

North Carolina Capacity Development Report For Public Water Systems

Calendar Year 2021

Published:
September 15, 2022

N.C. Department of Environmental Quality
N.C. Division of Water Resources
Public Water Supply Section



STATE OF NORTH CAROLINA

Roy Cooper, Governor

NORTH CAROLINA DEPARTMENT OF ENVIRONMENTAL QUALITY

Elizabeth S. Biser, Secretary

DIVISION OF WATER RESOURCES

Richard E. Rogers, Jr., Director

PUBLIC WATER SUPPLY SECTION

Rebecca Sadosky, Ph.D., Chief

Location:

512 N. Salisbury Street
Raleigh, NC
(919) 707-9100

Mailing Address:

N.C. Division of Water Resources
Public Water Supply Section
1634 Mail Service Center
Raleigh, NC 27699-1634

Submit questions or comments to Andrew Jarman, Capacity Development Program Coordinator, at 919-707-9061, or Andrew.Jarman@ncdenr.gov. This report is available to the public on the N.C. Division of Water Resources' website at: <http://deq.nc.gov/about/divisions/water-resources/drinking-water/capacity-development/program-reports>.

Contents

1.0	Introduction.....	1
1.1	Federal Context.....	1
1.2	Public Water System Responsibilities	2
1.3	General State Responsibilities	2
1.4	Summary	3
2.0	Capacity Development and Associated Metrics.....	4
2.1	Impact of Capacity Development Efforts.....	5
2.2	Incorporating Asset Management	7
3.0	Activities to Support the Mission	7
3.1	Water System Site Visits	7
3.1.1	Sanitary Surveys	8
3.1.2	Non-Sanitary Survey Site Visits	9
3.2	Engineering Plan Review.....	10
3.3	Compliance Oversight and Enforcement	10
3.3.1	Compliance with Established Monitoring Requirements.....	11
3.3.2	Compliance with Established Reporting Requirements.....	13
3.3.3	Compliance with Established Treatment Techniques.....	14
3.3.4	Compliance with Established MCLs.....	15
3.3.5	Compliance with Established Public Notice Requirements.....	16
3.3.6	Other Current and Upcoming Compliance Assistance Strategies	17
3.3.7	New Systems Letter.....	18
3.4	Drinking Water Protection Activities	18
3.4.1	Drinking Water Protection	19
3.4.2	Current and Upcoming Drinking Water Protection Initiatives.....	19
3.4.3	Wellhead Protection	20
3.4.4	Current and Upcoming Wellhead Protection Initiatives	21
3.5	Operator Certification and Training.....	21
3.6	Funding	21
3.6.1	Drinking Water State Revolving Fund	22
3.6.2	Failing System Loans	22
3.7	Partnerships.....	22
3.7.1	Division of Water Infrastructure	22
3.7.2	Area-Wide Optimization Program.....	23
3.7.3	N.C. Rural Water Association	23
4.0	Assessing Outcomes and Results.....	24
4.1	Overall Compliance Rates or Water Systems	24
4.2	Population Served by Compliant Community Water Systems.....	27
4.3	New System Performance	28
4.4	Violations Versus Required Contaminant Sampling Events.....	31
4.5	Compliance Oversight Analysis.....	32
5.0	Conclusion	35
Appendix A		A-1

Tables and Figures

Table 1: Capacity Development Measures	6
Figure 1: Site Visits Performed by Public Water Supply Section Staff	8
Figure 2: Distribution of 2021 Monitoring Violations by Contaminant Group	11
Figure 3: Distribution of 2021 Analytes Required by Contaminant Group	12
Figure 4: Distribution of 2021 Reporting Violations	13
Figure 5: Distribution of 2021 Reporting Required	14
Figure 6: Distribution of 2021 Treatment Technique Violations	15
Figure 7: Distribution of 2021 MCL Violations	16
Figure 8: Percentage of Public Water Systems Receiving at Least One Monitoring or MCL Violation Since 1999	24
Table 2: The Number of Public Water Systems with Maximum Contaminant Level (MCL) and Monitoring (MR) Violations	26
Table 3: Population Served by Compliant Community Public Water Systems	27
Table 4: Comparison of Contaminant and Monitoring Violations for Existing Active Public Water Systems and Systems Permitted Between 2019 to 2021	29
Table 5: The Number of Public Water Systems Beginning Operation Between 2014 and 2021 with Contaminant and Monitoring Violations	30
Figure 9: Monitoring and MCL Violations Versus Required Analyte Results per Calendar Year for All Public Water Systems	31
Figure 10: NC Population with Access to Safe Water at Home - MCL	33
Figure 11: NC Population with Access to Safe Water at Home - Monitoring	34
Table A.1: Schedule of New Rule Implementation by EPA	A-2

1.0 Introduction

North Carolina operates a drinking water regulatory and assistance program that supports the public interest via fulfillment of the following mission:

To promote public health by ensuring that safe, potable water is available in adequate quantities to the residents and visitors of North Carolina served by public water systems by assuring that such systems are properly located, constructed, operated, and maintained.

The purpose of this report is to document activities and progress conducive to carrying out this mission. The efforts described herein are primarily implemented by the Division of Water Resources, Public Water Supply Section, working in cooperation with the Division of Water Infrastructure as the entity within the Department of Environmental Quality that administers the Drinking Water State Revolving Fund (DWSRF) capitalization grants.

1.1 Federal Context

The legal requirements setting the context for safe drinking water delivered by public water supply systems are initiated by the U.S. Congress and specifics are determined by the U.S. Environmental Protection Agency (EPA), as defined within the *Safe Drinking Water Act (SDWA)* and the associated *National Primary Drinking Water Regulations (NPDWR)*. These requirements apply to public water systems and are designed to achieve sustainable drinking water while considering public health impacts as well as technical and economic feasibility.

It is important to differentiate public water systems from private systems that are not subject to the regulations. As per federal definition, public water systems include those which provide drinking water for human consumption and maintain a minimum of 15 connections or regularly serve 25 or more individuals for at least 60 days of the year. Public water systems are categorized as either community water systems, which serve essentially the same consumers on a year-round basis; and non-community water systems, which include all other water systems not categorized as community. In North Carolina there were 1,995 community and 3,159 non-community water systems in operation during 2021.

Community water systems typically serve primary places of residence and are owned by entities such as counties, towns, homeowner associations, or mobile home park owners. Non-community water systems can be further subdivided as either transient or non-transient. Non-transient water systems include industries or schools, where a consistent population consumes the water. Transient water systems provide water on a daily basis, but rarely serve the same population of people, such as a highway rest-stop. Transients may also serve the same people, but for less than 60 days per year, such as a rural church. Consumers of transient water systems represent the most limited exposure to contaminants and risk because long-term exposure is typically limited.

The EPA created different requirements for the various types of water systems described above, and the differing requirements reflect risks to which each population is exposed. The most fundamental requirements to assess the safety of drinking water are related to public water system adherence to allowable levels of contaminants in the drinking water, referred to as Maximum Contaminant Levels (MCLs), and the monitoring and reporting procedures necessary to detect their presence. Therefore, the resulting regulatory requirements of public water systems are often detailed and complicated, particularly for smaller systems without the technical expertise to interpret complex concepts and rules.

Many tens of thousands of chemical compounds are accepted for beneficial use by modern society, and some can and do make their way into sources of drinking water supply. At present, the EPA has established MCLs for a small subset of these compounds, with new regulations adopted following a comprehensive and established process. The EPA gathers data and conducts research to determine which compounds pose the greatest risk to public health, and the levels at which no negative health impact is expected to occur, which are known as the Maximum Contaminant Level Goals (MCLG). Established MCLs cannot be set at the MCLG if there is no feasible way for public water systems to comply. Therefore, in consideration of complicating factors such as the availability of analytical lab methods to detect the compounds of interest, the occurrence of such compounds in source waters, the availability of treatment technologies to remove the compound, and the affordability of treatment, the EPA sets the regulatory MCLs as close to the MCLG as reasonably possible.

1.2 Public Water System Responsibilities

It is ultimately the responsibility of the supplier of water to provide compliant drinking water from the public water system for which it is responsible. The responsibility to achieve and maintain compliance includes proper construction and operation, record-keeping, and addressing non-compliance in a timely fashion. Water systems collect samples according to EPA-mandated monitoring schedules and then compare analytical sample results to contaminant-specific MCLs. Systems must determine the locations and frequency of required samples based on the population served, water system type, source water type, and prior analytical results.

Water system compliance with all drinking water rules and regulations can be challenging. Regulations are typically contaminant specific, and the types of treatment or response necessary to reduce one contaminant below a regulatory threshold may lead to an exceedance of another. Therefore, fundamental tension exists between some rules, often referred to as “simultaneous compliance issues.” For example, deaths from pathogenic organisms were drastically reduced after the introduction of disinfection. However, disinfection itself can lead to the creation of byproducts that may cause cancer over many years of exposure. Similarly, as water systems adjust treatment processes to control disinfection byproducts, the necessary chemistry changes can increase the corrosivity of the water, which may then result in lead leaching from household plumbing fixtures. These examples suggest that there are often narrow ranges within which a water system can operate and remain in compliance. Changes in the raw water quality, which may occur after events such as rainfall or drought, require vigilant oversight by capable water system personnel to respond quickly and appropriately. The examples provided above illustrate that although some consumers equate product safety with zero risk, the fundamental tension between treatment approaches often requires a balancing of competing priorities to maximize public health protection. Simply stated, there is always some level of risk in treated drinking water, even when the treatment process addresses simultaneous, inter-related factors, maximizes public health, and results in a product that is compliant with state and federal regulations.

1.3 General State Responsibilities

The primary objective of the North Carolina Public Water Supply Section is to ensure that water delivered by public water systems does not pose a danger to public health. This is accomplished through compliance oversight of the *North Carolina Drinking Water Act* and the federal *Safe Drinking Water Act*, which are represented in 15A NCAC 18C, the *Rules Governing Public Water Systems* (e.g., the *Rules*), and are available online at: <https://deq.nc.gov/about/divisions/water-resources/drinking-water/plan-review/rules-governing-public-water-systems>. North Carolina has demonstrated sufficient legal authority and programs for implementing the federal requirements, and as such the Public Water Supply Section has been granted primary enforcement responsibility, or primacy, to regulate public water systems in the state. To support this mandate, the Public Water Supply Section serves the public interest and assists public water systems through a multi-faceted approach that includes:

- Review and approval of engineering infrastructure plans and specifications;
- Enforcement of water sample monitoring requirements and evaluation of analytical results;
- Comprehensive system site visits to inspect facilities and provide technical assistance;
- Development of programs to encourage and support local drinking water protection activities;
- Examination and professional certification to license water system operators;
- Partnering with other entities to provide technical assistance, training, and outreach; and
- Other initiatives designed to facilitate compliance with the *Rules*.

Compliance oversight is a major component of the Public Water Supply Section's approach. The Public Water Supply Section issues a notice of violation for each missed or incorrectly collected sample. These are considered "monitoring violations." In addition, systems with contaminants detected above the established MCL levels receive a notice of violation for each exceedance. These are referred to as MCL violations. Monitoring and MCL compliance has a direct and dramatic impact on the safety of drinking water served by public water systems, and they are used as primary performance indicators. Section 4.0 of this report will demonstrate that effort expended by the Public Water Supply Section has reduced monitoring and MCL violations.

