wisconsin does not require the periodic review of its MCLs or its secondary MCLs. Depending on the contaminant, Wisconsin’s analytical framework mostly relies on the analytical methods described by the EPA.\textsuperscript{80} However, Wisconsin does allow for the use of specific analytical methods as described by the American Water Works Association, the American Public Works Association, and the Water Environment Federation.\textsuperscript{81}
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 which dependably complies with such maximum contaminant levels, including accepted methods for quality control and testing procedures to insure compliance with such levels. The specific monitoring requirements to ensure that each MCL is dependably complied with are described in the code of federal regulations and varies 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. 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. 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. These waterborne pathogens may enter water distribution systems as fecal contamination from humans or animals. Fecal contamination in distribution systems commonly occurs because untreated sewage is released into source waters or there is manure runoff during periods of heavy precipitation into the source water of a distribution system. 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. 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. Noncommunity groundwater systems that serve 1,000 or fewer people must monitor for total coliforms each calendar quarter. If the system receives a total coliform-positive sample, then the system must collect at least three additional total coliform samples during the next month. Community groundwater systems that serve 1,000 or fewer people must monitor for total coliforms once per month. Surface water systems that serve 1,000 or fewer people must monitor for total coliforms monthly and may not reduce its monitoring frequency. All public water systems that serve more than 1,000 people must monitor monthly and, in general, systems are not eligible to conduct reduced monitoring. Noncommunity groundwater systems serving 1,000 or fewer people may be eligible to reduce sampling frequency from quarterly to annually. 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. These plans are subject to state review and revision and were required to have been submitted by March 31, 2016.

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. 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. Additionally, if any routine or repeat sample is total coliform-positive, the system must analyze that total coliform-positive sample to determine if E. coli is present.

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. A system must perform a Level 1 assessment if any of the following occurs: for systems that take 40 or more samples per month, the system exceeds 5 percent 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. A Level 1 assessment is a basic examination of the source water, treatment and distribution system, and relevant operational practices. A system must perform a Level 2 assessment if any of the following occurs: 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. An E. coli MCL violation occurs if the system has an E. coli-positive repeat sample, the system has a total coliform-positive repeat sample following an E. coli-positive routine sample, the system fails to take all required repeat samples following an E. coli-positive routine sample, or the system fails to test for E. coli when any repeat sample tests positive for total coliform. A Level 2 assessment is a more detailed examination of the system, its operational practices, and its monitoring program and results. 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.

**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. Volatile organic compounds generally enter the drinking water system through spills and improper disposal. 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. 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.

**Monitoring for Volatile Organic Contaminants**

Volatile organic contaminants MCLs apply to community and nontransient noncommunity water systems. As a result, the monitoring requirements focus on these systems. Community and nontransient noncommunity water systems must take four consecutive quarterly samples for each contaminant except vinyl chloride during each three-year period. However, water systems may be eligible for reduced monitoring. If initial monitoring was completed before 1993 and the system did not detect any volatile organic contaminant, then the system may take one sample annually. Additionally, if a groundwater system conducts three years of annual sampling and there has been no detection of any volatile organic contaminant, the state may allow for the water system to conduct sampling once every three calendar years. Both surface water systems and groundwater systems may also be eligible for waivers from monitoring requirements. A groundwater system may apply to its state for the waiver of reduced monitoring if it does not detect any volatile organic contaminant after completing initial monitoring. Groundwater system monitoring waivers cannot be effective for more than six years. If granted, one of the conditions of the waiver must require the groundwater system to take one sample at each sampling point during the six-year period that the waiver is effective. A surface water system may also apply to its state for the waiver of
reduced monitoring requirements if it has not detected any volatile organic contaminant after completing initial monitoring.116 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 0.0005mg/L in any sample, then the system must monitor quarterly at each sampling point which resulted in the detection.117 Additionally, any system that violates any volatile organic contaminant MCL must monitor quarterly.118

In general, the EPA does not require water systems to monitor for vinyl chloride. However, if any volatile organic contaminant other than vinyl chloride is detected at a level exceeding 0.0005mg/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.119 Surface water systems are only required to monitor for vinyl chloride if it is required by the state.120

**Monitoring for Synthetic Organic Contaminants**

Synthetic organic contaminants MCLs apply to community and nontransient noncommunity water systems. As a result, the monitoring requirements for organic contaminants focus on these systems. According to federal regulations, each community water system and nontransient noncommunity water 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.121 Groundwater systems must take a minimum of one sample at every entry point to the distribution system which is representative of each well after treatment.122 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.123 Water systems may be eligible for reduced monitoring. If a system serves more than 3,300 persons and does not detect a regulated synthetic organic contaminant in the first three years of monitoring, it may decrease monitoring to a minimum of two quarterly samples during one year in each three-year compliance period.124 If a system serves less 3,300 persons or less and does not detect synthetic organic contaminants in the first three years of monitoring, it may reduce its monitoring to a minimum of one sample during each three-year compliance period.125 Furthermore, each community and nontransient water system may apply for a waiver from the state.126 A state must consider the factors described by federal regulation in deciding whether to grant a waiver.127 Waivers granted by states are effective for three years.128 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 which resulted in the detection.129 A system that violates any synthetic organic contaminant MCL must monitor quarterly.130

**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.131 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.132 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.133 Community water systems and nontransient, noncommunity water systems are required to conduct regular monitoring for both disinfection byproducts and disinfectant residuals. 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 and haloacetic acids are both byproducts of chemical disinfection. Chlorine and chloramine are regularly applied to drinking water to provide disinfection to kill microbiological contaminants.

Community water systems and nontransient, noncommunity water systems that use a primary or residual disinfectant other than ultraviolet light or that delivers water that has been treated with a primary or residual disinfectant other than ultraviolet light must conduct routine monitoring for total trihalomethanes (TTHM) and five haloacetic acids (HAA5). The frequency with which monitoring must be conducted largely depends on the number of users served by the water system and its source water, and reflect 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. Regarding surface water systems, systems that serve less than 500 people must take 2 samples per year, systems that serve between 500 and 9,999 people must take 2 samples per quarter, systems that serve between 10,000 and 49,999 people must take 8 samples per quarter, systems that serve between 50,000 and 249,999 people must take 12 samples per quarter, systems that serve between 250,000 and 999,999 people must take 24 samples per quarter, systems that serve between 1,000,000 and 4,999,999 people must take 56 samples per quarter, and systems that serve over 5,000,000 people must take 112 samples per quarter. Regarding groundwater systems, systems that serve less than 10,000 people must take 2 samples per year, systems that serve between 10,000 and 99,999 must take 4 samples per quarter, systems that serve between 100,000 and 499,999 must take 8 samples per quarter, systems that serve over 500,000 people must take 8 samples per quarter. Water systems are required to monitor during the month of the highest disinfection byproduct concentrations. Monitoring must be conducted at locations recommended in the system’s Initial Distribution System Evaluation (IDSE) report or the system’s monitoring plan.

Under certain circumstances, a water system may be eligible for reduced monitoring. Surface water systems that use a source water that has annual average concentration of total organic carbon that is less than or equal to 4.0 mg/L, an annual average concentration of TTHM that is less than or equal to 0.040 mg/L, and an annual average concentration of HAA5 that is 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. Groundwater systems that have an annual average concentration of TTHM that is less than or equal to 0.040 mg/L and an annual average concentration of HAA5 that is less than or equal to 0.030 mg/L are also eligible for reduced monitoring. Additionally, small systems may be required to conduct more frequent monitoring if they exceed the MCL for either trihalomethane or haloacetic acid.

Chlorite and Chlorine Dioxide

Chloride dioxide is used by some water systems as a disinfectant for odor and taste control. Chlorite is a disinfection byproduct that results from the use of chloride dioxide. Water systems that use chloride dioxide for disinfection or oxidation must monitor for chlorite and chlorine dioxide. Water systems must 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. 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. If a daily chlorite sample exceeds the MCL, then the water system must take samples in the distribution system. Chlorite sampling at the entrance of the water system may not be reduced, but monthly sampling within the public water system may be reduced. If a sample exceeds the chlorite MCL at the entrance to the distribution system, the system is required to conduct additional monitoring.

Water systems must 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. 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. Monitoring for chlorine dioxide may not be reduced.

Bromate
Bromate may be formed during the ozonation treatment process if the bromide ion is present in the water. 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. 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 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.

Disinfection Byproduct Precursors Monitoring
Disinfection byproduct precursors are the organic matter that naturally occurs in source water that reacts with chemical disinfectants to form a variety of disinfection byproducts. The most prominent disinfection byproduct precursor is natural organic matter, which is usually measured as total organic carbon.

Surface water systems that use conventional filtration treatment must monitor for total organic compound in both source water and in treated water once per month per plant. 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.

Chlorine and Chloramines Monitoring
Chlorine and chloramine are commonly used for drinking water disinfection. Water systems that disinfect must maintain a detectable disinfectant residual in the distribution system; chlorine and chloramines are the standard disinfects for this purpose. Sampling for chlorine and chloramines must be conducted in tandem with sampling for total coliforms. Monitoring for chlorine and chloramines may not be reduced.

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 varies depending on the type of water system. Groundwater systems must take a minimum of one sample at every entry point to the distribution system which is representative of each well after treatment. Surface water systems must 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. The required frequency of sampling varies depending on the inorganic contaminant. 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. 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. States may grant a monitoring waiver for a group of several other inorganic contaminants as well. 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.
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. 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.

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. 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. Vulnerable systems may be eligible for reduced monitoring. A system designated as utilizing waters contaminated by effluents from nuclear facilities 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. Such systems may be eligible for reduced monitoring. Designated water systems cannot apply for a waiver from monitoring requirements.

State Monitoring
Similar to maximum contaminant levels, 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.

Michigan
The State of Michigan has adopted by reference the same analytical and sampling procedures as those prescribed by the EPA. 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, surface water that serve 1,000 or fewer people, and public water systems serving more than 1,000 people 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.

Organic Contaminant Monitoring
Michigan’s monitoring requirements for volatile organic contaminants are identical to federal requirements. Additionally, Michigan allows for groundwater systems that perform annual sampling for not less than three years to reduce their monitoring frequency to one sample every three years, which is allowed under federal regulations.

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

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. Similar to Michigan’s routine monitoring scheme for TTHM and HAA5, Michigan’s reduced monitoring scheme is also identical to the federal requirements.

Michigan’s monitoring requirements for chlorite, chlorine dioxide, bromate, disinfection byproduct precursors, chlorine, and chloramine are largely identical to federal requirements.
Inorganic Contaminant Monitoring
Michigan’s inorganic contaminant monitoring scheme is generally very similar to the federal inorganic contaminant monitoring scheme.188 Michigan does allow samples from up to five sampling points to be composited per analysis, which is permitted but not required by federal regulations.189

Radionuclides Monitoring
Michigan’s radionuclides monitoring scheme is largely similar to the federal radionuclides monitoring scheme.190

Ohio
Ohio’s monitoring requirements are largely the same as the federal requirements. However, there are specific points of difference. Similar to Michigan, Ohio requires more frequent monitoring for both trihalomethanes and haloacetetic acid. Additionally, 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.191 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 4 times per month.192 Ohio’s regulations regarding the frequency of routine coliform monitoring for all systems serving more than 1,000 people are identical to federal regulations.193

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).194 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).195 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).196

This report will assume that Rule 3745-81-24(A) describes the monitoring requirements for volatile organic contaminants and that 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.197 However, Ohio does allow systems to reduce its sampling frequency as allowed by federal regulations.198 Ohio also does not appear to exempt vinyl chloride from routine monitoring.199

Regarding synthetic organic contaminants, Ohio’s monitoring requirements largely mirror the federal requirements.200

Disinfection Byproduct 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.201 Additionally, Ohio’s reduced monitoring requirements for TTHM and HAA5 are also identical to the federal requirements.202 Ohio’s monitoring requirements for chlorine,203 chlorine dioxide,204 chlorite,205 chloramine, bromate,206 and disinfection byproduct precursors207 are largely similar to federal requirements.
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.208

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.209

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.210 Similarly, Ohio requires designated systems to collect quarterly samples for tritium and strontium-90, while federal regulations only require annual samples.211

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 2 samples per month as opposed to 1.212 Wisconsin does not allow community groundwater systems serving 1,000 or fewer people to reduce the monitoring frequency.213

Organic Contaminant Monitoring
Regarding volatile organic contaminants, Wisconsin's monitoring requirements largely mirror the federal requirements, except that Wisconsin requires water systems to conduct routine monitoring for vinyl chloride.214

Wisconsin's monitoring scheme for synthetic organic contaminants largely mirrors federal requirements.215

Disinfection Byproduct and Disinfectant Residuals Monitoring
Wisconsin's routine monitoring requirements for TTHM and HAA5 are identical to federal requirements.216 Additionally, Wisconsin's reduced monitoring requirements for TTHM and HAA5 are identical to the federal requirements.217

Wisconsin's monitoring requirements for chlorite, bromate, chlorine and chloramine, chlorine dioxide, and disinfection byproduct precursors are identical to existing federal requirements.218

Inorganic Contaminant Monitoring
Wisconsin's monitoring requirements for inorganic contaminants are largely similar to the federal requirements.223

Radionuclide Monitoring
Wisconsin's requirements regarding radionuclide monitoring are largely the same as the federal requirements. However, Wisconsin's regulations do grant its Department of Natural Resources the discretion to require water systems that use only groundwater to monitor for man-made radioactivity.224
Summary

The national primary drinking water regulations created by the EPA pursuant to the SDWA serve as the floor for drinking water contaminant regulation. These regulations regulate 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 maximum contaminant levels, which exist for the primary purpose of protecting public health and are enforceable. Additionally, secondary maximum contaminant levels 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.

None of the states surveyed had taken extensive action to either regulate contaminants that do not have a corresponding federal primary maximum contaminant level or to develop state-only primary maximum contaminant levels that are more stringent than the corresponding federal standard. Through its regulation of vinyl chloride, Wisconsin is the only state to have adopted a primary maximum contaminant level that is more stringent than the corresponding federal standard. Through its regulation of microcystins, Ohio is the only state that has developed a regulatory scheme for a contaminant that is not subject to national primary drinking water regulations. States have been more willing to adopt secondary maximum contaminant levels that are more stringent than their federal counterparts, but frequently these standards have limited legal teeth, if any.

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 three 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.
Overview

Compared with other regulated drinking water contaminants, lead is one of the most dangerous and 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 in the service lines or household plumbing after the drinking water has left the water plant.

The SDWA addresses lead in various ways. 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 like pipes, solder, and flux that are not lead free. The statute also prohibits the sale or manufacture of drinking water coolers that are not lead free. It requires the EPA to publish guidance for schools to help them address lead in their drinking water supplies, which in part may come from drinking water coolers.

The SDWA also regulates lead as a drinking water contaminant. The EPA initially published the lead and copper rule (LCR) in 1991. Through the LCR, the EPA has established a complex process to address lead levels in drinking water.

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

- What is the federal scheme for addressing lead in drinking water?
- To what extent do states LCRs differ from the EPA’s?

Federal Scheme for Regulating Lead as a Drinking Water Contaminant

General Outline of the LCR

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

The LCR establishes a MCLG of zero because there is no safe level of lead in drinking water. MCLGs, however, are nonenforceable health goals. When the EPA finds that it is not feasible to determine the level of a contaminant in drinking water, in lieu of a MCL it can establish a treatment technique that reduces the level of the contaminant to satisfy the law's requirements. 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, lead service line replacement, and public education.

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 15ppb or 0.015 mg/L. 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. 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, lead service line replacement, and public education. Water systems must monitor for lead at, among other places, the source water and consumer taps. Finally, systems must report lead-related data through consumer confidence reports, notices to individual consumers, and public education.

**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. Large water systems must implement corrosion control by default unless they are deemed to have optimized corrosion control. When they first come into existence, rather than implement corrosion control by default, small and medium systems conduct initial sampling. If during that initial sampling period they exceed the action level, then they must implement corrosion control; if they remain below the action level, then they qualify for reduced monitoring. 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.

Water systems must recommend which kind of corrosion control would be most suitable. Corrosion control options include alkalinity and pH adjustment, calcium hardness adjustment, and the addition of a phosphate or silicon-based corrosion inhibitor. The responsible agency evaluates the recommendation and either approve it or designate an alternative scheme.

When a system exceeds the action level, it must make a source water treatment recommendation. Source water treatment includes ion exchange, reserve osmosis, lime softening, or coagulation/filtration. The responsible agency determines whether or not to require installation of source water treatment.

If after a system has installed corrosion control and/or source water treatment it is still exceeding the action level, it must replace lead service lines (LSLs). The system is to replace annually at least 7 percent of the initial number of LSLs in the distribution system. There is no requirement to replace any individual LSL where the lead concentration in all samples from that LSL is less than 15ppb.

Systems are only required to replace the part of the LSL that they own, though there has been much discussion of which lines the systems are and should be responsible for replacing. 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. Partial lead service line 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. If a system engages in PLSLR, it must provide enhanced notice to potentially affected residents of the lead risk.

Systems can cease their required LSLR when they meet the action level for two consecutive monitoring periods.

**Public Education**

All water systems must deliver consumer notices of lead tap water monitoring results to persons served by the system who reside at sites that are tested. In addition to sending monitoring results to those served by the system at tested sites, water systems that exceed the action level must deliver public education materials. Much of the content is predetermined. Systems must send all such materials to the responsible agency before sending them to the public. The content focuses mostly on health risk and tells consumers where they can go for help. 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.263 The
LCR contains specific requirements for delivery of the
materials, and allows states to define which communities
have enough non-English speakers that materials should
be translated to other languages.264

Water systems that exceed the action level must also
sample the tap water of any customer who requests
it.265 Systems must provide the consumer notice as soon
as practical, but not later than 30 days after the system
learns of the tap monitoring results.266

**Monitoring**

Monitoring for lead can include monitoring at consumer
taps, in source water, and monitoring for water
quality parameters other than lead that indicate the
effectiveness of corrosion control.267

For monitoring taps, each system must identify a “pool
of targeted sampling sites.”268 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.269

For community water systems, sampling sites are broken
down into tier 1, tier 2, and tier 3.270 Tier 1 sites are single
family structures that contain lead pipes or copper pipes
with lead solder installed after 1982, or are served by a
LSL.271 When multifamily residences make up 20 percent
or more of the structures served by a system, they can
be included in the pool.272

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 a LSL.273

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 1983.274 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.275

The LCR contains some prescriptions for sample
collection.276 Samples should be first-draw samples,
which should be 1-liter in volume “and have stood
motionless in the plumbing system of each sampling site
for at least six hours.”277 Samples must be collected from
the cold water tap and collected at a tap that is typically
drawn for consumption (as opposed to a laundry
sink faucet, for example).278 Water system employees
or residents can collect the samples.279 The LCR also
addresses when samples can be deemed invalid.280

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 systems providing poor sampling guidance
to residents.281 The LCR itself only provides limited
instruction on sampling collection protocol; to the
extent there is more instruction, it is in informal guidance
documents.282 During the lead and copper 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.283

Monitoring occurs at six-month intervals.284 Systems that
qualify for reduced monitoring can monitor annually.285
Small and medium systems can earn reduced monitoring
after meeting the action level during two consecutive
six-month monitoring periods and do not need approval
from the responsible agency.286 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.287

Systems that meet the reduced monitoring requirements
for three consecutive years can further reduce
monitoring to once every three years.288 Small systems
that can demonstrate that they meet the action level
and have lead free materials in their system can qualify
for a “full waiver” from monitoring, which is defined as
monitoring once every nine years.289
State Implementation

To have primary enforcement responsibility, states must implement the LCR.290 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.291

Michigan

Michigan has adopted the federal LCR with almost no material revisions.292 With regard to public education requirements for certain non-English speaking consumers, Michigan provides translated educational materials to systems with 10 percent or more non-English speaking consumers. Also, systems that exceed the action level must issue a public health advisory within 3 days of learning of the exceedance.293

Ohio

As to translation of public education materials, Ohio requires that systems provide it to communities with 10 percent or more non-English speaking consumers.294 More significantly, Ohio stands out due to recent revisions to the law. In 2016, the Ohio legislature passed HB 512, which amended various aspects of the Ohio SDWA, including provisions addressing lead.295 HB 512 revises various aspects of Ohio’s SDWA and also requires the Ohio EPA to promulgate regulations to implement certain statutory revisions, which rules are still in draft form.296

With regard to consumer notice of lead levels in tap samples, Ohio has sped up the process. The federal LCR requires water systems to provide results to the relevant consumer as soon as practical after receipt but no later than 30 days after.297 Ohio requires laboratories that receive a lead tap water sample to complete analysis within 30 days.298 No later than close of business the day after completion of the analysis, the laboratory must provide notice of the results to the water system and the Ohio EPA.299 Water systems must in turn provide notice to the relevant consumers no later than 2 business days after receipt from the laboratory.300

The amendment calls on the Ohio EPA to establish threshold lead levels for individual taps, though the Ohio EPA has yet to do that. If, with regard to whatever tap level the Ohio EPA sets as a threshold, the laboratory results from any individual tap water sample show that the lead level exceeds the threshold level, then action must be taken.301 Nontransient noncommunity water systems must immediately remove from service all fixtures identified as contributing to elevated lead levels.302 Community water systems must include in the annual consumer confidence report (CCR) the household lead levels and additional health risk information regarding lead.303 All systems must provide the consumers within 2 business days information about the availability of health screening and blood testing and the actions the system is taking to reduce exposure.304

The amendment also requires more system-wide notice when systems exceed the action level.305 No later than 2 business days after receipt of the laboratory results, all systems must provide notice to all of its consumers that it exceeds the action level.306 No later than 5 business days after receipt of the results, a community water system must provide information on tap water testing availability to any consumer in the system who is known or likely to have LSLs, lead pipes, or lead solder.307 Within a month of receipt of the results, all systems must comply with public education requirements, providing information to all consumers about availability of health screenings and blood testing.308

The amendment also requires mapping to identify the areas and consumers most at risk based on lead in the distribution area materials.309 Community water systems must identify and map “areas of the system that are known or are likely to contain LSLs and identify characteristics of buildings served by the system that may contain lead piping, solder, or fixtures.”310 Nontransient noncommunity systems must “identify and map areas of the system with lead piping, solder, and fixtures in buildings served by the system.”311 The Ohio EPA may direct nontransient noncommunity water systems that are either schools or child day-care centers to collect additional tap water samples in buildings identified in the map.312 All systems must submit the map to the departments of health and of job and family
services. In addition to the map, systems must submit a report to the Ohio EPA that describes the tier 1 sampling sites. The map and related information must be revised if necessary and resubmitted every five years. The Ohio EPA can provide financial assistance to systems for the mapping as well as corrosion control.

**Wisconsin**

Wisconsin has adopted the federal LCR without any material revisions. Even as to translation of public education materials for systems with certain amounts of non-English speaking consumers, Wisconsin leaves it open-ended and subject to agency determination.