Note that oversight of private drinking water wells and those below the threshold for regulation under the SDWA are not under the jurisdiction of the Public Water Supply Section. Construction specifications for private wells are governed by 15A NCAC 2C. Monitoring for private wells is only required upon initial construction, and testing is regulated by the Department of Health and Human Services, within the Division of Public Health. Consistent with public water systems, the cost of any sampling and analysis is the responsibility of the well owner. The well owner is also responsible for any alterations required to make the water safe to consume.

Another major component in the Public Water Supply Section's ability to achieve its mission includes direct interaction with water system professionals. While suppliers of water employ certified operators, consultants, vendors, and contractors to assist them in navigating compliance and options impacting their public water system, the state supplements these resources by providing training and technical assistance to mitigate a wide variety of issues that may impact compliance. This report contains metrics associated with site visits as well as other mechanisms to maintain communication and provide assistance to the regulated community.

1.4 Summary

There are a variety of factors and entities that influence the quality and sustainability of the state's public drinking water resources. Although the supporting entities have different roles and responsibilities, all work cooperatively to impact public health by improving the technical, managerial, and financial capacity of water systems. In summary, the following basic concepts are necessary to gain a comprehensive understanding of the improvements to and the regulation of public drinking water in North Carolina:

- At the federal level, EPA utilizes a comprehensive, established process to determine the compounds that are regulated and their threshold levels for compliance. States are expected to adopt and enforce these regulatory standards.
- At the state level, the Public Water Supply Section is the primacy agency responsible for implementing federal regulations related to public drinking water. The state uses a multi-faceted approach to ensure water systems have the ability and incentive to remain in compliance. The various activities detailed in this report have resulted in a steady increase in compliance.
- Regulations are complex and vary with respect to water system type. The differing requirements reflect public health risks to which each population is exposed.
- Drinking water is not a zero-risk commodity. However, water system processes are often balanced among multiple, inter-related factors to maximize public health protection while maintaining compliance with state and federal regulations.
- Water systems in North Carolina do an excellent job providing potable water and maintaining water system infrastructure. Public drinking water in the state continues to serve an ever-expanding segment of the population with water that is compliant with regulatory requirements.

2.0 Capacity Development and Associated Metrics

The 1996 *Safe Drinking Water Act Amendments* obligated states to ensure that all new community water systems and non-transient non-community water systems, beginning operation after Oct. 1, 1999, demonstrate technical, managerial, and financial capacity. In response, the Public Water Supply Section developed a Capacity Development Program to meet the state's specific needs. The goal of the program is to require technical, managerial, and financial planning of new and existing community and non-transient non-community water systems that will improve systems' service and sustainability. Therefore, "capacity," as used in this report, refers to the technical, managerial, and financial capabilities of a water system to comply with the provisions of the *Safe Drinking Water Act*.

The EPA required the Public Water Supply Section to develop milestones as part of its Capacity Development Program. The milestones were published in the *Public Water System Capacity Development Guidance Document* (March 2000), and they are available online at <https://deq.nc.gov/public-water-system-capacity-development-guidance-document-march-2000>. The milestones primarily include tracking the number of projects that have completed the engineering infrastructure approval and certification requirements. The milestones and metrics associated with capacity are provided in this report and are indicative of the state's progress towards compliance and improvements in the drinking water industry.

The milestones, while reflective of the increase in the capacity of water systems in North Carolina to provide safe and sustainable drinking water, do not in and of themselves provide a comprehensive overview of progress gained across the state, nor do they reflect the combined efforts of Public Water Supply Section employees in the central and regional offices to implement improvements to water systems across the state. A more comprehensive view of the Section's dedication to improving public water systems' capabilities is realized when the milestones are considered in conjunction with the following activities:

- Assistance provided to water systems by Public Water Supply Section staff during site visits (Section 3.1);
- Engineering plan review of proposed water system infrastructure and infrastructure improvements (Section 3.2);
- Improvements in compliance trends due to compliance assistance and enforcement (Section 3.3);
- Statewide drinking water protection programs (Section 3.4);
- Examination, certification, and continued training of competent water system operators (Section 3.5);
- Support provided through various means of infrastructure funding (Section 3.6); and
- Partnerships with organizations that provide a range of assistance to public water systems (Section 3.7).

The August 2000 report, North Carolina's *Capacity Development Program Strategy*, identified indicators to evaluate the progress of water systems to comply with regulatory requirements and to maintain safe, sustainable operations. Completion of these indicators are required by rule for new, altered, or expanded community and non-transient non-community public water systems in North Carolina. Below is an excerpt from this report.

The primary component of North Carolina's Capacity Development Program is an evaluation of technical, managerial and financial capacity during the planning stages of new construction, expansion or system alteration. Therefore, a key indicator of water system capacity is compliance with the requirements specified in Section .0300 of the *Rules Governing Public Water Systems*. Specifically, the Public Water Supply Section plans to use existing databases to track the following information for public water systems:

- Number of public water systems with approved plans and specifications,
- Number of public water systems with a complete Water System Management Plan (WSMP),
- Number of public water system projects with a submitted Engineer's Certification to document that the system is constructed in accordance with approved plans and specifications,
- Number of public water system projects with a submitted Applicant's Certification to document that the system has an Operation and Maintenance Plan and an Emergency Management Plan,
- Number of public water systems that have an appropriate certified operator in responsible charge.

The above information, in addition to compliance information, will be used to measure improvements in capacity. It is important to note while reviewing this information that transient water systems are not subject to plan review and therefore, are not subject to the capacity development milestones to which community and non-transient non-community water systems are subject.

In addition, the Public Water Supply Section will track the number of water supply intakes with state-approved source water protection plans and/or source water assessments as a measure of improved capacity.

2.1 Impact of Capacity Development Efforts

Table 1 (page 6) is a summary of the number of systems that have completed the specific Capacity Development Program activities, identified in Section 2.0 above, from October 1, 1999, when all program requirements first became effective, through the end of each of the last ten years. This table also provides the percentage of systems that have completed each of these activities, as compared to the total number of community and non-transient non-community systems.

By program definition, water systems that complete the measures depicted in Table 1 increase their capacity. The systems listed in Table 1, with plans approved, have water infrastructure designed in accordance with applicable rules that help to ensure the water is treated and distributed safely. Water systems that have developed valid water system management plans have acknowledged their water system policies and have certified that their anticipated budget allows the water system to remain viable over time. Systems with applicant certifications for projects have developed operation and maintenance protocols, emergency management plans, and have certified that they have an appropriate certified operator. Water systems with final approval have completed all the capacity development measures for at least one project. The Section continues to have an increasing number of systems that satisfactorily complete all the capacity development measures. Over the past ten-year period, the percentage of systems with final approval has increased from 55 percent to 76 percent. As a result of completing these measures, water systems are better positioned to provide safe and sustainable drinking water to citizens across the state.

The Capacity Development Program staff coordinates with other Section staff to identify and develop reports to support the mission. A prime example of this coordination is the development of a sanitary survey report for staff making site visits. The report repopulates water system information from the state drinking water database and serves as a comprehensive summary of information associated with each specific water system. A variety of other reports make critical data readily available to staff and the consuming public. Public Water Supply Section staff continue to explore how data availability and reporting can improve the efficiency and effectiveness of the agency.

In summary, completion of capacity development milestones indicate that a public water system has completed a self-assessment and developed plans on a scale that benefits its financial, managerial, and technical capacity. The resulting plans are valuable tools for the proper maintenance of the water system and provide incentive for the system to proactively prepare for emergency and disaster events. With this program, the Public Water Supply Section continues to build a strong foundation regarding security concerns and federal requirements for vulnerability assessments and disaster preparedness for public water systems.

Table 1: Capacity Development Measures

Oct. 1, 1999 through:	Total Number of Community and Non-Transient Non-Community Systems	Systems with Plans Submitted		Systems with Plans Approved		Systems Covered by Complete Water System Management Plans‡		Systems with Engineer’s Certification		Systems with O&M and EM Plans*		Systems with Final Approval**	
		#	%	#	%	#	%	#	%	#	%	#	%
Dec. 31, 2011	2,546	1,744	68.5	1,554	61.0	1,628	63.9	1,450	57.0	1,406	55.2	1,398	54.9
Dec. 31, 2012	2,496	1,788	71.6	1,600	64.1	1,634	65.5	1,503	60.2	1,453	58.2	1,452	58.2
Dec. 31, 2013	2,471	1,829	74.0	1,645	66.6	1,647	66.7	1,555	62.9	1,506	60.9	1,508	61.0
Dec. 31, 2014	2,429	1,858	76.5	1,667	68.6	1,640	67.5	1,584	65.2	1,544	63.6	1,539	63.4
Dec. 31, 2015	2,409	1,890	78.5	1,699	70.5	1,639	68.0	1,606	66.7	1,567	65.0	1,563	64.9
Dec. 31, 2016	2,387	1,924	80.6	1,731	72.5	1,646	69.0	1,646	69.0	1,602	67.1	1,598	66.9
Dec. 31, 2017	2,346	1,943	82.8	1,849	78.8	1,668	71.1	1,684	71.8	1,637	69.8	1,645	70.1
Dec. 31, 2018	2,333	1,975	84.7	1,879	80.5	1,697	72.7	1,716	73.6	1,667	71.5	1,682	72.1
Dec. 31, 2019	2,327	2,002	86.0	1,899	81.6	1,716	73.7	1,747	75.1	1,696	72.9	1,717	73.8
Dec. 31, 2020	2,325	2,024	87.1	1,918	82.5	1,727	74.3	1,766	76.0	1,714	73.7	1,736	74.7
Dec. 31, 2021	2,322	2,059	88.7	1,952	84.1	1,783	76.8	1,790	77.1	1,729	74.5	1,761	75.8

*Tank rehabilitation projects do not require an Applicant Certification or a WSMP. A water system may receive final approval for a tank rehabilitation project based on a valid engineer’s certification only.

**It is important to note that not all projects are built during the same year that plans are approved and that an authorization to construct is issued. An authorization to construct is valid for a period of three years. Some projects that receive this authorization are not constructed.

‡ The number of systems covered by complete WSMPs has been updated to include multiple systems under single ownership with a master WSMP. “Systems with Plans Submitted” means the number of systems with at least one set of engineering plans and specifications submitted for review during the indicated period.

“Systems with Plans Approved” means the number of systems with at least one set of engineering plans and specifications reviewed and approved during the indicated period.

“Systems with Water System Management Plan Complete” means the number of systems with at least one WSMP completed during the indicated period.

“Systems with Engineer’s Certification” means the number of systems having at least one engineer’s certification during the indicated period in which a project was constructed according to approved plans and specifications.

“Systems with O&M and EM Plans” means the number of systems having at least one applicant certification during the indicated period that a project had an operation and maintenance plan and an emergency management plan.

“Systems with Final Approval” means the number of systems meeting all our capacity development requirements during the indicated period and for which a permit to operate was issued.

2.2 Incorporating Asset Management

The 2018 *America's Water Infrastructure Act* (AWIA), Section 2012, amended Section 1420 of the *Safe Drinking Water Act* (SDWA), requiring state drinking water programs to consider, and include as appropriate, asset management into their capacity development strategies. Asset management, as defined by the EPA, is the practice of managing infrastructure capital assets to minimize the total cost of owning and operating them, while delivering the service level customer's desire. The Public Water Supply Section completed revisions to incorporate asset management into North Carolina's capacity development strategy in 2021, which received EPA approval on April 19, 2022. The revisions to the strategy included activities to encourage asset management plan development and implementation, technical assistance related to asset management, and asset management plan training. The revised North Carolina strategy also highlights the cooperation between the Public Water Supply Section and partner organizations, such as the North Carolina Division of Water Infrastructure, North Carolina Rural Water Association, and the University of North Carolina Environmental Finance Center. All revisions incorporated into the strategy are based on North Carolina's asset management framework that was in place prior to the passage of AWIA and meets the intent of EPA's "five-core questions" of asset management.

As detailed within the revised strategy, asset management planning has been incorporated into the priority rating system for the Drinking Water State Revolving Fund (DWSRF) and the State Drinking Water Reserve Funding programs. This approach provides incentive for applicants to pursue asset management as they consider financing options for water infrastructure projects. The revised strategy also explains that grant money is available specifically for asset management and inventory assessment projects through the state funded Asset and Inventory (AIA) Grant program. Since the AIA Grant program began in 2016 to the end of 2021, 116 public water systems have been awarded 126 grants, totaling \$16,272,246 in funding.

3.0 Activities to Support the Mission

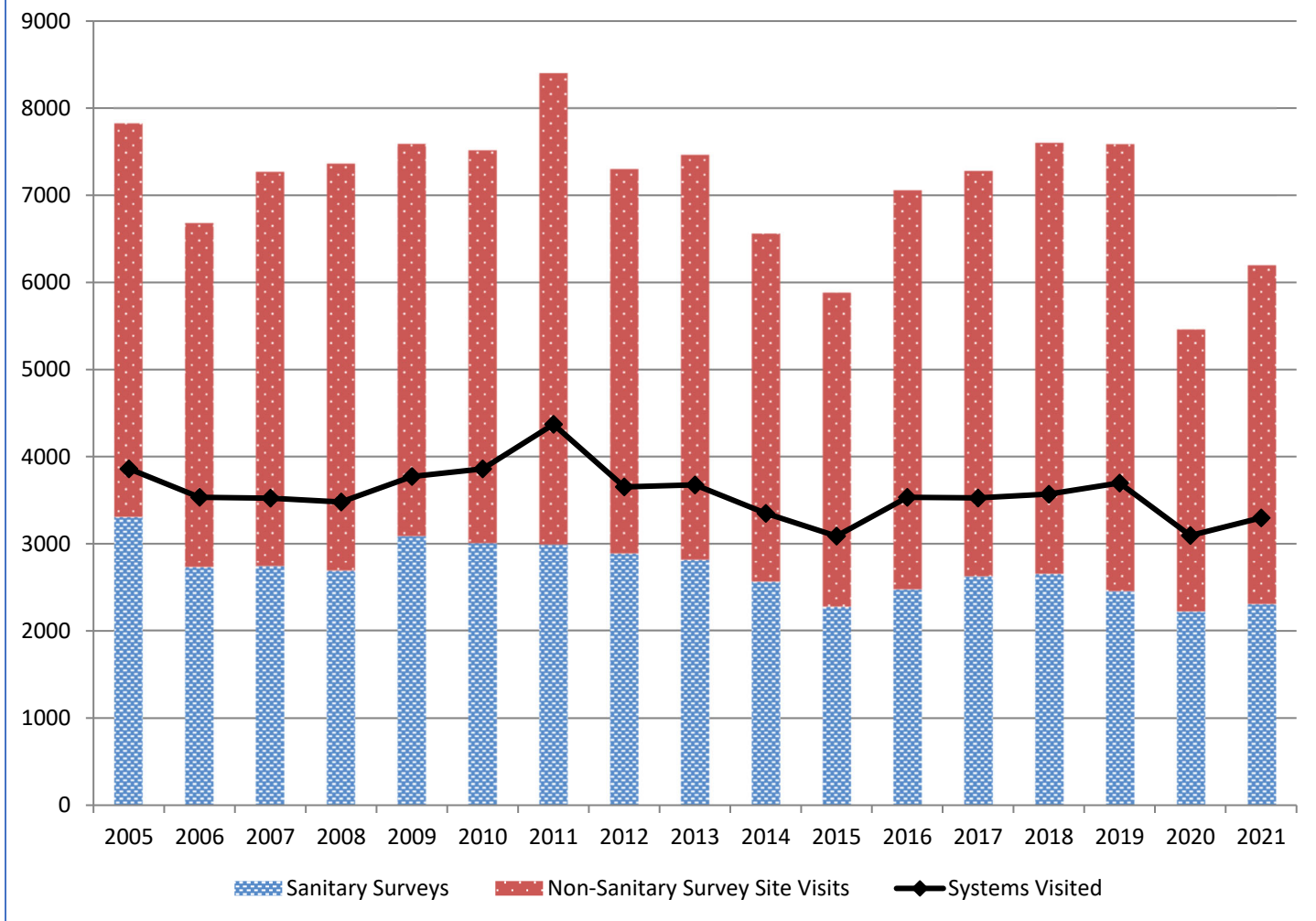
As discussed earlier, the Public Water Supply Section supports a variety of activities designed to influence the sustainability of the state's public drinking water resources and the proper operation of drinking water facilities. These activities reflect a comprehensive strategy that includes the following: 1) site visits and direct interaction with water system personnel, 2) engineering plan review of water system infrastructure, 3) compliance assistance and enforcement, 4) source water protection and related activities that encourage local participation in drinking water protection activities, 5) education and licensure of certified facility operators, and 6) mechanisms to help fund water system infrastructure. The Public Water Supply Section depends on internal coordination among staff and all of these supporting activities to assure that the state's public water systems are properly located, constructed, operated, and maintained.

3.1 Water System Site Visits

Public Water Supply Section staff that perform site visits play a vital role in supporting and maintaining water system capabilities throughout the state. These staff provide services that are crucial to both assessing and improving water system operations through better compliance with regulatory and engineering infrastructure requirements, detailed system inspections to identify and mitigate deficiencies, and assistance addressing contamination issues with technical solutions. Staff also provide input to improve water system management, maintenance, and operator competency.

Common reasons for site visits include sanitary surveys, providing technical assistance, performing informal and construction inspections, performing investigations regarding violations or complaints, performing assessments triggered under the Revised Total Coliform Rule (RTCR), and providing compliance assistance. Many of the staff members that visit water systems complete the training and pass an examination to become a certified operator that is licensed by the state. This allows regional office staff to utilize a unique technical perspective when communicating with water system professionals and when assisting with operational issues. As seen in Figure 1 (page 8), Public Water Supply Section staff performed approximately 6,200 visits to water systems in 2021, of which 2,296 were sanitary surveys. There were still fewer visits in 2021 than in the years prior to 2020 due to lingering restrictions related to COVID-19. The solid line depicts the number of systems visited annually and the stacked columns depict the number and type of visits performed per year.

Figure 1: Site Visits Performed by Public Water Supply Section Staff



Site visits focus on providing assistance regarding technical and regulatory concerns. Public Water Supply Section staff often make several visits to a given system during the year to help solve site-specific problems. Of the 3,298 water systems visited in 2021, 1,326 were community systems, which serve more than 8 million consumers.

3.1.1 Sanitary Surveys

The sanitary survey is the most comprehensive site visit that staff perform. Sanitary surveys are EPA-mandated site visits performed by the Public Water Supply Section to identify deficiencies that could potentially reduce a water system’s ability to provide drinking water that conforms to regulatory requirements. Public Water Supply Section staff perform sanitary surveys at the minimum frequency of once every three years for community ground water systems and once every five years for non-community systems. Sanitary surveys for surface water systems are completed annually.

The following components of a public water system are comprehensively evaluated during a sanitary survey:

- Source water,
- Water treatment,
- Distribution system,
- Finished water storage,
- System pumps,
- Monitoring and reporting data verification,
- Management and operations, and
- Operator compliance.

During the sanitary survey, Section staff members inspect the water system for approximately 190 potential deficiencies that can exist within the aspects listed above. The deficiency classifications range from significant deficiencies to minor deficiencies to recommendations. All significant and minor deficiencies are rule-based, whereas recommendations represent optional practices that can improve water system operations. The staff assist water systems by providing technical assistance to correct any deficiencies that exist. Additionally, section staff are able to recommend improvements that have the potential to benefit the water system and improve capacity.

3.1.2 Non-Sanitary Survey Site Visits

In addition to sanitary surveys, staff perform a variety of other site visits. Staff assess technical solutions resulting from onsite discussions among water system owners and service providers, and the resulting insight and guidance from regional office staff enhances the owner's ability to make informed decisions on matters that impact the viability of the water system. Described below are the most common types of non-sanitary survey site visits.

- Technical Assistance – Staff provide assistance with technical issues that require industry knowledge and expertise. Examples of technical assistance visits include evaluating leaks, well water pump and storage issues, treatment adjustments, and cross connection control.
- Informal System Inspection – These inspections vary in scope and can include updating ownership information, testing residual disinfectant concentration, collecting new well information, reviewing rules with the owner or operator to facilitate compliance and other tasks.
- Construction Inspection – Staff periodically inspect projects under construction to confirm they are constructed in accordance with the approved plans and specifications. Any non-approvable variations noted during construction will have the opportunity to be corrected prior to completion of the project, which helps ensure that approved projects can be placed into service as quickly as possible.
- Investigation – Staff may perform an investigation when a water system receives a violation or if a customer has issued a complaint regarding water service or quality. In the event of a coliform violation, staff may help collect samples to determine if the coliform contamination has been abated. Public Water Supply Section staff provide instruction if the water remains positive for coliform. Staff provide training to water system representatives for response to other violations. If there are customer complaints, regional staff communicate with the complainant and may collect and analyze water samples if warranted.
- Compliance Assistance – Regional staff provide education and materials to water system representatives to facilitate a return to compliance.
- Level 1 and Level 2 Assessments (RTCR) – As requested, staff perform system assessments triggered under the Revised Total Coliform Rule (RTCR) for some water systems, as they have the technical knowledge that small water systems without certified operators would not have if they completed assessments on their own. These Level 1 and Level 2 Assessments, which began being triggered once the RTCR came into effect on April 1, 2016, are required to help identify potential causes of contamination. In 2021, Section staff performed 191 site visits to assist water systems in completing Level 1 or Level 2 Assessments. This includes helping to perform the assessment itself and completing the required assessment form to document findings and certify that the assessment was completed. Please note that some water systems choose to perform their own assessments, and that in some cases, staff will not perform additional assessments for water systems that did not implement timely corrective actions identified during previous assessments.

Visits performed by Public Water Supply Section staff help systems access and improve compliance with sampling and engineering infrastructure requirements, as well as with management, operations and/or operator compliance concerns.

3.2 Engineering Plan Review

The Public Water Supply Section reviews plans and specifications for water system infrastructure projects. The plans and specifications are developed by professional engineers registered in North Carolina and submitted by the applicant of the project. Every submittal is reviewed by a Public Water Supply Section plan review engineer to determine if the plans and specifications comply with *15A NCAC 18C Rules Governing Public Water Systems (Rules)*. The *Rules* contain the minimum acceptable requirements for water system infrastructure design to ensure the protection of public health. The role of the Public Water Supply Section review engineer is to evaluate the plans and specifications for adherence to the requirements of the *Rules* and notify the design engineer when a discrepancy between the submittal and the *Rules* is noted. Plans and specifications are approved when they meet the minimum requirements of the *Rules*.