**Summary**

Although Michigan is in the process of revising its regulations, Ohio is currently the only one of the three states to have actually revised its lead in drinking water legal scheme. Ohio has begun with revising the relevant statute, and is in the middle of finalizing the corresponding revisions to the Ohio EPA regulations. Ohio’s revisions address the issue of delayed notice of sampling results to homeowners whose water has been sampled. They do so by imposing shortened timeframes on laboratories sending results to water systems and on water systems sending results to homeowners. The revisions establish a household level distinct from the system-wide action level that triggers, depending on the category of system, provision of additional lead risk information to homeowners and the public and replacement of fittings. The revisions require earlier public notice of triggering the action level. Finally, the revisions require comprehensive mapping of where in the system there may be LSLs or other lead plumbing features, which mapping helps to inform the public about risk and can lead to additional actions on the part of water systems.
Consumer Confidence Reporting

Overview

The SDWA amendments of 1996 introduced the concept of consumer confidence reports or CCRs. CCRs are annual reports submitted by water systems to their consumers and to their regulators. 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, and it requires the states to adopt a CCR scheme that tracks the federal scheme.

For 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 requires CCRs to address the following:

- 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

CCRs must be mailed or otherwise directly delivered annually, subject to certain exceptions for small systems that can seek alternatives, such as newspaper notice or public availability. 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.

Michigan, Ohio, and Wisconsin

Other 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. The EPA considers detects above a proposed MCL or a health advisory level to indicate possible health concerns.

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.
Ohio simply recommends that water systems report results that may indicate a health concern.\(^{330}\)

Wisconsin goes beyond encouragement and simply requires systems to report such information.\(^{331}\)

**Language and Translation**

In communities with “a large proportion of non-English speaking residents,” there is no requirement to fully translate the CCR.\(^{332}\) 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.\(^{333}\) The rule leaves it to the state to define “a large proportion.”

Michigan and Ohio define it as a community where at least 10 percent or more of the residents speak a language other than English.\(^{334}\)

Wisconsin defines it as “a specific non-English speaking group [that] comprises at least 5 percent of the population of the community served.”\(^{335}\)

**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.\(^{336}\)

All three states include that requirement.\(^{337}\) 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 that information as to fecal coliform, E. coli, copper, fluoride, lead, nitrate, and nitrite.\(^{338}\)

The EPA also requires water systems to provide specific health educational statements related to arsenic, nitrates, lead, and TTHM.\(^{339}\) 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.\(^{340}\)

**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.\(^{341}\)

Michigan tracks the federal rule, but adds a requirement that water systems deliver the CCR to the local health department that has jurisdiction in the county served.\(^{342}\)

Ohio does not provide a waiver, requiring all water systems to mail or otherwise directly deliver CCRs.

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.\(^{343}\)

**Note about Ohio**

Ohio’s CCR scheme is unique in a couple of ways due to its other drinking water laws. Given that Ohio is the only state that requires operating licenses, Ohio asks water systems to include information about the status of its license.\(^{344}\) Also, Ohio does not offer variances or exemptions to water systems. As a result, it does not require the CCR reports to contain information related to variances and exemptions.\(^{345}\)

Michigan and Wisconsin also provide the option to water systems to either use the regulator’s language or develop their own in consultation with the regulator.\(^{346}\) Ohio, however, does not provide water systems the option to develop their own statements.\(^{347}\)
Here 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.348

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.

**Overview**

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

- What is the SDWA scheme for financing of water systems?
- How does the federal scheme address states with primary enforcement responsibility?
- 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.349 Pursuant to the SRF program, the EPA makes annual capitalization grants to states, who in turn use the funds to provide financial assistance to public water systems.350 The primary form of financial assistance authorized by the SDWA is subsidized loans.351 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 2003.352 Congress has continued to provide annual appropriations of varying amounts since 2003.353 In fiscal year 2016, Congress appropriated $863.2 million to the SRF program.354 In a national assessment of public water system infrastructure needs, the EPA estimated that a total twenty-year capital improvement of $384.2 billion is needed for water systems to continue to provide safe drinking water to the public.355

To receive a capitalization grant from the EPA, a state must establish a SRF and submit a grant application to the EPA.356 If approved, the EPA and the state will enter a capitalization grant agreement.357 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.358 Additionally, states must prepare an intended use plan that describes the intended uses of moneys in the SRF.359 For years in which a state has not submitted a capitalization grant application, the state still must submit the intended use plan so long as the SRF program remains in operation.360 The intended use plan 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.362 It must
also include a list of projects, including the priority assigned to each project, and the expected funding schedule for each project. Lastly, an intended use plan 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. A state’s intended use plan is incorporated by reference into the state’s capitalization grant agreement.

The SDWA does contain additional restrictions regarding how states administer their respective SRF. States are required to make 15 percent of their SRF available solely for providing loan assistance to public water systems that regularly serve fewer than 10,000 persons. States are also specifically authorized to provide additional subsidization, including the forgiveness of principal, for loans made to a disadvantaged community. A state can use up to 30 percent of its annual capitalization grant for subsidies to disadvantaged communities.

**State Revolving Funds**

Following the creation of the SRF program by the 1996 Safe Drinking Water Act 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.

**Michigan**

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. MDEQ administers the fund in accordance with Part 54 of the Natural Resources and Environmental Protection Act. According to the MDEQ, Michigan has awarded over $893 million in financial assistance to over 284 borrowers since the fund’s establishment in 1998. The 2017 capitalization grant allotment for Michigan was $25,652,000. A community water supply or a noncommunity water supply that operates as a nonprofit entity is eligible to receive financial assistance from the state drinking water revolving fund. As such, both public and private water suppliers are eligible to receive funds.

Michigan law requires the MDEQ to annually establish interest rates to be assessed for projects receiving assistance from the SRF. In setting interest rates, the MDEQ must consider future demands, present demands, market conditions, and the cost of compliance with program elements. Michigan’s 2018 intended use plan establishes a 2.0 percent interest rate for 20- and 30-year loans made to municipal borrowers. Private borrowers will receive an interest rate subsidy that equates to the same subsidy received by municipal borrowers. According to its intended use plan, Michigan determines its interest rate based on loan demand, market conditions, program costs, and future needs.

All proposed projects are reviewed and scored based on the criteria described in MCL 324.5407. Each project is assigned points, with 1,000 points being the maximum score. 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, and 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. 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.

**Ohio**

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. 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. In 2017, the capitalization grant awarded to Ohio was in the amount of $23,107,000.
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 and nonprofit noncommunity public water systems. 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. Depending on the program year and tier category a project qualifies for, the term and interest rates vary. According to Ohio’s 2018 intended use plan, the standard long-term interest rate is established based on an eight-week daily average of the municipal market data index. Disadvantaged communities, small systems, and systems that meet affordability criteria are given discounted interest rates.

**Wisconsin**

Wisconsin amended its code in 1997 to provide for a safe drinking water loan program to provide 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. The Department of Natural Resources and the Department of Administration jointly administer the program. In 2017, Wisconsin received a capitalization grant of $14,372,000 from the EPA. In 2018, it will have $90,353,102 available in its drinking water loan fund. An applicant is ineligible for a loan if it does not have the technical, managerial, or financial capacity to ensure compliance with the SDWA or if the applicant is in significant noncompliance with any requirement of a primary drinking water regulation unless the financial assistance will ensure compliance.

Applicants to the safe drinking water loan program are scored based on the priority scoring criteria described in Wisconsin’s regulatory code. 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. The Wisconsin DNR maintains a project priority list based on the priority scores assigned by the scoring criteria.

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 Department of Natural Resources must pay an interest rate that is 55 percent of the market interest rate. An applicant that does meet the financial eligibility criteria established by the Department of Natural Resources pays a further discounted rate that is 33 percent of market interest rate. The Department of Natural Resources 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 percent or less than the median household income of the state. 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 3.2 percent. Therefore, the interest rate for applicants meeting the eligibility criteria is 1.056 percent. For all other applicants, the interest rate is 1.760 percent.

**State Grant Programs**

Pursuant to the SDWA, capitalization grant funds received by states from the EPA generally must be used for providing loans. However, in the Consolidated Appropriations Act of 2016, Congress required that 20 percent of each capitalization grant provided to a state must be used to provide an additional subsidy to eligible recipients in the form of forgiveness of principal, negative interest loans, or grants. Additionally, a portion of the capitalization grant may be available to public water systems as grants in accordance with the state’s intended use plan.
Michigan
In its fiscal year 2018 intended use plan, Michigan requested that $1,795,640 of the 2017 authorization grant be set aside for wellhead protection. One of the proposed uses for these funds is grants to local communities to increase source water protection efforts and initiatives. The intended use plan specified that it proposed to utilize $300,000 from the wellhead protection set-aside to provide the state funding for the grants under the surface water protection program. Nonfederally owned public water systems that utilize surface water as an intake source and that have no prior year fees owed to the state are eligible to receive grants from the surface water protection program. Grant eligible activities include tasks undertaken for the purpose of identifying the source water protection area, developing, implementing, or updating a source water intake protection program, and public outreach or education about source water protection. Such grants are a 50 percent local match program that requires the recipient to match the grant funds. Applicants must also provide for a source water protection team consisting of at least three people. Applications for the surface water intake protection grant program are scored based on criteria established by regulations. Additionally, Michigan’s 2018 intended use plan states that it will provide the additional subsidy required by the Consolidated Appropriations Act of 2016 in the form of principal forgiveness.

Ohio
Ohio’s 2018 intended use plan states that it will provide the additional subsidy required by the Consolidated Appropriations Act of 2016 in the form of principal forgiveness. The criteria for distribution of principal forgiveness include income, unemployment data, and population trends.

Wisconsin
Wisconsin’s 2018 intended use plan states that it will provide the additional subsidy required by the Consolidated Appropriations Act of 2016 in the form of principal forgiveness. The criteria for distribution of principal forgiveness include income, unemployment data, and population trends.

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 percent 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. Additionally, states are eligible to provide a 2 percent set-aside from their capitalization grant to provide technical assistance to public water systems serving 10,000 or fewer persons in their intended use plan. Set-asides are statutory authorizations for a state to spend a certain percentage of its capitalization grant for specific uses and programs.

Michigan
Michigan’s 2018 intended use plan includes a set-aside for technical assistance for small public water systems. The intended use plan requested that 1 percent of the capitalization grant be set aside to provide technical assistance to small water systems.

Ohio
Ohio’s 2018 intended use plan includes a set-aside for technical assistance for small public water systems. Specifically, the Ohio EPA has proposed to set aside 2 percent of its capitalization grant to provide technical assistance for small public water systems. Additionally, Ohio offers more favorable interest rates to certain small public water systems. All water systems that serve a population of 5,000 or less will receive an interest rate that is 0.5 percent less than the standard long-term interest rate. Water systems that serve a population of less than 2,500 with a median household income of $48,750 or less will receive an interest rate of zero percent. Water systems that serve a population between 2,500 and 10,000 with a median household income of $44,425 will receive an interest rate of one percent.
Wisconsin

Wisconsin's 2018 intended use plan includes a 2 percent set-aside for technical assistance for small public water systems. Additionally, small public water systems that serve a disadvantaged community are also eligible for a discounted interest rate.

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. Additionally, states may utilize a portion of the capitalization grant to 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.

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. Such measures for community water systems are required to be voluntary, incentive-based mechanisms.

Michigan

As described previously, Michigan’s 2018 intended use plan states that MDEQ is planning to utilize $300,000 from the 2017 wellhead protection set-aside to provide funding for the 50/50 match grants for source water protection efforts by local communities. Additionally, the 2018 intended use plan includes a request for an 8 percent set-aside to provide local assistance for capacity development to specifically support new and existing staff regarding source water protection activities.