The Public Water Supply Section receives an average of approximately 1,650 project plans each year. Plan review engineers either approve the plans as submitted or they issue comments for plans that do not meet minimum rule requirements. The Public Water Supply Section does not approve all plans submitted. Approximately 5 percent of plans are withdrawn by the applicant or recycled by the Public Water Supply Section due to the applicant's lack of response to comments. As a courtesy, section staff sends reminder letters and provides an opportunity for applicants to respond to comments prior to closing any infrastructure project.

From October 1, 1999, through the end of 2021, a total of 2,059 water systems submitted 34,620 projects for review. Of these, 1,761 systems achieved final approval status for 26,020 projects. The plan review team regularly provides correspondence to water systems that have projects approaching their "Authorization to Construct" deadline and for which no Engineer's Certification or Applicant's Certification have been received. This correspondence informs the system to submit the required documentation, request an extension of the Authorization to Construct, or withdraw the application if the project will not be constructed.

3.3 Compliance Oversight and Enforcement

In addition to using monitoring and MCL compliance data to indicate progress achieving the Section's mission, staff also use compliance data associated with other EPA-mandated requirements to identify needs and improve water systems that fail to meet these requirements on a consistent basis. Staff are regularly involved with data tracking and evaluation of compliance with drinking water requirements, and they work proactively with water systems to help them meet these requirements. This is achieved by effectively communicating expectations, answering compliance questions posed by the regulated community, and sending out reminders of upcoming sampling deadlines. If, despite these proactive efforts, a water system fails to meet the requirements, staff will then issue a notice of violation (NOV). Once NOVs are issued, staff continue to help the subject water systems return to compliance. Actions taken by the Public Water Supply Section following the issuance of a violation are critical to helping water systems navigate additional requirements that may result from the original violation. These requirements vary based on rule and violation type, so continued communication between Public Water Supply Section staff and water system personnel is needed to provide guidance on important next steps.

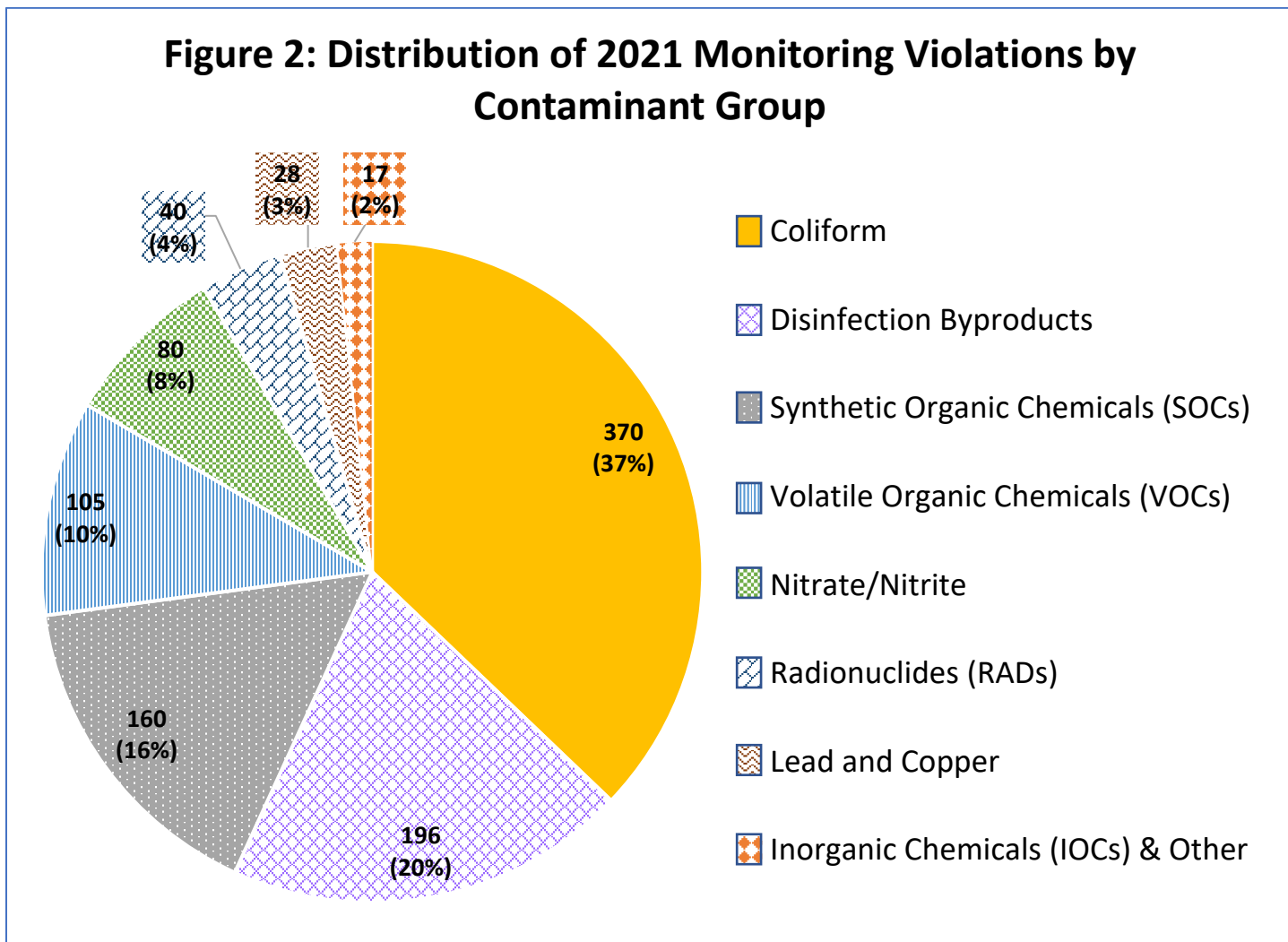
Monitoring and MCL notices of violation are the two violation types used as indicators in assessing water system performance. However, there are additional violation types issued in accordance with EPA requirements that are important to consider for staff providing compliance assistance. When there is no reliable method that is economically and technically feasible to measure a contaminant at concentrations to indicate there is not a public health concern, EPA sets a "treatment technique" rather than an MCL. A treatment technique is an enforceable procedure or level of technological performance which public water systems must follow to ensure control of a contaminant. Water systems that fail to follow these enforceable procedures or meet the enforceable levels are issued violations, which are referred to as "treatment technique violations." EPA also requires that water systems that fail to report rule specific information and/or data to the public or the Public Water Supply Section in a timely manner receive a notice of violation, and these violations are referred to as "reporting violations." Additionally, EPA requires notices of violation be issued for water systems that fail to notify the public of violations they have received, which are referred to as "public notification violations." These three violation types, along with monitoring and MCL violations, are the five general violation types analyzed in this report.

By reviewing compliance data, the Public Water Supply Section analyzed the contaminants associated with monitoring, reporting, treatment technique, and MCL violations issued in 2021, in order to identify which contaminant group results in the greatest number of violations. With the goal of improving compliance and reducing the number of violations, the Section is using this data to develop strategies and to target compliance assistance toward specific contaminant regulations. The compliance data was also assessed by violation type, which provides insight into whether the compliance issues can be best addressed through technical or managerial capacity improvements. Examples of this type of analysis are provided in the following sections.

3.3.1 Compliance with Established Monitoring Requirements

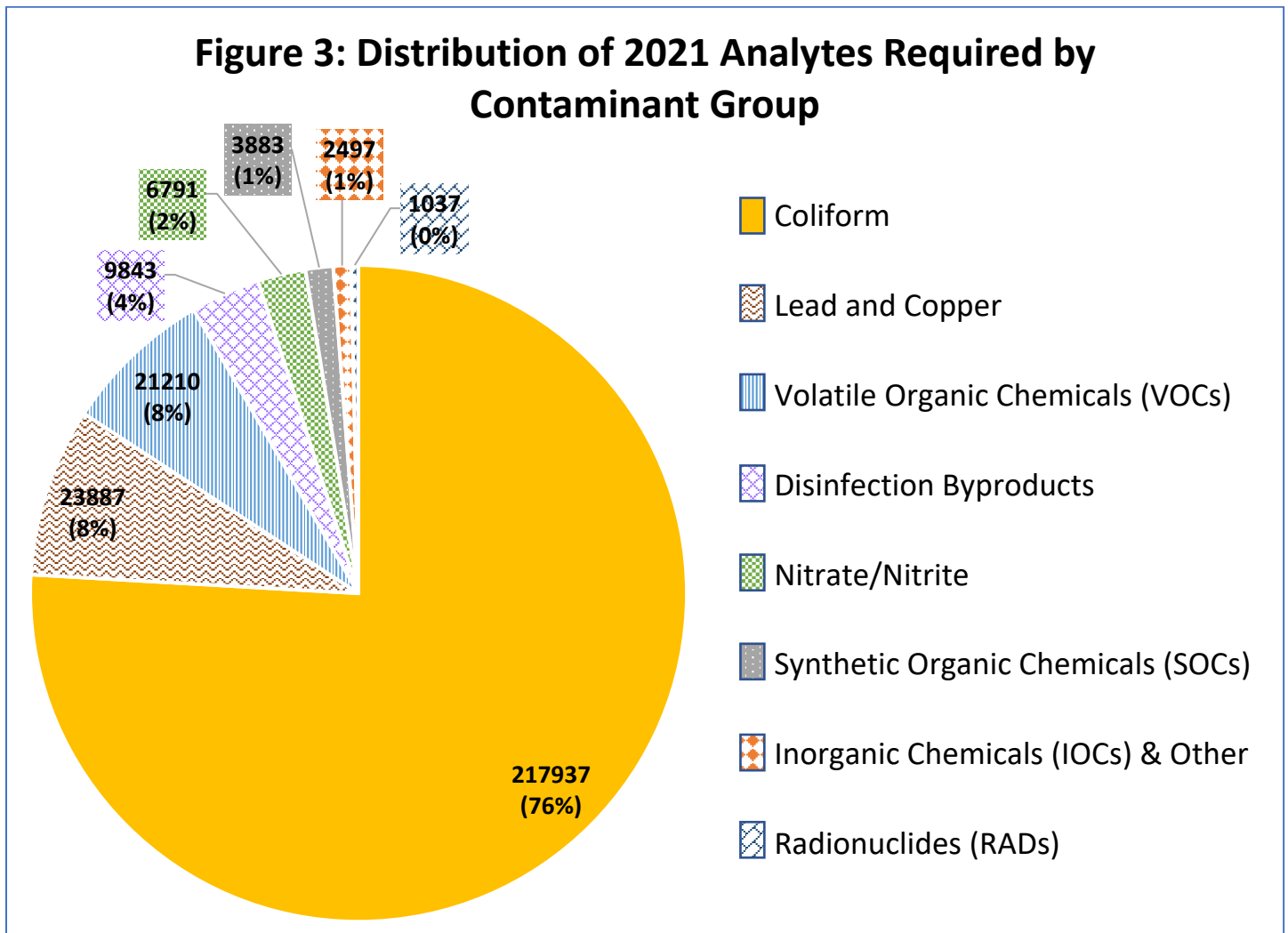
Monitoring violations are issued when a water system fails to collect a required sample or fails to complete analytical testing within the required monitoring period. To help water systems avoid monitoring violations, Section staff query data and then contact water system personnel in advance of due dates when sampling has not been performed. Automated phone calls and emails have been implemented to contact a large number of water systems in an efficient manner, and monitoring schedules have been made available to water systems online for easy reference. Even though this strategy appears simple, “forgetting to sample” has been identified as a common problem, and water systems have demonstrated improved compliance since the implementation of monitoring reminders.

While the Public Water Supply Section’s efforts to improve water system compliance has steadily reduced the number of monitoring violations issued, monitoring violations remain the most frequent type of violation issued in the state. Figure 2 below shows the total number of monitoring violations issued in 2021, divided into eight different contaminant groups. This figure also shows the percentage of monitoring violations for each contaminant group.



To better understand the breakdown of monitoring violations listed in Figure 2, the number of actual violations were compared to the maximum number of possible violations within each category type. This approach allows a standard comparison among the different contaminant groups and is necessary because differing rule requirements result in a widely varying number of samples due for a specified contaminant group. For example, every public water system is required to collect total coliform (TCR) samples, but only community water systems are required to collect radionuclide samples. In this illustration the sheer number of TCR samples will likely lead to a greater number of missed-sample violations than radionuclide violations. Therefore, comparing the number of violations as a percentage of the number of possible violations allows a comparison that can be seen in relative context.

Figure 3 below shows the total number of analyte monitoring required for each of the eight contaminant groups. This figure also shows the percentage of the total required analyte monitoring by contaminant group.

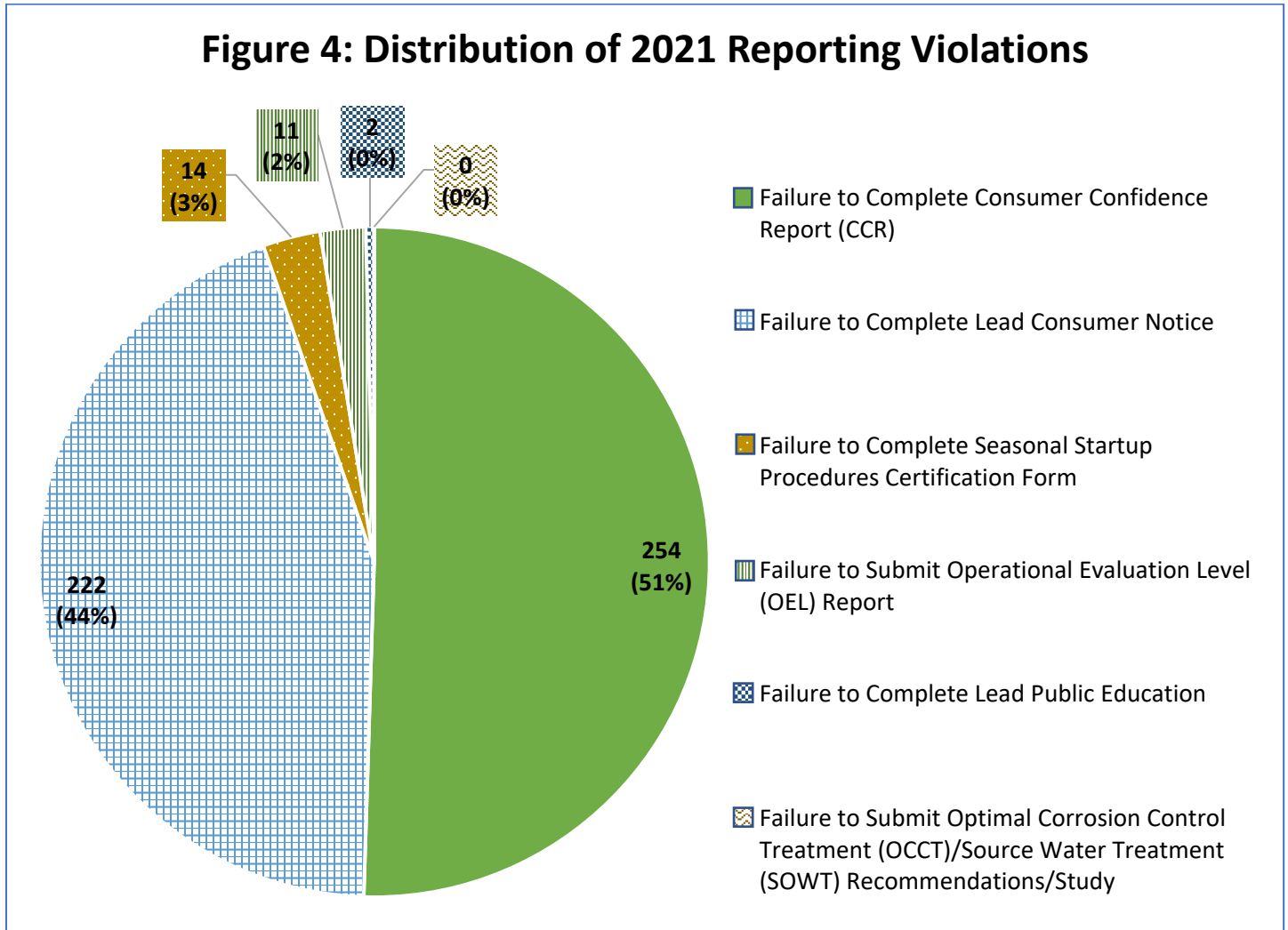


Figures 2 and 3 demonstrate that coliform sampling comprised 37 percent of monitoring violations and 76 percent of the required analytes. In contrast, the percentage of monitoring violations issued for nitrates or nitrites, disinfection byproducts, radionuclides, inorganic chemicals, synthetic organic chemicals, and volatile organic chemicals were all higher than the percentage of analytes required for these contaminants. This indicates that water systems failed to monitor for these six contaminant groups the most as a percentage of the number of analytes required. In response to this analysis, the Public Water Supply Section can investigate specific reasons that these contaminant groups receive the highest number of monitoring violations by percentage of analytes required and better develop targeted compliance assistance strategies on a contaminant-by-contaminant basis to reduce the number of missed samples in the future.

3.3.2 Compliance with Established Reporting Requirements

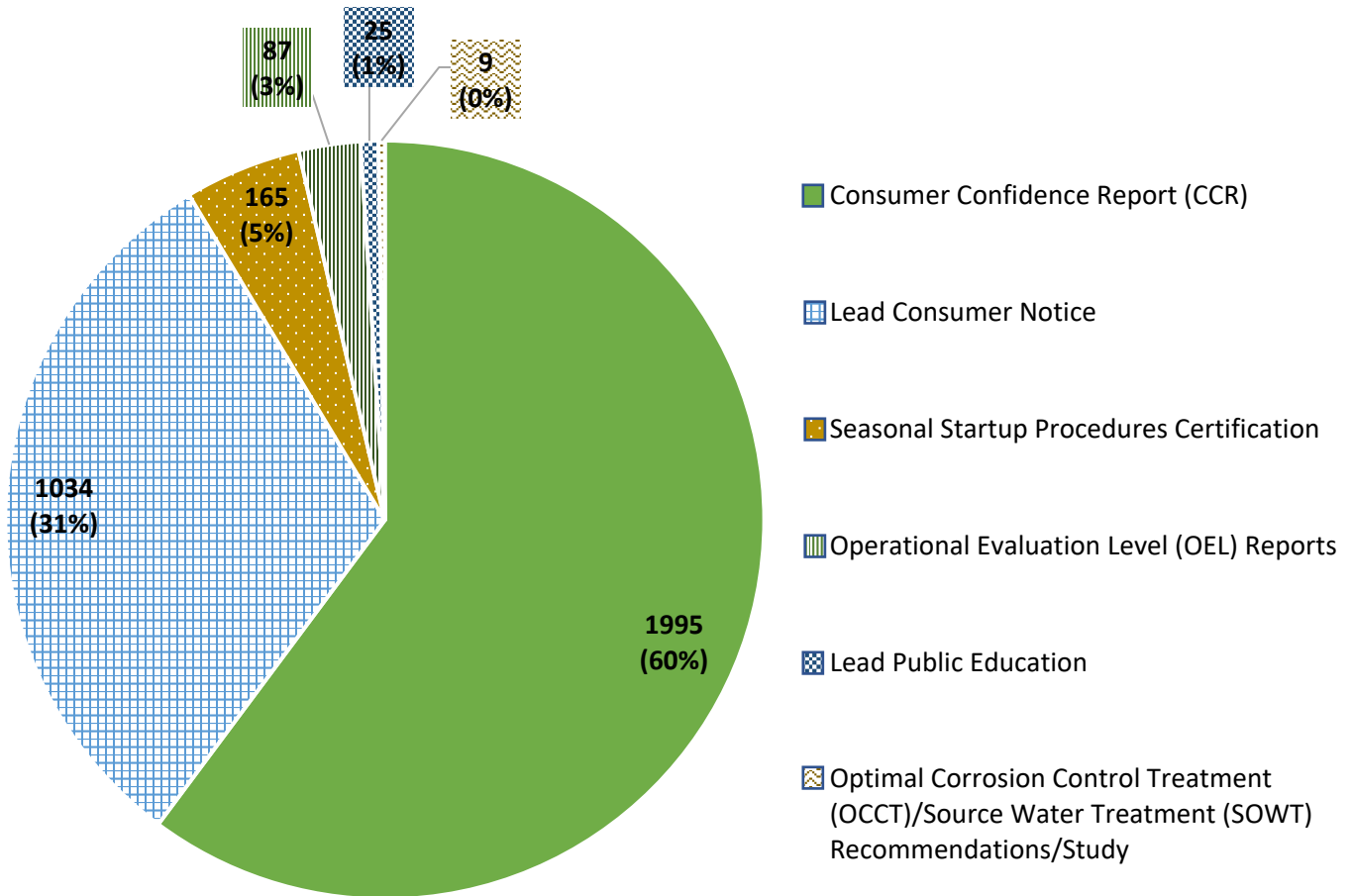
Reporting violations are issued when a water system fails to report rule specific information and/or data to the public or the agency in a timely manner. Section staff typically contact water system personnel in advance of when specific reporting requirements are due. These reminders are especially important for certain reporting types, such as Operational Evaluation Level (OEL) reports, which are triggered based on sample results and are not required from a water system on a regular basis. Providing compliance assistance for reporting requirements has been demonstrated to reduce violations. It also results in increased consumer confidence because it supports transparency and information regarding the quality of the finished water.

Figure 4 shows the total number of reporting violations issued in 2021, divided into the six different types of reporting violation categories. This figure shows the number of violations issued for each reporting category, as well as the percentage of the total reporting violations for each category.



As with monitoring violations, to achieve a better understanding of the number of reporting violations, the number of actual violations can be compared to the maximum number of compliance determinations. This analysis allows a direct comparison among the different reporting types, as differing rule requirements can generate a varying number of reporting violations for a specified rule. Figure 5 (page 14) shows the total numbers of reporting required in 2021, divided into six different reporting types for which violations were identified and issued during the year.