Additionally, 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. Additionally, Michigan’s scoring criteria awards an additional 100 points to communities that have completed an approved source water protection program.

Ohio

One of the long-term goals expressed in Ohio’s 2018 intended use plan 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. Ohio’s 2018 intended use plan also states that it intends to set aside 5 percent of its capitalization grant for the Public Water Systems Supervision program. This program includes the implementation of Ohio’s Harmful Algal Bloom Response Strategy. 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. Additionally, Ohio’s 2018 intended use plan includes a set-aside of 5 percent for funding to implement voluntary, incentive-based source water quality protection measures. 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. In regard to scoring criteria, the Ohio EPA awards 5 bonus points if a public water system has an endorsed source water protection plan.

Wisconsin

In its 2018 intended use plan, 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. 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.
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 lead and copper rule into scoring criteria.

Michigan

In its 2018 intended use plan, Michigan requested an 8 percent set-aside for local assistance and capacity development. 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 lead and copper rule oversight. 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. Additionally, the 2018 intended use plan proposed to forgive the city of Flint its prior debt totals of $20,770,336 using the capitalization grant additional subsidy amount.

Ohio

Ohio’s 2018 intended use plan specifically states that it is accepting applications for zero percent interest planning loans, including planning loans for conducting corrosion control studies, mapping the location of lead service lines, and developing public notification systems. Additionally, Ohio expressly states that it will accept nominations for construction loans with normal interest rates to replace lead service lines. Ohio’s Safe Drinking Water Act 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 lead service lines and to identify characteristics of buildings served by the system that may contain lead piping, solder, or fixtures, and to comply with corrosion control requirements. Additionally, Ohio has created a Lead Plumbing Fixture Replacement Assistance Grants Program, which was appropriated $12 million in 2016. 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. If it has exceeded the lead action level, it is given 45 points.

Wisconsin

Providing assistance to public water systems that have replaced or will be replacing lead service lines is both a long-term and short-term goal in Wisconsin’s 2018 intended use plan. 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 lead service lines. 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 percent or less when compared to the median household income in Wisconsin as a whole. In 2017, Wisconsin awarded 35 financial assistance agreements for lead service line replacements totaling $13,781,375. In 2018, Wisconsin plans to issue an additional $13,026,510 in principal forgiveness for lead service line replacement projects. In the long-term, Wisconsin’s stated goal is to replace all remaining lead service lines in their entirety.

Wisconsin also incorporates lead and copper contamination considerations into its scoring criteria. Four points is awarded if a project includes the replacement of lead service lines.
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. \(^{461}\) 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. \(^{462}\) However, for each fiscal year, a state may not grant subsidies to disadvantaged communities in excess of 30 percent of the capitalization grant received that year. \(^{463}\)

**Michigan**

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. \(^{464}\) 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. \(^{465}\) Second, the median annual household income of the area to be served must be less than 120 percent of the state’s median annual household income. \(^{466}\) Third, the applicant must satisfy one of the following criteria: more than 50 percent 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 percent 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 percent of the service area’s annual median household income. \(^{467}\)

If a community qualifies as a disadvantaged community, then it can be awarded 50 additional project priority points, \(^{468}\) can have its loan term extended up to 30 years after the date of project completion, \(^{469}\) and, if the disadvantaged community has a population of less than 10,000 people, receive technical assistance to cover project planning costs. \(^{470}\)

**Ohio**

According to Ohio’s administrative code, a nonprofit public water system that operates or provides water to a community water system, a public water system that is regulated by the public utilities commission of Ohio and that operates or provides water to a community water system, a political subdivision \(^{471}\) that operates or provides water to a community water system, a political subdivision that operates or provides water to a community water system, a political subdivision that operates or provides water to a community water system, or a nonprofit noncommunity public water system is eligible to be designated as a disadvantaged community and receive loan assistance. \(^{472}\) 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. \(^{473}\) 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. \(^{474}\) 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. \(^{475}\) The Ohio EPA determines whether an applicant qualifies for disadvantaged community status based on the scoring criteria described in Appendix F of its 2018 intended use plan. \(^{476}\)

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. \(^{477}\) The amount, form, and duration of each award of financial assistance to a disadvantaged community is at the discretion of the Ohio EPA. \(^{478}\)
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 percent or less of Wisconsin’s median household income receives an interest rate that is 33 percent of the State’s market rate. 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. The criteria include population, median household income, projected population loss, and unemployment rate. Principal forgiveness funds are allocated to the highest priority projects in municipalities with the greatest financial need as determined by the affordability criteria score.

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 3.200 percent for loans with municipal meetings on or after October 1, 2017 through December 31, 2017.

Summary

While the Drinking Water State Revolving Fund 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 to be eligible to receive federal assistance. In general, Ohio and Michigan receive more assistance through higher annual capitalization grants than Wisconsin. While states are constrained as to how to utilize funds by federal requirements, they do have a significant amount of flexibility in developing interest rates for projects funded by state loan funds and in setting the scoring criteria for applications.

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, in order to be eligible the disadvantaged community must also be a small system.
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 or an 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, 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. The main questions explored are as follows:

- When it comes to developing and altering standards like 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. 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.

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. In Wyoming, the one state that does not have primary enforcement responsibility, Region 8 still relies on the state to issue permits for construction of water systems and water wells.

With regard to enforcement, the SDWA provides for citizen enforcement of the 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. 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 their civil action. 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 attorney fees of the citizen.

**Michigan**

**Standards**

Michigan’s Administrative Procedures Act regulates rulemaking generally, which provides various opportunities for public involvement. 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.

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.” 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. While this is likely a public hearing given how administrative agencies typically behave, it is not clear given the wording.

**Permits**

MDEQ issues construction permits for water systems, but does not issue operating permits. For construction permit applications, MDEQ evaluates the ability for the water system to satisfy the drinking water standards. 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, it provides public notice of its evaluation and a comment period of at least 45 days. High capacity water system construction permitting is the only kind of permitting in Michigan where the law requires public notice and comment.

**Enforcement**

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

**Ohio**

**Standards**

Ohio’s Administrative Procedures Act regulates rulemaking generally, which provides various opportunities for public involvement. 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.

MDEQ approves plans for construction of water systems and issues licenses for operating them. In neither case is there any express opportunity for public notice and comment or public hearings.

**Permits**

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

**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. Where the Ohio EPA finds that there is a “danger of contamination” that threatens the public health, it can, though is not required to, hold a hearing. 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 Administrative Procedures Act.\textsuperscript{504} The Ohio APA requires a hearing for many of those orders,\textsuperscript{505} 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.\textsuperscript{506} Aggrieved persons can bring challenges there.\textsuperscript{507}

**Wisconsin**

**Standards**

Wisconsin has a legal scheme for administrative procedure and review that regulates rulemaking generally, which provides various opportunities for public involvement.\textsuperscript{508} 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.\textsuperscript{509} 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.\textsuperscript{510} Before the Wisconsin DNR can issue a conditional waiver, though, it must provide notice and an opportunity for a public hearing.\textsuperscript{511}

**Permits**

Wisconsin approves plans for the construction of water systems,\textsuperscript{512} which must also contain details about compliance with the operating standards.\textsuperscript{513} However, there does not appear to be a distinct permit requirement purely for operation.\textsuperscript{514} With one possible exception, 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.\textsuperscript{515} 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.\textsuperscript{516}

**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 administrative procedures law allows members of the public to request an adjudicatory hearing if they are aggrieved and if there is a dispute of material fact.\textsuperscript{517} There is no clear definition of which kinds of agency actions the law addresses, although it expressly excludes rulemakings.\textsuperscript{518} Agency actions pursuant to certain laws are excluded from the process, but the drinking water laws are not one of the laws that trigger exclusion.\textsuperscript{519}

**Summary**

Overall, none of the state drinking water laws provided much by way of robust public involvement. Not surprisingly, the states relied mostly on their APA to involve the public in rulemaking and challenges to agency action. And no state provided its citizens the ability to enforce the state’s drinking water law in state court.

Ohio was the only state to expressly call on citizens to file complaints about violations. Another theoretically meaningful difference is Ohio’s ability to issue permits not just for construction but also for operation; however, no additional public participation was built around that.
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, the report addresses the following questions:

- 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. Federal standards for operator certification can be found in the statute and in guidance documents, the primary one being Operator Certification Guidelines: Implementation Guidance. States that wish to exercise primary enforcement responsibility must have operator certification programs that are based on minimum federal guidelines.

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 percent of a state’s Drinking Water State Revolving Fund capitalization grant. 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; and stakeholder involvement.

Michigan

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

Michigan’s operator certification scheme is based in part on water system categorization. Michigan classifies its public water systems into three categories: Distribution (Class S), Limited Treatment (Class D), and Complete Treatment (Class F). These categories are differentiated based on the water supply system’s function: distribution, limited treatment, and filtration. Furthermore, each category is divided into five-levels: “1” represents the highest level, while “5” signifies the lowest level. Each level corresponds with the number of people served by the public water system.

In order to become a certified operator, an applicant must take and pass an exam for the specific system he wishes to operate. To sit for the exam, however, an applicant must be qualified to take the exam. To determine whether an applicant is qualified to sit for an exam, Michigan implements a points system based on educational and professional experience. 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, he or she is not required to have any professional experience to take the lowest level certification exam. Eventually, if a certified operator wants to become authorized to operate a water
system at a higher level, he or she must meet certain professional experience requirements.\textsuperscript{536}

Once an operator is certified, she 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.\textsuperscript{537} Consequently, the only time that 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 where she works.

Lastly, certified operators are required to renew their certificates every three years.\textsuperscript{538} In order to renew their certification, operators are required to complete a certain amount of continuing education hours.\textsuperscript{539} Depending on the level of certification, a certain number of those continuing education hours must be “technical” or “managerial” in nature.\textsuperscript{540}

\section*{Ohio}

Ohio has authorized the Ohio EPA to implement its operator certification program.\textsuperscript{541} To help in developing and revising the program, the Ohio EPA’s director is tasked with appointing an advisory council.\textsuperscript{542}

In Ohio, operators of all types of public water systems are required to be certified.\textsuperscript{543} Additionally, Ohio classifies its water systems into two categories: distribution systems and treatment plants.\textsuperscript{544} Distribution systems are based on population and are classified as either I or II.\textsuperscript{545} On the other hand, treatment plants are based on source of supply, quality of source, complexity of treatment, design capacity, and the system’s potential for health hazards.\textsuperscript{546} Based on these standards, a treatment plant is classified as either A, I, II, III, or IV.\textsuperscript{547}

To become a certified operator in the State of Ohio, an applicant must apply for and pass the state’s operator certification exam and have the requisite amount of hands on working experience.\textsuperscript{548} In order to apply for the operator exam, an applicant must have a high school diploma or its equivalents.\textsuperscript{549} Furthermore, an applicant must have the requisite amount of operating experience to sit for any of the public water system examinations.\textsuperscript{550} Individuals applying for Class A, I, or II certification, who do not have the necessary working experience, are permitted to take the operator exam.\textsuperscript{551} Upon successfully completing the exam, an applicant becomes an Operator In Training (OIT) and has 48 months to fulfill the necessary experience requirements.\textsuperscript{552}

In Ohio, to remain certified an operator must renew their certificate every two years.\textsuperscript{553} Specifically, certificates expire on December 31 of the second year of certification.\textsuperscript{554} Additionally, in order to renew their certifications, operators must continue their education by completing a specific number of “contact hours.”\textsuperscript{555} 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.\textsuperscript{556}

\section*{Wisconsin}

Wisconsin is permitted to implement an operator certification program.\textsuperscript{557} The Wisconsin Legislature has granted the Department of Natural Resources the authority to implement the state’s operator certification program.\textsuperscript{558} Unique to Wisconsin, an operator can be certified to run either a waterworks or water system.\textsuperscript{559}

Wisconsin divides water systems into five subclasses, which are differentiated based on the water system’s function.\textsuperscript{560} In order to become a water system operator, an applicant must pass an exam.\textsuperscript{561} To sit for the exam, the applicant must have a high school diploma or GED.\textsuperscript{562} Certification is based on the subclass of water system.\textsuperscript{563} 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.\textsuperscript{564} Operators are required to complete six hours of continued education over their certification period.\textsuperscript{565}

Similar to water system operators, waterworks operators must have at least a high school diploma or GED and pass one of the more subclass exams.\textsuperscript{566} Additionally, to manage a waterworks subclass, an operator must hold a Grade 1 level certification, which requires one year of working experience to obtain.\textsuperscript{567} 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. An Operator-in Training is permitted to operate a Grade 1 water system for a period not to exceed one year. Furthermore, waterworks operators are required to renew their certificates every three years. Over that three-year period, both Grade T and Grade 1 operators need to complete 18 hours of continuing education. Wisconsin's continuing education requirement can be satisfied by attending professional organization meetings, conferences, or approved online waterworks courses.