Figure 5: Distribution of 2021 Reporting Required



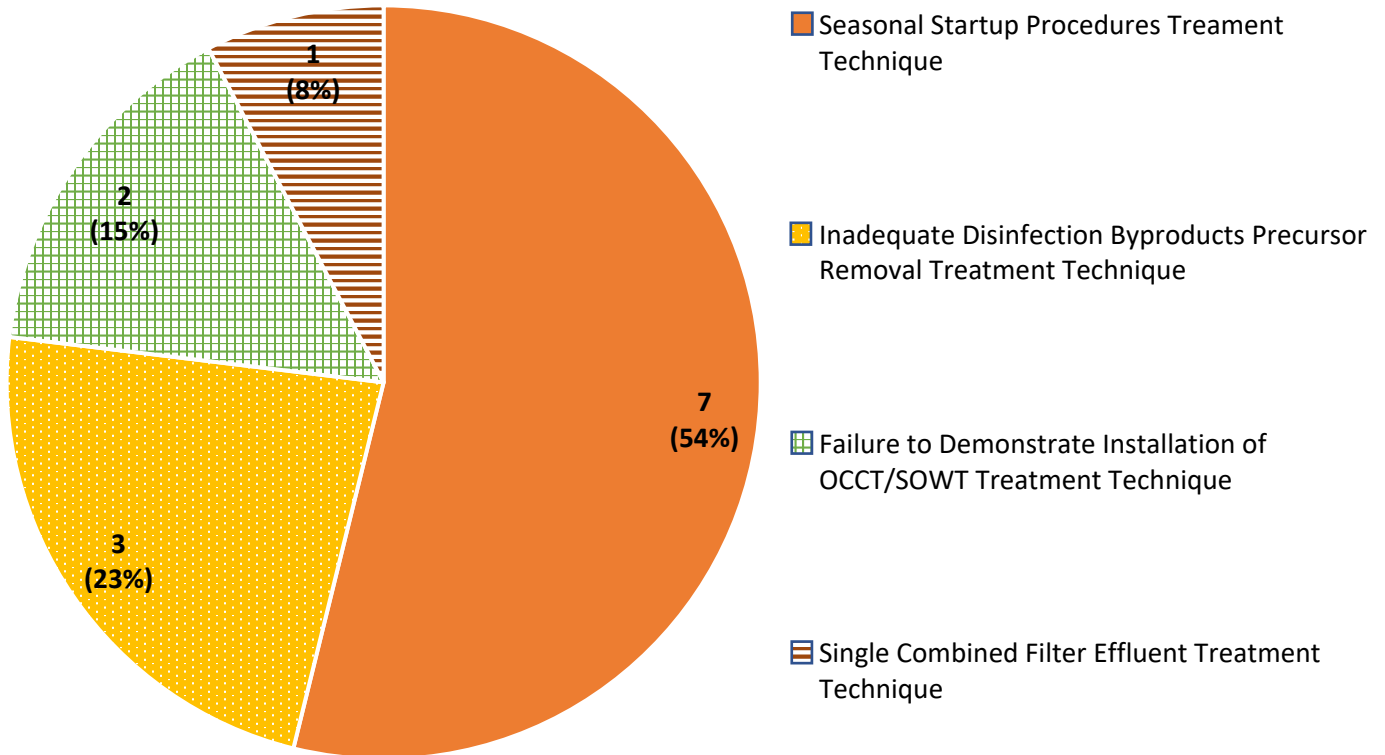
Figures 4 and 5 show that lead consumer notices account for 31 percent of the required reporting but 44 percent of reporting violations. In contrast, consumer confidence reports account for 60 percent of the required reporting, but only 51 percent of the reporting violations. Understanding where water systems perform disproportionately to expectations can help the Section prioritize and develop targeted outreach to improve reporting.

3.3.3 Compliance with Established Treatment Techniques

When a water system fails to complete or adequately address established treatment technique procedures or levels to control contamination, a notice of violation is issued along with an Administrative Order which requires the water system to complete the necessary procedures, notifications, and/or reports within a specified timeframe. Public Water Supply Section staff will send reminders to the owners of seasonal water systems at the beginning of each year regarding seasonal startup procedures to help them avoid a treatment technique violation, but other treatment technique violations are prompted due to sudden changes or issues that arise, for which reminders are impractical.

The EPA sets treatment techniques to help control contaminants of concern, when there is no reliable or feasible method to measure these contaminants directly. Therefore, the Section strives to reduce the number of treatment technique violations in the interest of protecting public health. Figure 6 (page 15) shows the distribution of treatment technique violations issued in 2021, divided into four different treatment technique types for which treatment technique violations were identified during the year. This figure shows the number of violations issued for each treatment technique type, as well as the percentage of the total treatment technique violations. As displayed in Figure 6, the number of treatment technique violations issued for failure to complete seasonal startup procedures, under the Revised Total Coliform Rule (RTCR), far exceeded the number of treatment technique violations issued for any other treatment technique type in 2021. This analysis suggests that the Section target efforts on improving compliance with seasonal water systems under the RTCR.

Figure 6: Distribution of 2021 Treatment Technique Violations

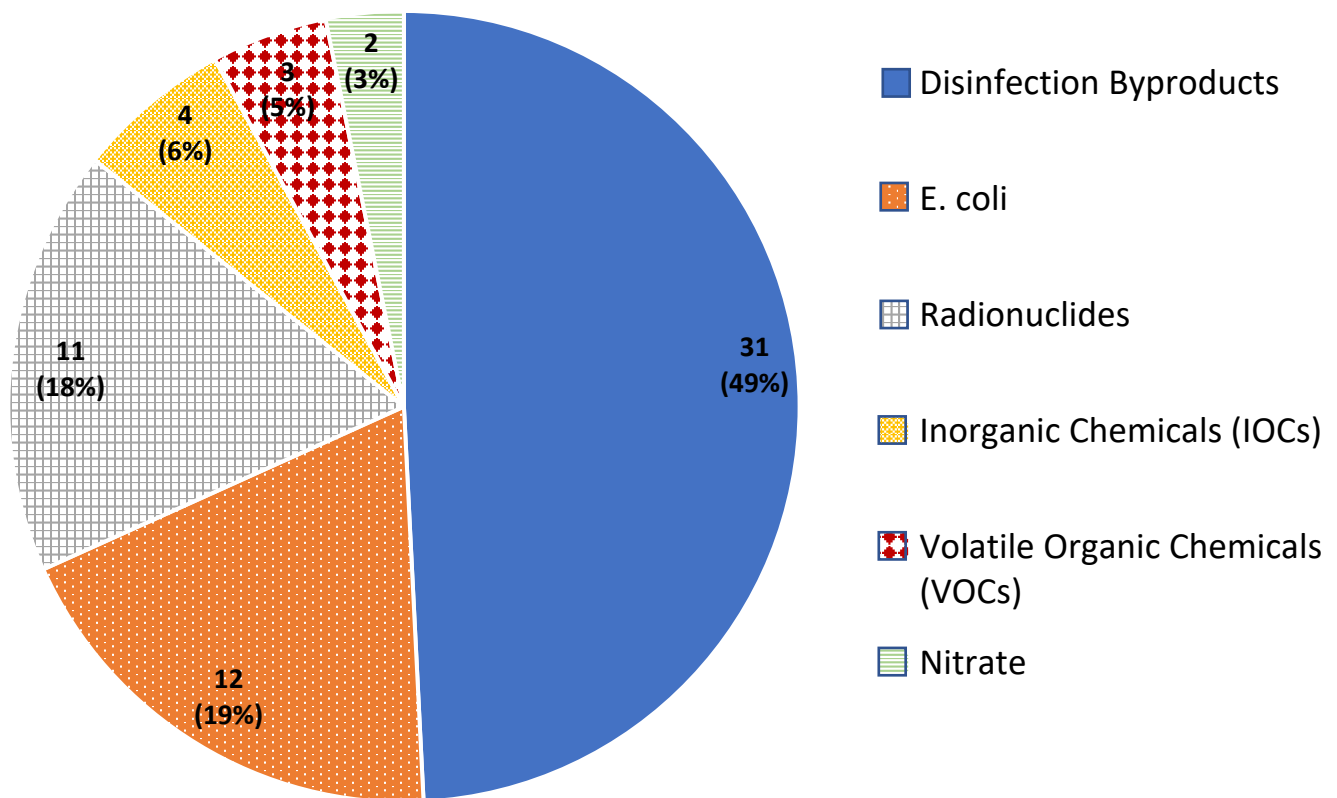


3.3.4 Compliance with Established MCLs

When a water system exceeds the established MCL for a contaminant, a notice of violation is issued along with an Administrative Order which requires the water system to develop a plan for returning to compliance within a specified timeframe. As part of the Administrative Order, the water system must submit quarterly updates on progress to achieve compliance to the Public Water Supply Section. Ideally, a water system will return to compliance within the date listed under an Administrative Order. However, historical data suggests that water systems do not return to compliance by the specified date. To reduce the number of water systems out of compliance, Section staff meet quarterly to individually assess and review the progress that these water systems are making. Complicating factors such as length of time out of compliance, proposed changes to treatment and operation, and recent sampling results are considered, and an appropriate response is identified to assist the water system. One of the primary goals of this strategy is to maintain consistent and clearly documented communication between the Public Water Supply Section and water systems, which typically leads to the development of situation-specific letters and other documented communication. For example, if during the review it is determined that a water system is not on the path to compliance, that system will be issued a “last chance letter,” indicating that an action plan must be provided to the Section within a specified deadline to avoid further legal action. Before issuance of a penalty, additional communication may be provided to indicate that the penalty process has been initiated, and that a penalty will be assessed following any additional or continued violation. This strategy ensures that expectations are unambiguous, have been clearly documented, and are legally defensible.

The EPA sets MCLs based on the health risk of exposure to a contaminant of concern. Therefore, the Section strives to reduce the number of MCL violations in the interest of protecting public health. Figure 7 below shows the total number of MCL violations issued in 2021, divided into six different contaminant types for which MCL violations were identified during the year. This figure shows the number of violations issued for each contaminant type, as well as the percentage of the total MCL violations. As displayed in Figure 7, the number of MCL violations issued for disinfection byproducts far exceeded the number of MCL violations issued for any other contaminant type in 2021. The two other contaminant groups for which a significant number of MCL violations were issued are E. coli and radionuclides, which included 12 and 11 exceedances, respectively. This analysis suggests that the Section target its effort on improving compliance with the Stage 2 Disinfection Byproducts Rule, Revised Total Coliform Rule, and Radionuclides Rule, which are the rules in North Carolina with the greatest number of water systems failing to meet the specified health-based drinking water standards.

Figure 7: Distribution of 2021 MCL Violations



3.3.5 Compliance with Established Public Notice Requirements

Public notification violations are issued when a water system fails to notify the public of violations they have received or situations that may pose a risk to public health. The requirements for providing public notification vary and depend on the originating violation. Violations are divided into three different tiers for public notification, and these are based on the seriousness of the violation and any potential adverse public health effects that may result. A Tier 1 public notice requires immediate notification within 24 hours after learning of the violation. Tier 1 notices are associated with contamination that poses an immediate or acute risk to public health. A Tier 2 notice requires notification as soon as possible but within 30 days after learning of the violation. Tier 2 notices are associated with problems that may present health impacts following consumption over a long period of time. A Tier 3 public notification requires notification as soon as possible but within one year after learning of the violation, and Tier 3 notices are associated with water system failure to meet requirements that do not pose a direct public health risk, such as a failure to monitor for contaminants.

The Public Water Supply Section receives a copy of the notification that water systems send out to the public, and a certification from the water system stating that the public notification complied with all requirements of the Public Notification Rule. To assist water systems with submitting public notices and certifications, the Public Water Supply Section developed an online application that allows water systems to electronically submit and certify public notifications. The electronic submittal option for public notification has reduced processing time, which allows for additional resources to provide compliance assistance to water systems that frequently fail to complete public notification requirements.