**Summary**

Every state has adopted the EPA's baseline standards for water operator certification programs, including Michigan, Ohio, and Wisconsin. In particular, Michigan, Ohio, and Wisconsin require operators to take and pass an exam in order to become certified. To sit for the exam, each state requires that an applicant has a high school diploma or a GED. Furthermore, each state demands that an operator renew his certification every two or three years. However, to renew one's license, an operator must continue their water operation education by taking and completing various state approved courses. Lastly, each state requires that a public water system be supervised and controlled by a certified operator that has the same or higher classification as the system.

Although Michigan, Ohio, and Wisconsin have met or exceeded the baseline standards, each state's operator certification program is also slightly different from one another. Specifically, each state has divided their 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 hazardous. Lastly, Wisconsin categorizes its public water systems into one class, which is divided into subclasses based on the type of treatment or process used at the facility.

Additionally, Michigan, Ohio, and Wisconsin differentiate based on the necessary amount of experience required to operate a public water system. In Michigan, an applicant does not need to have any experience to operate the state's lowest-level public water system. In Ohio and Wisconsin, however, allow applicants to satisfy their professional experience requirements after passing the exam by granting them "Operator in Training" status.
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 they 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.

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

An entire part of the SDWA is devoted to providing the EPA with certain emergency powers. There is no specific definition of what constitutes a drinking water emergency, though the statute applies emergency management standards to situations that involve manmade and natural events that cause significant disruption to drinking water access.

Part D 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. Among other things, it can issue administrative orders and sue a violator.

Part D prohibits tampering defined as interfering with a water system with the intention to harm people. The EPA, in conjunction with the Centers for Disease Control, must also review methods to detect the intentional introduction of contaminants into water systems and source water.

In much greater length, Part D addresses the threat of terrorism. Community water systems serving more than 3,300 persons must conduct an assessment of vulnerability to terrorism and similar intentional acts. For security reasons, the SDWA actually exempts these assessments from the Freedom of Information Act, which prohibits states and local government units from requiring water systems to provide such vulnerability assessments. As part of the vulnerability assessments, community water systems serving more than 3,300 persons must develop an emergency response plan (ERP) that includes at a minimum plans, procedures, and an inventory of necessary equipment to mitigate the risk of such vulnerability and to respond if necessary. The EPA has published guidance documents to assist water systems in developing ERPs.

The EPA promotes the use of the Water and Wastewater Agency Response Network or WARN model for quickly tapping into nearby resources. WARN is a network water and wastewater utilities that through mutual aid agreements agree to help each other in emergencies with personnel, equipment, materials, and services.
**Minimum Drinking Water Emergency Requirements for States That Wish to Have Primary Enforcement Responsibility**

In terms of states that wish 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.”

**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.” 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. Michigan’s drinking water emergency scheme addresses all such emergencies but expressly mentions terrorism and other intentional acts.

Michigan requires water systems to conduct emergency response planning. All Type I systems must develop ERPs and MDEQ can require certain Type II systems to develop them.

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 “must, 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.” On the other hand, the rule goes on and lists five categories of information that an ERP can address, but only requires systems to address one of them. 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. No explanation is provided for why MDEQ only requires ERPs to address one of the five, and it is not clear how a water system can comply with the minimum program outline as described and yet only address one of the five items.

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

If efforts to avoid a drinking water emergency fail, 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.

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

Pursuant to the state’s Emergency Management Act, Michigan has an overall plan, called the Michigan Emergency Management Plan, to address various kinds of emergencies including those that involve drinking water. 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.

Michigan empowers local municipalities to enter into Mutual Aid Agreements or MAAs to increase access to resources in the event of an emergency. MAAs consist of reciprocal promises between municipalities to provide or share personnel, supplies and other aid in the event of an emergency. The MAAs are made available through the MiWarn system, which is the state’s WARN system. MiWarn provides water and wastewater agencies with a MAA template that is written broadly enough to encompass various kinds of drinking water emergencies.
Ohio

In the context of drinking water, Ohio defines an emergency as “an imminent and substantial danger to human health.” 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. In general, contingency plans must provide for protection of public health through public notification, provision of alternate water sources, and restoration of service. There is a detailed list of items that must go in a contingency plan. Among the fifteen 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. Water systems must revise their contingency plans as necessary but at least annually. The Ohio EPA has the right to deem the plan inadequate and require revisions. Additionally, at least once a year water systems must discuss or perform a drill of the contingency plan.

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. Alternate sources must be able to support a minimum of 1 gallon per day per person for the customers of the system. Water transportation must also be covered in these contingency plans.

If efforts to avoid a drinking water emergency fail, 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. 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.

Distinct from the state’s general emergency response plan, the Ohio EPA has a two-volume Drinking Water Supply Emergency Plan. Volume I is an internal document aimed at state and local agencies; Volume II is a document intended for water systems. 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.

Ohio empowers water systems to enter into Mutual Aid Agreements or 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. OHWARN provides water and wastewater agencies with a MAA template that is written broadly enough to encompass various kinds of drinking water emergencies.

Ohio has 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.” 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.” The loan amount cannot exceed $25,000 and must be repaid within one year of receipt. 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. The maximum amount of money available to any single public water system is $25,000. 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.
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.”

Community water systems must develop emergency response plans. Elsewhere in the regulations, there is a requirement that community water systems have an emergency operation plan. While the wording is confusing, 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. 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. 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.

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. The code asks utilities to take immediate action where necessary, though the utility commission retains the ability to exercise after the fact oversight.

Pursuant to the state’s Emergency Management law, Wisconsin has an overall plan, called the Wisconsin Emergency Response Plan, to address various kinds of emergencies including those that involve drinking water. 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.

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

Summary

All three states encourage use of the WARN scheme and mutual aid agreements to promote resource efficiency for emergency responses.

In terms of express legal authority, Michigan’s and Ohio’s legal schemes define an emergency and communicate what the drinking water agency can do to respond to them. Wisconsin’s legal scheme is less clear on what constitutes an emergency and how the drinking water agency must or should react.

In terms of planning, Ohio has the most specific provisions. It clearly lists water systems obligations when it comes to developing and revising an emergency response plan and remaining prepared to implement. Compared to Ohio, neither Michigan nor Wisconsin is as clear or comprehensive when defining a system’s obligations.

In terms of financial assistance, only Ohio had a well-defined financing mechanism expressly to aid a water system in responding to an emergency.
Management of Algal Blooms and Their Consequences

Overview

Cyanobacteria are an ancient group of micro-organisms that consist of unicellular and multicellular prokaryotes. According to the International Code of Botanical Nomenclature, there are approximately 150 genera with about 2,000 species of cyanobacteria. While cyanobacteria occur in a wide-range of aquatic ecosystems, including both marine and freshwater habitats, they generally prefer freshwater habitats. Cyanobacteria present an additional public health problem that other algal blooms do not. Specifically, 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. 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. 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.

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

While toxigenic cyanobacteria naturally exist in the environment, they generally do not present a health risk to wildlife or humans at normal concentrations. However, during cyanobacteria blooms, cyanobacteria can release large amounts of toxins. The occurrence of cyanobacteria blooms are not new phenomenon. The first incident of acute cyanotoxin poisoning of a domestic animal was recorded in scientific literature in the 19th century. There are also anecdotal accounts of Chinese troops being poisoned by drinking from a green colored river during the Han dynasty. However, given the persistent issues of agricultural runoff and the eutrophication of many bodies of water, as well as the cyanobacterial bloom that caused Toledo to issue a “do not drink” advisory on August 2, 2014 for the 400,000 people connected to its water system due to elevated levels of microcystins, the issue has gained recent attention.

Numerous environmental factors can contribute to a cyanobacteria bloom. It is well established that cyanobacteria increase with eutrophication. As such, it was originally assumed that cyanobacterial blooms required high phosphorus and nitrogen concentrations. However, studies have shown that lower nitrogen and phosphorus concentrations may favor cyanobacteria blooms. Nonetheless, high concentrations of phosphorus and nitrogen, which may result from fertilizer runoff from agricultural operations, may indirectly lead to cyanobacteria blooms.
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. 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. Cyanobacteria have slower growth rates than most other algal species. Therefore, cyanobacteria require long water retention times in order to form a bloom. Temperature is another important factor for cyanobacterial growth. Maximum growth rates are attained for most cyanobacteria in waters above 77 degrees Fahrenheit. These optimal temperatures are higher than those normally associated with algae. 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 re-occur in hospitable habitats.

However, a cyanobacteria bloom does not necessarily mean there will be high concentrations of cyanotoxins. As mentioned above, not all cyanobacteria produce toxins. Therefore, it’s common for a bloom to consist of both toxic and nontoxic cyanobacteria. To further complicate matters, it can be difficult to predict when a cyanobacteria bloom will become highly toxic because the factors involved in an increase in toxin production within cyanobacteria as well as the increased occurrence of toxin-producing cyanobacteria species are still unclear. While cyanobacteria blooms tend to re-occur in the hospitable habitats, not every cyanobacteria bloom produces cyanotoxins.

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. 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. 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. 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.

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. 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. 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.

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 primary federal law regulating drinking water contamination is the SDWA. 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.668

While there is currently no national drinking water regulation for cyanotoxins, the EPA has published a health advisory regarding microcystins, which is non-regulatory guidance for contaminants not subject to any national primary drinking water regulation.669 Additionally, the EPA has included cyanotoxins on all four Contaminant Candidate Lists.670 The EPA has also utilized its authority under the SDWA to include cyanotoxins in its monitoring program for unregulated contaminants.571 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.672

In 2015, the SDWA was amended to provide for an assessment and management of the risk of algal toxins in drinking water.673 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.674 This report was submitted to Congress in November of 2015.675 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.676

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.678

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.679 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 cyanotoxins680 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.681 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.682 Michigan’s administrative code also specifies that every treatment system must include a minimum of two units for coagulation, sedimentation, and filtration.683 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.684 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 that draw from source waters that are susceptible to cyanotoxin contamination. Specifically, the MDEQ has conducted a thorough survey of the approximately 60 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. This report assessed the systems that are susceptible to the risks posed by cyanobacteria blooms due to one or more factors.

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. 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, and so they have the ability to stop drawing water while a cyanobacteria bloom passes by its intake. 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. 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. 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. 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. It is unclear if 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. Caseville’s intake is buried beneath the lake bottom which insulates it from water quality issues.

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 that can monitor for cyanobacteria. Additionally, the Monroe plant voluntarily follows the protocols established by Ohio regarding monitoring for microcystins in both their raw and treated water. The Frenchtown system includes 2 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. The newer Frenchtown plant uses membrane microfiltration units for its filtration process. The designs of these water treatment plants is in line with Michigan regulations for surface water systems, which require a treatment system to include a minimum of two units for each portion of the conventional treatment process for rapid mix, flocculation, sedimentation, filtration, and disinfection.

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 that are at-risk regarding 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 microcysts. There are recent examples of cyanotoxins overwhelming conventional ozonation systems.698

**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. It has also not developed any guidance regarding the use of algaecides for severe cyanobacteria blooms.

**Ohio**

Among the three 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.699 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.700 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 microcysts and its monitoring requirements.701 All surface water systems must conduct regular cyanobacteria and microcystin monitoring in both raw and finished water.702 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.703 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 31.704 If a surface water system does not detect any microcysts 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 30.705 Systems may be eligible for reduced monitoring. Routine cyanobacteria or microcystin monitoring frequency requirements may be revised at the discretion of the Ohio EPA.706 Systems may also be required to conduct increased monitoring. If any microcysts are detected in finished water, then the system must increase the frequency of its monitoring in both raw water and finished water to daily.707 If microcystin concentrations exceed five 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.708 Ohio has established action levels of 0.3 micrograms per liter for vulnerable individuals and 1.6 micrograms per liter for all individuals.709 Additionally, Ohio requires all public water systems to develop and submit written treatment optimization protocols when microcysts are detected in a sample of either raw or finished water.710 In developing its protocols, the public water system must review and optimize its existing conventional treatment system to effectively remove cyanobacteria cells.711 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 microcysts 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.712

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. 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 must complete the analysis of the resamples within 24 hours of collection. 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 3 hours of receiving the analytical results. The Ohio EPA may require additional distribution system monitoring based on sampling results and other relevant circumstances.

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

While Ohio has developed rules to limit the risk posed by cyanotoxins in public water systems, it has not taken strong action to address cyanobacteria formation in source waters. It 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 percent 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 percent total load reduction in the amount of total and dissolved phosphorus entering the Lake Erie Western Basin by the year 2025. However, like many states, it has not developed water quality criteria for either phosphorus or nitrogen.

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 Department of Natural Resources (DNR) have monitored suspected bloom sites to determine whether a bloom is actually occurring, its analysis and identification of at-risk systems does not appear to be as thorough as that conducted by the Michigan Department of Environmental Quality.

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.

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. Conventional treatment plants must provide a minimum of two units each for rapid mix, flocculation, and sedimentation processes.

Limiting Cyanobacteria in Source Waters

In an effort to reduce the amount of nutrients entering surface waters, Wisconsin promulgated water quality standards for phosphorus for lakes and reservoirs as well as rivers and streams. However, like both Ohio and Michigan, Wisconsin has not developed water quality standards for nitrogen.

Additionally, 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. It is important to note that the federal EPA has not formally listed microcystins or any other cyanotoxin as a contaminant for formal regulation, including the development of an enforceable primary maximum contaminant level, under the SDWA. 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.

Of the three 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 that require water systems to monitor for cyanobacteria and microcystins. Lastly, it is the only state that has developed regulations regarding how a public water system must prepare for and respond to harmful algal blooms of cyanobacteria that may cause the release of dangerous cyanotoxins into the public water system.

No state has taken aggressive regulatory steps to address the proliferation of cyanobacteria in source waters. Ohio has developed a general Clean Water Act permit that regulates the application of algaecides to certain cyanobacteria blooms. However, no state has developed water quality criteria standards for nitrogen and only Wisconsin has developed a water quality criteria standard for phosphorus.
Private Water Supplies: Well Construction and Protection from Pollution

Overview

The SDWA scheme only seeks to protect 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 improperly 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 below is on protections that apply expressly to private drinking water wells.

This section explores the following questions:

- 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 EPA devotes a webpage to private water wells and provides basic tips there, but does not regulate private water well construction.

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. It applies to wells used for potable water, and to some extent to irrigation, heat exchange (or geothermal), and industrial wells. 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”).

To assist with the development of rules and standards, MDEQ has appointed an advisory board with representation from four different Michigan regions. The Water Well Advisory Committee has its own webpage and posts meeting minutes. The Committee advises MDEQ on development of the administrative rules that regulate water well construction.
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.\textsuperscript{733} The certificates are not transferable and expire annually with opportunities for renewal.\textsuperscript{734} The certification and substantive standards generally do not apply those who place water wells intended to their own permanent single family residence, or intended for farming purposes on their own farm.\textsuperscript{735}

MDEQ or the local health department has the authority to inspect well installations.\textsuperscript{736} MDEQ and the local health department can investigate potential violations of the construction code and order any necessary corrections.\textsuperscript{737} They can also suspend a certificate of registration.\textsuperscript{738} The attorney general or local prosecuting attorney has the authority to prosecute violations, which are considered misdemeanors.\textsuperscript{739} 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.\textsuperscript{740}

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.

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.\textsuperscript{741} 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.\textsuperscript{742}

**Ohio**

Ohio’s Department of Health and its local health districts (or boards of health) administer the private water system scheme.\textsuperscript{743} 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.\textsuperscript{744} These regulations do not address non-potable wells, agricultural wells, or geothermal systems.

There was a council advising the Department of Health and the local health agencies on private water systems called the Private Water Systems Advisory Council.\textsuperscript{745} 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.\textsuperscript{746} The legislature accomplished that in 2016.\textsuperscript{747} Currently, any rules adopted to implement the relevant statute must be approved by the board of health commissioners.\textsuperscript{748} The Department of Health retains oversight over local health agencies’ implementation of the scheme.\textsuperscript{749}

Most private water system contractors must register annually and comply with any surety bond requirements.\textsuperscript{750} Volunteers and those working on a system that serves only their own home need not register or be bonded.\textsuperscript{751} Those who own homes that they rent to others must register but need not be bonded.\textsuperscript{752}

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 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.\textsuperscript{753} Addressing the violation may include making repairs to the system or paying for a replacement system.\textsuperscript{754}

Ohio requires the local health agency to issue permits prior to construction, alteration, or sealing of a private water system.\textsuperscript{755} Applications for permits must describe location, design, construction, installation, and development of the system, and must include a site plan.\textsuperscript{756} Once construction or alteration occurs pursuant to a permit, there must also be approval of the water system.

Private water systems must submit logs that track completion of constructions, the receipt of which trigger
an inspection.\textsuperscript{757} The inspection includes collection of water samples to be tested for nitrates and bacteria.\textsuperscript{758} Sample results are shared, and if the system shows levels of bacteria or nitrates that are above the maximum contaminant levels that apply to public water systems regulated by the SDWA, the health agency can withhold approval of the system until there is effective remediation.\textsuperscript{759} Certain water systems, such as resident day camps and adult care facilities, must have their water sampled annually.\textsuperscript{760}

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.\textsuperscript{761} There are more specific horizontal isolation distances, such as but not limited to 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.\textsuperscript{762} Regarding agricultural facilities, depending on the kind and size, the isolation distances range from 5 feet to 300 feet.\textsuperscript{763}

### 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.\textsuperscript{764} This scheme applies private systems that provide water for human consumption.\textsuperscript{765} 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.\textsuperscript{766}

Counties apply for authorization to administer the scheme.\textsuperscript{767} Delegation to counties is broken down into five distinct levels.\textsuperscript{768} 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.\textsuperscript{769}

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.\textsuperscript{770} Counties must do a certain amount of reporting to the Wisconsin DNR to allow the agency to exercise oversight, and generally must cooperate with state agencies as it relates to private systems.\textsuperscript{771}

Counties must be prepared to advise private well system owners to not drink the water in the event of certain kinds of contamination.\textsuperscript{772} 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.\textsuperscript{773}

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.\textsuperscript{774} There is also a well inspection requirement that arises when one owner transfers property to another.\textsuperscript{775}

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.\textsuperscript{776} There are prescribed minimum distances from buildings and floodplains.\textsuperscript{777} In terms of distances from contamination sources, there are various kinds such as but not limited to 1200 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.\textsuperscript{778}
There is a process of licensure and business registration for both well drillers and pump installers.\textsuperscript{779} For well drillers, there are extensive licensure requirements that address minimum experience and supervision and history of compliance with relevant laws.\textsuperscript{780} The licensure requirements for pump installers are relatively fewer.\textsuperscript{781} No water well drilling license is necessary for, among others, those performing work on property they own or lease and those constructing nonpotable wells.\textsuperscript{782} No pump installation license is necessary for, among others, those who install pumps on nonpotable wells.\textsuperscript{783} There are also various exceptions to the requirement for drillers and installers to register.\textsuperscript{784}

**Summary**

All three states regulate water well construction through a combination of professional licensure for those constructing the wells and standards that govern the construction process. While there is variance in very specific details, the overall scheme is similar.

The main differences relate to bonding and scope of application for which Ohio differs significantly. Ohio has bonding requirements while Michigan and Wisconsin do not. Ohio’s scheme is more narrowly focused on potable water wells, whereas Michigan and Wisconsin apply more generally to monitoring, geothermal, industrial, and other wells.

**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.

**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.\textsuperscript{785} 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.\textsuperscript{786} There is a prohibition against “underground waste,” which is defined as “[u]nreasonable damage to underground fresh or mineral waters” and other substances.\textsuperscript{787} 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.\textsuperscript{788} Part of that authority involves locating wells in a manner that prevents pollution of water supplies and order suspension or alteration of activity if there is a threat to public health, safety, or property.\textsuperscript{789} On her own initiative or based on a verified complaint, the Supervisor can call a hearing to determine whether unlawful waste is taking place or is reasonably imminent, and if it is what to do about it.\textsuperscript{790}

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.\textsuperscript{791}

Michigan has slightly different standards for high volume hydraulic fracturing (HVHF) operations, defined as operations that intend to use more than 100,000 gallons of drilling fluids in the fracturing process.\textsuperscript{792} While these rules apply more standards with regard to private water wells, most of those standards relate to water volume not water quality.\textsuperscript{793} However, for HVHF operations, an applicant or permittee at its own expense must collect “baseline samples from all available water sources, up to a maximum of 10, within a \(\frac{1}{4}\)-mile radius of the well location.”\textsuperscript{794} Initial sampling must take place between 7 days and 6 months before initiation of drilling operations.\textsuperscript{795} Regarding additional wells, that initial
sampling satisfies the sampling requirement for up to 3 years so long as those additional wells are drilled on the same or contiguous drilling sites. Samples must be analyzed for benzene, toluene, ethylbenzene, xylene, total dissolved solids, chloride, and methane. The applicant or permittee must provide the results to the Supervisor and water well owners within 45 days of collecting the samples, though it must inform the Supervisor immediately if benzene, toluene, ethylbenzene, or xylene is detected at all.

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. Based on the Instruction, permittees must install at least one groundwater monitoring well close to and downgradient of the well location. 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). Samples must be collected prior to drilling operations, and at approximately 3 and 6 months after drilling completion (but not well completion).

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.

Ohio

Chapter 1509 of the statutory code and the implementing regulations comprise Ohio’s principal laws that regulate oil and gas drilling. For the most part, the Division of Oil & Gas Resources within the Ohio DNR implements the laws. The Chief of the Division administers the regulatory scheme.