3.3.6 Other Current and Upcoming Compliance Assistance Strategies

Public Water Supply Section staff are frequently invited to provide technical training for the benefit of engineers, laboratories, and public water system owners and operators. Training events include seminars and webcasts facilitated by the Public Water Supply Section, those sponsored by external agencies, and EPA-sponsored trainings. Staff also often serve as instructors at Water Treatment Facility Operator Schools held throughout the year. Seminars, webcasts, and operator schools are primary means for water system owners and operators to learn of new regulations, changes to existing regulations, and learn of new and existing strategies to achieve compliance. As with the previous year, most of the training provided by staff during 2021 was virtual due to the COVID-19 pandemic. Current and future technical trainings will likely focus on the new Lead and Copper Rule Revisions (LCRR) in order to prepare water systems for upcoming changes in regulatory requirements.

The Section utilizes a variety of existing software tools to support compliance assistance activities. Examples of these software tools include The Bacti Dashboard and Web Intelligence reports, both of which are used to analyze data and alert users of follow-up actions that may be needed. The Bacti Dashboard, which was developed internally by division IT staff, alerts staff when positive coliform results are submitted into the database and supports communication and outreach efforts to address problems quickly and efficiently. Web Intelligence is a software package licensed to the Department of Environmental Quality for use in analyzing data. Section staff have set up queries and alerts in Web Intelligence and use these tools to streamline the issuance of violation letters, assess data, and monitor the progress of efforts to improve water system compliance. Many of these reports are run internally by staff on a daily basis and alert staff to exceedances of MCLs, action levels, and other levels that trigger immediate follow-up action. Staff have also enhanced their use of Web Intelligence to immediately identify exceedances of disinfection byproduct (DBP) MCLs and Operational Evaluation Levels (OELs) upon upload of analytical results. Web Intelligence reports are also being used to improve DBP violation tracking capabilities to learn more about which systems have compliance issues and how they have been solved. This has improved staff's knowledge as to which treatment and operational strategies are more likely to work in certain situations to reduce DBP MCL violations.

The Public Water Supply Section continues to collect information from water systems via its Lead & Copper Data Acquisition tool, an online updating process for systems to report information on the construction materials used throughout their distribution system and for information regarding their sampling sites for lead and copper. This tool also allows lead and copper records to be accessible to the public, thereby improving transparency and supporting consumer confidence. The Lead & Copper Data Acquisition tool was updated to allow water systems to report information on Lead Service Lines (LSLs) and lead goosenecks/pigtails in preparation for revisions to the Lead & Copper Rule. Public Water Supply Section staff that oversee lead and copper compliance continue to notify regional office staff, and the Division of Public Health, Environmental Health Section via email if results from the action level report indicate an exceedance of the lead or copper action level. The Lead and Copper Distribution System lab form was recently updated to help ensure that lead and copper tap samples are collected from the appropriate locations. Systems must now select a location as a "cold water tap location from a kitchen, bathroom or other interior tap from which water is typically drawn for consumption." This was to help circumvent systems from collecting samples from outside taps.

The Electronic Online Certification (ECERT) tool continues to be effective in allowing water systems to electronically submit and certify certain documents electronically. These documents include Consumer Confidence Reports (CCRs), public notices, special public notices, lead consumer notices, public education materials, and 90th percentile lead and copper summaries. Implementation of ECERT has allowed staff to review submitted documents in greater detail and provide timely feedback to water systems if corrections are needed. Improved efficiency in processing these documents will allow staff to focus their efforts on how to best reduce the number of reporting and public notification violations in the coming years.

Other compliance assistance strategies involving software tools under development pertain to electronic reporting of laboratory data for parameters not requiring analyses by certified labs, such as many of the lead and copper water quality parameters. This process involves an approval process for water system representatives and requires re-programming of the current Lab Data Submittal process. Guidance and forms have been developed to implement this process, and the Water Quality Parameter lab form has been updated for use by both certified labs and “state-approved” persons not affiliated with certified labs. While the Public Water Supply Section already required electronic submittal of laboratory data, using the Lab Data Submittal and Lab-to-State tools, the Section completed its transition to EPA’s electronic submittal application, known as the Compliance Monitoring Data Portal (CMDP). This transition was initiated to help reduce the overall number of analytical submission errors and to bring certified laboratories into compliance with EPA’s new Cross-Media Electronic Reporting Rule (CROMERR). Another software tool previously completed was the PWS Reports application, which allows certain data reports created by Public Water Supply Section staff to be run and viewed by water system personnel, laboratories, and the general public. Two key reports made available for external use include the Sampling Status Report, which allows users to see if water systems completed sampling requirements, and the Public Notice Generator (Tier 3) Report, which allows water systems to generate public notices automatically using data directly from the Public Water Supply Section’s SDWIS database.

3.3.7 New Systems Letter

When a new system becomes activated in the Public Water Supply Section inventory, the owner is sent a “new system letter” and a packet of information to assist them in achieving compliance with North Carolina’s *Rules Governing Public Water Systems*. The letter and packet include important information for the system such as their water system name and identification number, system activation date, compliance monitoring requirements, laboratory analyses and reporting information, rule-specific information and required plan and document submittals, public notification and consumer confidence report information, water system classification and certified operator requirements, operating permits and fees, and Public Water Supply Section contact information. Packet enclosures include a copy of the *Rules* and various guidance documents, along with the forms that they must complete and submit back to the Public Water Supply Section upon becoming a new water system. Historically, it has been observed that there is a significant learning curve associated with gaining familiarity with the agency’s requirements for compliance. This learning curve may result in violations, especially for small systems whose owners lack technical sophistication associated with operating a water system. Therefore, the packets and outreach available to new systems help to mitigate potential negative impacts for system owners.

3.4 Drinking Water Protection Activities

The Public Water Supply Section offers services to assist in the voluntary protection of local drinking water sources. Water systems may participate to improve their ability to provide safe and sustainable drinking water by implementing proactive steps to reduce potential contamination. The Public Water Supply Section offers technical assessments of the state’s more than 8,000 drinking water sources and maintains financial incentives through a network of collaborating state agencies.

3.4.1 Drinking Water Protection

The Public Water Supply Section continues to work to improve and implement North Carolina's drinking water protection strategy. This approach involves evaluating the susceptibility to contamination and the initiation of protective strategies for the state's public drinking water resources. Activities include delineation and assessment of drinking water sources, wellhead and surface water protection, coordination with other state agencies, and initiation of programs designed to encourage local drinking water protection efforts. These activities encourage public water systems to protect their water sources by supporting a multi-barrier approach to drinking water protection. Systems that maintain drinking water sources that are less susceptible to contamination may achieve greater financial and technical capacity because fewer resources may be necessary to mitigate pollution incidents.

Partnership arrangements with other agencies and programs are a major component of the Public Water Supply Section's drinking water protection strategy. Specifically, other agencies integrate Public Water Supply Section drinking water protection data into their agendas and funding priorities. The Section maintains relationships with agencies that fund agricultural best management practices, stormwater best management practices, land conservation, and stream restoration projects.

In 2021, the Section provided assistance to the local Natural Resources Conservation Service's (NRCS) State Office to help refine their "local priority areas." The "local priority areas" were originally identified in 2019 as conservation funding priorities within North Carolina for the purpose of protecting drinking water sources in accordance with 2018 Farm Bill mandates. In 2020, 8 watersheds within the original 19-county "local priority area" were selected as "high priority areas." In 2021, the "high priority areas" were expanded to include a total of 298 watersheds. These areas will receive focused outreach, higher competitive ranking, and increased conservation payments for installation of agricultural best management practices that have a demonstrated history of protecting and/or improving the quality of receiving waters. The Section also reviewed and confirmed that two new watersheds proposed to be included in NRCS's National Water Quality Initiative (NWQI) program are in source water assessment areas. The NWQI program addresses agricultural sources of water pollution in priority watersheds by providing technical and financial assistance for conservation planning and agricultural best management practice implementation. If approved, conservation work in the two new watersheds will help address impaired surface waters and provide source water protection benefits for several public water systems.

In the late summer of 2021, Public Water Supply Section staff provided recommendations to the USDA Farm Services Agency (FSA) to help inform revisions to their Conservation Reserve Program (CRP) Water Quality Zone, which is defined at the county scale. FSA is required to limit their Water Quality Zone coverage to no more than 25 percent of the cropland acres in the state. Section staff identified each county's percentage of land area within source water assessment areas and/or wellhead protection areas. Counties with high percentages of source water assessment areas and/or wellhead protection areas were recommended to remain in the Water Quality Zone. This approach helps build source water protection into the CRP by improving the competitive ranking of candidate land geographically located within source water assessment and/or wellhead protection areas. Source water protection benefits should be achieved via the land use change associated with CRP enrollment.

3.4.2 Current and Upcoming Drinking Water Protection Initiatives

In 2021, Public Water Supply Section staff coordinated N.C. Source Water Collaborative efforts to continue the source water protection awards program. Two source water protection award recipients were identified in 2021, representing two of the six award categories. The website was updated to acknowledge and provide further information regarding award winning projects. Such examples serve as templates to other communities planning source water protection activities. The awards program continues on an annual basis.

The Public Water Supply Section continued to improve the functionality of its GIS mapping applications, which exist to assist local governments, water system owners, volunteer organizations and other agencies with information vital to protect drinking water. Susceptibility ratings and associated assessment results are critical components of this data and are summarized in technical reports made available via the Public Water Supply Section's geographic information application. Additionally, agencies enlisting drinking water protection as a priority item within their own environmental programs use the Public Water Supply Section's GIS applications to help locate and prioritize environmental projects.

The Section promotes and provides technical expertise to assist communities with local source water protection planning. The voluntary program uses a successful seven-step process across the state to protect both ground and surface water sources. To date, the Public Water Supply Section has approved 10 local surface water protection plans covering 13 different public water systems with a total of 19 separate intake facilities, which serve to protect drinking water for approximately 446,154 people. The source water protection planning process empowers local stakeholders to define and achieve long-term, proactive drinking water protection goals.

In 2014, state legislation amended G.S. 130A-320 to mandate surface water protection planning. Due to its existing voluntary surface water protection planning process, the Public Water Supply Section was assigned the task of implementing the legislation, which requires the development and implementation of source water protection plans for public water systems treating and furnishing water from surface supplies. A voluntary stakeholder team met multiple times to provide guidance and recommendations regarding standardized surface water protection planning formats and to help identify mandatory provisions for implementation. The team also critiqued the draft rule language. Stakeholders represent professional associations, non-profit organizations, councils of government, local government and local utilities, state and federal agencies, and industry representatives. Staff assessed the economic impact of the rule and finalized rule language. The rule (15A NCAC 18C .1305) became effective January 1, 2019.

On October 23, 2018, America's Water Infrastructure Act (AWIA) was signed into law. AWIA established requirements that mandate development of a Risk and Resiliency Assessment and an Emergency Response Plan for the majority of the water systems subject to 15A NCAC 18C .1305. Evaluation of AWIA guidance, published by the EPA in August 2019, revealed significant overlap with the state's 15A NCAC 18C .1305 rule. Therefore, to reduce regulatory burden and allow public water systems to create and maintain one plan, rather than two separate plans addressing essentially the same, but not identical, state and federal requirements, the Section revised 15A NCAC 18C .1305. The amended rule went into effect on April 1, 2020.