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, 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. 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. 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. In each instance, the procedure for pre-drill sampling is outlined in a guidance document called Best Management Practices for Pre-Drilling Water Sampling. 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.

The only other time that Ohio’s oil and gas scheme expressly addresses private water wells in a significant manner is in the context of the storage or disposal of various related wastewaters, such as brines. Unlike in the context of drilling and production, as to disposal and storage, there is a requirement to restore or replace a contaminated private water supply.

Wisconsin

Wisconsin has a relatively simple set of laws that regulate oil and gas drilling. The Wisconsin DNR implements the laws. Wisconsin prohibits any person from committing “waste”, though “waste” is not defined in the relevant statute or set of regulations. 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.

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. The regulations are to address siting, construction, operation, maintenance, disposal of waste, proper abandonment of wells, reclamation of affected land, and operator competence. However, while Wisconsin has a regulatory scheme for oil and gas exploration, 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, 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.

**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.

**Michigan**

Michigan addresses protection of groundwater generally through its Right To Farm Act and the “generally accepted agricultural management practices” or GAAMPs. 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. 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. 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.

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. It also states that byproducts (such as food waste) should not be applied to land within 50 feet of a residential single family well.

**Ohio**

Ohio regulates runoff from agricultural operations through the Ohio DNR. Ohio’s regulation is focused on protection generally of “waters of the state,” which include wells. 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.

**Wisconsin**

Wisconsin regulates runoff pollution from various agricultural facilities. It does so mostly through requiring implementation of best management practices. 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.” A “[s]ite that is susceptible to groundwater contamination” can be an area within 250 feet of a private well. 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 is to a site 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. 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.

Wisconsin also regulates certain animal feeding operations or AFOs. 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. Also, barnyards, feedlots, and certain other systems must not be located within 250 feet of a private well.

**Summary**

As to oil and gas, the main differences in how each state expressly addresses private well protection relate to setbacks and monitoring. Wisconsin does not have a significant regulatory scheme for oil and gas in general, let alone one that protects private wells. Both Michigan and Ohio use setbacks from private wells as a principal protection mechanism. Both states also require pre-drill sampling of private wells within a certain distance of the oil and gas well, with Ohio having a broader set of analytic parameters and Michigan (through guidance) also requiring post-drill sampling.

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, while Wisconsin has a few regulations that expressly address private wells. For both Michigan and Wisconsin, all the standards are in the form of setbacks.

As to oil and gas, agriculture, and other industrial sources of risk, Wisconsin is different in another important way. Wisconsin devotes an entire chapter of regulations to its well compensation program. The purpose is to provide financial assistance to those who need to replace their contaminated private water supplies. The compensation program does not apply to wells are compensable due to contamination from mining. The program is no-fault and rather than hold anyone liable for causing the harm, it simply provides financial assistance to those who need it. Contamination is determined based on either a Wisconsin DNR advisory or 2 water samples taken at least 2 weeks apart but less than 2 years apart. Among the reasons for denial of a claim is that the residential water supply is contaminated only by bacteria or nitrates or both and not some other contaminant. To be eligible for compensation, the claimant must have an annual family income of no more than $65,000. There is a long list of eligible and ineligible costs. Generally, no compensation award can exceed the lower of 75 percent of eligible costs or $9000. Other than this compensation scheme, Wisconsin has no formal process to resolve contamination issues that involves the person or entity alleged to have caused the contamination.
Drinking water challenges in the Great Lakes region and across the country continue to put public health at risk with significant recent events in Flint, Michigan and Toledo, Ohio. While providing clean, safe drinking water to the public is the responsibility of federal, state, and local governments, how they work together and what they each are responsible for is important for advocates working in their communities. This report is meant to be a guide in understanding existing state policies in Michigan, Ohio, and Wisconsin; how they compare to federal SDWA regulations; and how they compare to neighboring states. While in many cases, these three states provide similar policies to the federal government, some have gone steps further to improve policies and regulations that protect drinking water even if it is in response to crises. For example, Ohio has significantly improved policies related to algal blooms in response to Toledo’s “do not drink” advisory. The collaboration and coordination among all types of stakeholders to ensure that drinking water is protected and safe for all residents in these states will be the most important factor in success. The endnotes provide references to the existing state policies, regulations, and reports noted throughout the report. These references are available for the reader in efforts to dive deeper into how these regulations could affect your community and local decision making in protecting drinking water safety and human health.
Endnotes

Safe Drinking Water Act Basics
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 40 CFR 141.2.
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.
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 59,15500 (Mar. 29, 2010).
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).
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 MACR 325.10602 with 40 CFR 141.63.
37 Compare MACR 325.10604d with 40 CFR 141.61.
38 Compare MACR 325.10604c with 40 CFR 141.62.
39 Compare MACR 325.10610 with 40 CFR 141.64.
40 Compare MACR 325.10610a with 40 CFR 141.65.
41 Compare MACR 325.10604 with 40 CFR 141.66.
42 Compare MACR 560.415 to 40 CFR 143.3.
43 Compare MACR 560.415 to 40 CFR 143.3; Note that there are additional contaminants for which the EPA has established secondary maximum contaminant levels.
44 MCL 560.105(g).
45 Ibid.
46 MACR 560.405.
47 MACR 560.406.
48 These deed restrictions and advisories may include minimum well construction features needed to provide an acceptable on-site water supply, possible need for water treatment, an advisory to complete an on-site water supply well before beginning site development, and other advisory information needed to protect public health or groundwater resources. MACR 560.426(1)(a)-(d).
The Michigan SDWA grants the MDEQ power and control over public water supplies. MCL 325.1003. A public water supply is defined as a waterworks system that provides water for drinking or household purposes to persons other than the supplier of the water, but it does not include a waterworks system that supplies water to only one house, apartment, or other domicile. MCL 325.1002(p), (j).

MCL 24.201 et seq. MA CR 325.10605.

Compare OAC 3745-81-12 with 40 CFR 141.61(a).

Compare OAC 3745-81-10 with 40 CFR 141.65(a).

Compare OAC 3745-81-14 with 40 CFR 141.63(a).

Compare OAC 3745-81-15 with 40 CFR 141.66.

Compare OAC 3745-81-11(C), (D) with 40 CFR 141.64.

Compare OAC 3745-90-02.

Compare OAC 3745-82-02 with 40 CFR 143.3.

Ohio’s secondary MCL for pH is 7.0-10.5 while the EPA’s secondary MCL is 6.5-8.5. Ibid.

OAC 3745-82-01.

OAC 3745-82-03.

OAC 3745-81-32(D)(1)(B).

OAC 3745-91-09.

ORC 106.3.

ORC 119.04(A)(1)(B).

ORC 106.03(A).

OAC 3745-80-02.

Compare WAC NR 809.20, 809.24 with 40 CFR 141.61.

Compare WAC NR 809.30 with 40 CFR 141.63.

Compare WAC NR 809.561 with 40 CFR 141.65.

Compare WAC NR 809.50 with 40 CFR 141.66.

Compare WAC NR 809.561 with 40 CFR 141.64.

Compare WAC NR 809.24 with 40 CFR 141.61.


Ibid.

Compare WAC NR 809.70 with 40 CFR 143.3.

WAC NR 809.70.

WAC NR 809.070(3).

Compare WAC NR 809.203, 243, 311, 52, and 563 with 40 CFR 141.25, 24, 25, 131.

WAC NR 809.203, 809.311; Standard Methods for the Examination of Water and Wastewater is now in its 23rd edition.

42 USC 300f(1)(D).

78 Fed Reg 10270.

Ibid.

Ibid.

Ibid.

40 CFR 141.854(b).

40 CFR 141.854(j).

40 CFR 141.855(b).

40 CFR 141.856(b).

Noncommunity groundwater systems that serve 1,000 or fewer people in some months and more than 1,000 persons in other months may qualify for reduced sampling frequency. 40 CFR 141.857(b), (d).

40 CFR 141.854(d), (e).

40 CFR 141.853(a)(1).

Ibid.

40 CFR 141.858(a)(1).

40 CFR 141.858(a)(3).

40 CFR 141.858(b).

40 CFR 141.859(a).

40 CFR 141.859(a)(1).


40 CFR 141.859(a)(2).

40 CFR 141.860(a).


Ibid.


Ibid.

Ibid.

Ibid.

Volatile organic contaminants and their corresponding MCL are listed in 40 CFR 141.61(a) while synthetic organic contaminants and their corresponding MCL are listed in 40 CFR 141.61(c).


40 CFR 141.24(f)(5).

40 CFR 141.24(f)(6).

40 CFR 141.24(f)(7).

Ibid.

40 CFR 141.24(f)(9).

40 CFR 141.24(f)(10).


Ibid.

40 CFR 141.24(h)(4)(i); 40 CFR 141.24(h).
122 40 CFR 141.24(h)(1).
123 40 CFR 141.24(h)(2).
125 40 CFR 141.24(h)(4)(iii).
126 40 CFR 141.24(h)(5).
127 40 CFR 141.24(h)(6).
128 40 CFR 141.24(h)(5).
129 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).
130 40 CFR 141.24(h)(8).
132 Ibid.
133 Ibid.
134 40 CFR 141.621(a)(2).
135 Ibid.
136 Ibid.
137 40 CFR 141.621(a)(1).
138 40 CFR 141.621(a)(2).
139 Ibid.
140 For the purposes of monitoring for disinfectant residuals and byproducts, small systems are surface water systems that serve fewer than 500 people.
141 40 CFR 141.132(b)(1)(i).
143 Ibid.
145 Ibid.
146 Ibid.
147 Ibid.
148 Ibid.
149 40 CFR 141.132(c)(2)(i).
150 40 CFR 141.132(c)(2)(ii).
151 40 CFR 141.132(c)(2)(iii).
155 40 CFR 141.132(e).
157 Ibid.
158 40 CFR 141.132(d).
159 Ibid.
160 40 CFR 141.132(c)(1)(i).
161 40 CFR 141.132(c)(1)(ii).
162 40 CFR 141.23(a)(1).
163 40 CFR 141.23(a)(2).
164 40 CFR 141.23(b)-(e).
165 40 CFR 141.23(b)(2).
166 40 CFR 141.23(b)(3).
167 These contaminants are antimony, arsenic, beryllium, cadmium, chromium, cyanide, fluoride, mercury, nickel, selenium, and thallium. 40 CFR 141.23(c).
168 40 CFR 141.23(b)(3).
170 40 CFR 141.26(a)(3).
171 40 CFR 141.26(b)(1), (2).
172 40 CFR 141.26(b)(1).
173 Ibid.
174 40 CFR 141.26(b)(2).
175 40 CFR 141.26(b)(2)(iv).
176 40 CFR 141.26(b)(3).
177 MACR 325.10605.
179 Compare 40 CFR 141.856 with MACR 325.10704f.
180 Compare 40 CFR 141.857 with MACR 325.10704g.
181 Compare 40 CFR 141.855(d) with MACR 325.10704e(2).
182 Compare 40 CFR 141.141(f)(4) with MACR 325.10716(6).
183 Compare 40 CFR 141.124(f)(6) with MACR 325.10716(8).
184 Compare 40 CFR 141.141(h) with MACR 325.10717(1).
185 Compare 40 CFR 141.621(a)(2) with MACR 325.10719h.
186 Compare 40 CFR 141.623(a) with MACR 325.10719j.
187 Compare 40 CFR 141.132 with MACR 325.10719e.
188 Compare 40 CFR 141.23 with MACR 325.10710.
189 See 40 CFR 141.23(a)(4); MACR 325.10710(4)(d).
190 Compare 40 CFR 141.26 with MACR 325.10725, 10726, 10728, 10730.
191 Compare 40 CFR 141.854 with OAC 3745-81-51(B)(4).
192 Compare 40 CFR 141.856 with OAC 3745-81-51(D)(1).
193 Compare 40 CFR 141.857 with OAC 3745-81-51(E).
194 OAC 3745-81-24(A).
195 OAC 3745-81-24(B).
196 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.
197 OAC 3745-81-24(A).
198 OAC 3745-81-24(A)(4)-(5).
Lead as a Drinking Water Contaminant

Although the law regulates both lead and copper, this report will focus on lead.

42 USC 300g-6. The statute provides a definition of “lead free”: not containing more than 0.2 percent lead when used with respect to solder and flux and "not more than a weighted average of 0.25 percent 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:\/\slash 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).

42 USC 300j-24. For the guidance materials, there is an EPA website devoted to lead, schools, and drinking water. See EPA, Lead in Drinking Water in Schools and Childcare Facilities (website), available at https:\/\slash www.epa.gov/node/116045.
There are similar but less stringent pool composition requirements for nontransient noncommunity water systems. 40 CFR 141.86(a)(7).

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.


Consumer Confidence Reporting


For general information on CCRs, the EPA maintains a helpful website: https://www.epa.gov/ccr.

Loans and Grants


42 USC 300j-12(a)(1)(B); 40 CFR § 35.3545(a).

Ibid.

42 USC 300j-12(a)(1)(B); 40 CFR § 35.3550.

42 USC 300j-12(b)(1).

40 CFR § 35.3555(a).

Ibid.

42 USC 300j-12(b)(2).

42 U.S.C § 300j-12(b)(3)(B).

40 CFR § 35.3545(b).

42 USC 300j-12(a)(2).

42 USC 300j-12(d).

Ibid.

MCL 141.1066b.

MCL 324.5417.


Ibid.

A community water system is defined as a public water supply that provides year-round service to not less than 15 living units or which regularly provides year-round service to not less than 25 residents. MCL 324.5401(f).

A noncommunity water system is defined as a public water supply that is not a community water supply, but that has not less than 15 service connections or that serves not less than 25 individuals on an average daily basis for not less than 60 days per year. MCL 324.5406.
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).

A noncommunity water system is defined as a public water system that is not a community system. OAC 3745-81-01(P)(11)(b).


Wisc. Stat. § 281.61(2).

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.

MCL 325.1013.

MCL 315.1013(6).

MCL 325.1004.

Ibid.

MCL 325.1004(3). This is in line with Michigan’s water withdrawal legislation found at MCL 324.32701-32730. MCL 325.1004(4).

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.

MACR 325.10203-10208.

ORC Ch. 119.

ORC 6109.07; OAC Ch. 3745-91.

ORC 6109.21; OAC Ch. 3745-84.

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.

ORC 6109.14.

ORC Ch. 119.

ORC 119.06.

ORC 3745.02-06; OAC Ch. 3746.

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.

WAC NR Ch. 227.

WAC NR 809.73.

WAC NR 809.90.

WAC NR 809.90(7).

WAC NR 108.04 and 811.08.

WAC NR 811.08(1).

Operation and maintenance requirements are at Ch. WAC NR 810.

WAC NR 811.12.

Public Participation in Standards, Permits, and Enforcement

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.

Act 306 of 1969; MCL 24.201-328. The Office of Regulatory Reinvention hosts the Michigan Register, published biweekly, on its site: http://www.michigan.gov/opt/0,5880,7-338-35738_40280-428840--,00.html. Among other things, administrative rules are published there (but not permits or enforcement actions).
Operator Certification

42 USC 300g-8.

Ibid.


42 USC 300g-8.

Ibid.


MCL 325.5009; MACR 325.11901-11909. (Part 19).


Ibid.

Ibid.

MACR 325.11912. See also MDEQ, Drinking Water Operator Certification (website), available at http://www.michigan.gov/deq/0,4561,7-135-3308_3333_4171-00.html.

MACR 325.11911 and 325.11912.


MACR 325.11911 and 325.11912.

MACR 325.11905.

Ibid.

Ibid.

Ibid.

ORC 6109.04(C)(1)(b); OAC 3745-7-01 to 3745-7-20.

OAC 3745-7-10 to 3745-7-11.


Management of Drinking Water Emergencies

42 USC 300i to 300i-4 (Part D).

Ibid.

42 USC 300i-1.

42 USC 300i-2.

42 USC 300i-4(a).

42 USC 300i-4(b).


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.

42 USC 300g-2(a)(5); 40 CFR § 142.10(e).

MA CR 325.10104(m).

MACR 325.1002(i).

MACR 325.12303(1).

MACR 325.12301-12304.

MACR 325.12302.

MACR 325.12303(1).

MACR 325.12301.

MACR 325.12301(1)(i)-(v).

MCL 325.1015.

MACR 325.12304.

Ibid.

MCL 30.407a.


MACR 325.12303(1)(iii); MCL 30.410.

MACR 30.410.

www.miwarn.org.


ORC 6109.05(A).

OAC 3745-85-01.

OAC 3745-85-01(B).

OAC 3745-85-01(D).

OAC 3745-85-01(F).

OAC 3745-85-01(F)(4).

OAC 3745-85-01(E).

OAC 3745-85-01(D)(7).

OAC 3745-85-01(7)(b).

OAC 3745-85-01(D)(7)(a).

ORC 6109.05(B).

OAC 3745-85-01(G).


The version available online is from 2003 but it is in the process of being updated.

http://epa.ohio.gov/ddagw/security.aspx#115202878-resources.

Pages 14-15.

http://www.ohwarn.org/.


OAC 3745-86-01.

OAC 3745-86-01(A)(4).

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WAC NR 810.26.

WAC NR 810.23(2).

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Ibid.

Wis Stat 280.11.

PSC 185.89.

PSC 185.11(6).

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Wis Stat 323.13(1)(d).

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Management of Algal Blooms and Their Consequences

Bettina C. Hitzfeld, et al., Cyanobacterial Toxins: Removal during Drinking Water Treatment, and Human Risk Assessment, Environmental Health Perspectives, 1 (hereinafter, “Cyanobacterial Toxins: Removal during Drinking Water Treatment”).

Ibid.


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 Microcystins, at Table 1-1 (June 2015). 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.


Ibid.


Toxic Cyanobacteria in Water, at 95.


Ibid.

Ibid.

Ibid.

Ibid.

42 USC 300g-1(b)(1)(A).


81 FR 81099 (Nov. 17, 2016). In particular, the Contaminant Candidate Lists have highlighted three particular cyanotoxins: microcystin-LR, cylindrospermopsin, and anatoxin-a.

42 USC 300j-4(a)(2).

40 CFR 141.40.


42 USC 300j-19.


Ibid.


MDEQ’s report focused on two systems that share two intakes in the Western basin of Lake Erie: the Frenchtown Township and City of Monroe systems. Ibid.

Gary Kohlhepp, MDEQ, Harmful Algal Bloom Monitoring and Assessment in Michigan Waters (May 2015).

MCL 325.1104.

MACR 325.11008.

MACR 325.11302.

Ibid.

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Ibid.

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Ibid.

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Ibid.

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Tom Henry, Carroll Township’s scare with toxin a ‘wake-up call’, The Blade (Sept. 15, 2013).

ORC 3745.50(A).

Ibid.

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OAC 3745-90-03.

OAC 3745-90-03(A)(1).

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OAC 3745-90-03(A)(3).

OAC 3745-90-03(A)(2)(d).

OAC 3745-90-03(A)(2)(c).
PROTECTING DRINKING WATER IN THE GREAT LAKES

Private Water Supplies: Well Construction and Protection from Pollution

https://www.epa.gov/privatewells.

MCL 333.12701-12771; MACR 325.1601-1781.
MCL 333.12701 & 12703; MACR 325.1606(3).
MCL 333.12707.
MCL 333.12711.
MCL 333.12714.
MCL 333.12704.
MCL 333.12705.
MCL 333.12703(2).
MCL 333.12708.
MCL 333.12709.
Ibid.
MCL 333.12715.
MACR 325.1622(1).
785 MCL 324.61501-61527; MACR 324.101-1406.
786 MCL 324.615.
787 MCL 324.61504 (referring to definitions in MCL 324.61501).
788 MCL 324.61506.
789 Ibid.
790 MCL 324.61507.
791 MACR 324.101-1406.
792 MACR 324.1401-1403.
793 MACR 324.1404(1).
794 Ibid.
795 Ibid.
796 Ibid.
797 Ibid.
798 MACR 324.1404(2).
799 MACR 324.1404(1).
800 MDEQ, Supervisor of Wells Instruction 1-2015: Oil and Gas 
Development in High Population Density Areas 
801 Instruction at 3.
802 Ibid.
803 Ibid.
804 ORC 1509.01-99; OAC 1501:9-1 to 1509:9-12.
805 ORC 1509.02.
806 Ibid.
807 ORC 1509.23.
808 ORC 1509.21(L).
809 ORC 1509.05(A)(8)(b); OAC 1501:9-1-02(F).
810 ORC 1509.05(A)(8)(c).
811 ORC 1509.05(A)(8)(b)&(c).
812 http://oilandgas.ohiodnr.gov/portals/oilgas/pdf/BMP_PRE_ 
DRILLING_WATER_SAMPLING.pdf.
813 Curiously, in a document jointly authored by Ohio EPA, Ohio 
DNR, and the Ohio Department of Health that recommends 
homeowners best practices for private water supply sampling 
in the context of oil and gas drilling activity, the list of possible 
parameters that can be sampled is longer and includes items 
such as strontium, bromide, methane, benzene, toluene, xylene, 
and ethylbenzene. http://epa.ohio.gov/portals/0/general%20 
pdfs/waterwellsampling.pdf.
814 ORC 1509.22(F).
815 Wis Stat 295.31-37; WAC NR 134.01-13.
816 Wis Stat 295.3(1).
817 See Wis Stat 295.35(3) (describing which activities are 
prohibited as wasteful because they leave behind or destroy 
otherwise valuable minerals).
818 Wis Stat 293.35(2).
819 Ibid.
820 WAC NR 134.01-13.
821 See e.g. WAC NR 134.09(2) (authorizing Wisconsin DNR to 
withhold approval if the exploration plan will not adequately 
protect waters of the state).
822 MCL 286.471-474. Michigan also has guidance on CAFOs that 
requires an isolation distance of 150 feet between private water 
wells and waste storage facilities. MDEQ, Complying As A 
CAFO – Part II: Guide to CAFO Permit Process, Requirements, 
and Regulations (Mar. 2007), at § 4.
823 MCL 286.473(1).
824 Michigan Department of Agriculture and Rural Development, 
Generally Accepted Agricultural and Management Practices 
for Site Selection and Odor Control for New and Expanding 
825 Ibid at 28.
826 Michigan Department of Agriculture and Rural Development, 
Generally Accepted Agricultural and Management Practices 
828 ORC Ch. 939; OAC 1501:15-5-01 to 1501:15-5-20.
829 OAC 1501:15-5-01(46).
830 WAC NR Ch. 151.
831 Ibid.
832 Wis Stat 281.16.
833 WAC NR 151.015(18).
834 WAC NR 151.06.
835 Ibid.
836 WAC NR Ch. 243.
838 WAC NR Ch. 123.
839 WAC NR 123.01.
840 WAC NR 123.02.
841 WAC NR 123.04.
842 Ibid.
843 WAC NR 123.06(h).
844 WAC NR 123.20.
845 WAC NR 123.21.
846 WAC NR 123.24.