In February 2020, emails were sent to the water systems required to comply with the Source Water Protection Planning Rule containing lists of Department-provided potential contaminant sources (PCSs) that have the potential to reach surface waters within the defined areas of interest for each water system. This information was derived from existing Source Water Assessment Program (SWAP) data. The NC Rural Water Association (NCRWA) assisted with outreach and technical assistance to the water systems subject to the new rule. With the transition from voluntary to regulated source water protection planning, there is a fundamental change in the Section's approach to drinking water protection. Throughout 2021 Section staff sent multiple rounds of reminder emails to the regulated community reminding them of approaching compliance certification deadlines. Staff presented at an operator training event and reviewed Source Water Protection Planning Rule requirements, compliance certification deadlines and certification procedures. Section staff track compliance certifications as they are received from the water systems. In 2021 the Public Water Supply Section received 72 certifications of compliance with the Source Water Protection Planning Rule.

3.4.3 Wellhead Protection

The Safe Drinking Water Act Amendments of 1986 established requirements for states to develop wellhead protection programs. Congress intended these programs to be a key part of a national groundwater protection strategy, which prevents contamination of groundwater used for public drinking water. North Carolina's EPA-approved program is part of this national strategy. The program is a voluntary pollution prevention and management program designed to protect groundwater sources of public drinking water supply. Public water systems that choose to participate in the program develop and submit a local wellhead protection plan to the Public Water Supply Section for review and approval.

In North Carolina, development of a local wellhead protection plan is viewed as a valuable supplement to existing state groundwater protection programs. The Public Water Supply Section's program is for public water systems that decide to provide added protection to their local groundwater supplies. Public water systems that desire to develop a wellhead protection plan may ask to receive technical assistance from Public Water Supply Section staff or from the North Carolina Rural Water Association, through their contract with the Public Water Supply Section, as described in Section 3.7.3 of this document. Upon implementation, the local wellhead protection plan reduces the susceptibility of wells to contaminants. The reduction of susceptibility to contamination increases the capacity for water systems to provide compliant drinking water by reducing the need to install costly treatment options to remove contaminants.

3.4.4 Current and Upcoming Wellhead Protection Initiatives

The Public Water Supply Section approved nine wellhead protection plans covering ten water systems during the current reporting period. Of these plans, five were renewals of previously approved plans. At the end of the current reporting period, there were 156 active wellhead protection plans covering 172 public water systems with 999 public water supply wells that serve approximately 1,064,979 people.

In addition to the review of completed wellhead protection plan submittals, the Public Water Supply Section reviewed draft wellhead protection area delineations submitted by public water systems in the early stages of plan development. This allows the systems to receive tentative approval of their wellhead protection areas prior to proceeding with development of the remaining plan components (*i.e.*, potential contamination source inventory, management plan, etc.), which could be impacted by changes to the wellhead protection areas.

To better assist the NC Division of Waste Management's Underground Storage Tank (UST) Section in meeting their regulatory mandates, the Public Water Supply Section published an ArcGIS feature service of North Carolina's wellhead protection areas to the ArcGIS Online Server site. This feature service allows the UST Section to more efficiently and accurately determine if petroleum contamination sites are within wellhead protection areas as required by their risk assessment protocol.

3.5 Operator Certification and Training

The North Carolina Water Treatment Facility Operators Certification Board has authority to oversee the examination of water system operators and the certification of their competency to operate drinking water system facilities. The Public Water Supply Section provides support to serve the Board and implement its policies. Section staff perform a variety of functions that include: administering statewide examinations, approving continuing education opportunities, managing database and state records, providing training and outreach, collecting fees, participating in the enforcement of the Rules Governing Water Treatment Facility Operators (Title 15A Subchapter 18D), and conducting an annual renewal process. Section staff also teach at the operator schools and provide speakers for continuing education workshops. North Carolina currently has approximately 5,670 certified water system operators with more than 8,181 active certifications.

The Public Water Supply Section continues to increase the capabilities of public water systems by influencing the technical training and increasing the competency of public water system operators. Over the past few years, changes were initiated to improve business efficiency and to expand customer services to the state's certified operator community. An online portal to access personal information from the operator database has been welcomed and utilized by many certified operators. A scheduling system and procedures for effective utilization of training and on-demand examination room are being developed. Changes are continually made to the operator certification portion of the website to allow for a more user-friendly interface and to achieve consistency with other Division of Water Resources' websites.

3.6 Funding

In 2013, reorganization within the Department of Environmental Quality (DEQ) included the creation of the Division of Water Infrastructure that now administers the Drinking Water State Revolving Fund (DWSRF) capitalization grants. Prior to that time, the DWSRF Program was implemented by the Division of Water Resources, Public Water Supply Section. These two groups work cooperatively to implement programs funded by the DWSRF, including the provision of funding for public water system infrastructure projects for systems that demonstrate technical, managerial, and financial capacity. Funding made available through the DWSRF includes low-interest, no-interest, and principal forgiveness loans.

The Public Water Supply Section's contributions in its cooperative effort to support the DWSRF Program include the following:

- Provide input to Drinking Water State Revolving Fund prioritization;
- Implement rules and an approval process to establish technical, managerial, and financial capacity of applicants for funding;
- Provide system-specific input to the DWSRF Program on request;
- Provide data for Drinking Water State Revolving Fund reporting;

- Participate in the Drinking Water State Revolving Fund Needs Survey by delivering requests to surveyed water systems, coordinating with them to complete the survey, and providing technical assistance as needed; and
- Utilize set-asides to support capacity development activities as described in the Drinking Water State Revolving Fund Intended Use Plan.

3.6.1 Drinking Water State Revolving Fund

Water systems apply to the DWSRF Program for water infrastructure funding, and program staff prioritize the applications to fund the highest priority projects. The DWSRF Program increases capacity for water systems by promoting the following short-term objectives:

- Provide loans to reduce acute health risks;
- Provide loans to enable water systems with the adequate capacity to consolidate non-viable water systems;
- Provide funding for preventative and efficiency measures, such as replacement of aging infrastructure; and
- Provide technical assistance for small systems.

The DWSRF Program also increases capacity for water systems by promoting the following long-term objectives:

- Increase the percent of population served by safe public water systems;
- Increase the safety of public water systems;
- Promote safe and affordable drinking water by reducing costs associated with capital improvements;
- Assist water systems to remain compliant with increasingly complex rules under the *Safe Drinking Water Act*; and
- Ensure technical integrity of the proposed water system improvements, advocate self-sufficiency, protect water resources from new pollution sources, and promote sustainability.

During the 2021 calendar year, eighteen DWSRF projects totaled \$34.17 million in new commitments for infrastructure improvement. The DWSRF Program continually increases its ability to provide low-interest loans to water systems through federal capitalization grants, the required 20 percent state match, and the repayment-funding stream of revolving loans.

3.6.2 Failing System Loans

Some systems, especially small systems, lack the resources to consistently provide safe drinking water to the public as the *Safe Drinking Water Act* requires, resulting in long-term noncompliance. Principal-forgiveness loans are available to water systems having adequate capacity that take over such a failing system. In most cases, the project includes connecting the failing system to the rescuing system and replacing the distribution system in the failing system. The Drinking Water State Revolving Fund Program is currently working to consolidate the Town of Bethel (a non-viable public water system serving 749 residential connections / 1,656 consumers) with the Greenville Utilities Commission water system. Completion of this consolidation project will give these consumers access to a safe, reliable, and economical water supply. By these efforts, the Drinking Water State Revolving Fund Program has consolidated 27 failing systems serving about 1,504 consumers since the program's inception in 2004.

3.7 Partnerships

The Public Water Supply Section engages in voluntary and contractual partnerships to enhance capacity development efforts in North Carolina. Cooperation with the Division of Water Infrastructure (DWI) ensures that federal funds help increase capacity for public water systems. Participation with U.S. EPA's Area-Wide Optimization Program and a contract with the N.C. Rural Water Association serve to augment the already substantial efforts put forth by the Public Water Supply Section.

3.7.1 Division of Water Infrastructure

As detailed in Section 3.6 of this report, the Public Water Supply Section works in close cooperation with the Division of Water Infrastructure in administering North Carolina's Drinking Water State Revolving Fund (DWSRF) Program. The Section provides input, data, and other information to assist funding awards to public water systems implementing capital improvement projects to return to compliance with both state and federal drinking water regulations. Implementation of funded projects results in both short-term and long-term improvements to a public water system's capacity, as previously discussed.

The Division of Water Infrastructure has worked closely with North Carolina’s Local Government Commission to develop a Viable Utility Program to distribute funding through the new “Viable Utility Reserve” (VUR). The VUR offers funding to improve the technical, managerial, and financial capacity of distressed local government units, allowing them to continue to provide safe and reliable drinking water to customers, despite financial challenges. The first project to receive VUR funding is the same consolidation of the Town of Bethel water system into the Greenville Utilities Commission (GUC) water system that was discussed previously under Section 3.6.2 of this report. The Viable Utility Program has already accepted competitive project applications for VUR funding during the spring of 2022.

3.7.2 Area-Wide Optimization Program

The Area-Wide Optimization Program is a joint program between the EPA and the states. EPA developed the program to help water systems meet increasingly stringent regulations and simultaneous compliance challenges while achieving higher levels of water quality. The Public Water Supply Section has participated in the Area-Wide Optimization Program since 2000 and works cooperatively with water systems to use existing equipment and treatment processes to improve or optimize water quality.

A typical scenario under the Area-Wide Optimization Program is for Public Water Supply Section employees, Area-Wide Optimization Program participants from other states, regulatory programs, representatives from the EPA, and the water system operators to optimize the water treatment processes of a water system that has volunteered to host the Area-Wide Optimization Program activities. These activities enhance capacity by optimizing the capabilities of the volunteering water system while allowing all Area-Wide Optimization Program participants to share and increase their knowledge of water treatment facilities.

In 2021, Area-Wide Optimization Program team members were limited to only a few outreach activities due to lingering restrictions related to the COVID-19 pandemic. North Carolina Area-Wide Optimization Program staff wrote an article about the program for the NC Waterworks Operators Association’s “Go With The Flow” publication, made presentations on iron and manganese optimization at training events, and presented several AWOP awards in-person to qualifying water systems during public meetings. Staff also remotely attended state and regional planning meetings throughout the year.

The Public Water Supply Section awarded 66 water treatment facilities the 2021 Area-Wide Optimization Program Award for optimized treatment. Public Water Supply Section regional staff generally present these awards in the presence of the governing body of the water system. The Public Water Supply Section awards water systems each year that demonstrate outstanding turbidity and microbial removal and for meeting performance goals that are more stringent than the state and federal drinking water standards. Water systems meet these goals by increased surveillance, by reducing treatment fluctuations, and by maintaining excellent coagulation and filter performance. By reaching this level of optimized performance, employees of these water systems have demonstrated their dedication to provide their customers with the best possible drinking water quality. Providing public recognition of these awards builds elected officials’ support with the utility staff activities and may help expand the number of participating systems.

3.7.3 N.C. Rural Water Association

The Public Water Supply Section has a contractual agreement with the N.C. Rural Water Association for circuit riders to provide technical assistance to water systems that serve less than 10,000 people. A circuit rider receives system referrals from the Public Water Supply Section and requests for assistance from other sources. During the reporting period, the circuit riders completed 871 contacts to systems with issues such as compliance and treatment, operation and maintenance, water loss and leak detection, management techniques, and emergency response. Circuit riders conduct initial visits to referred water systems to explain monitoring requirements and to enhance the systems’ ability to meet all regulatory requirements.

The Public Water Supply Section has a second contractual agreement with the N.C. Rural Water Association help public water supply systems develop local Wellhead Protection (WHP) plans. Many of these systems are small systems that lack the technical and financial resources to pursue drinking water protection on their own. Under the condition of the contract, the N.C. Rural Water Association provided on-site technical assistance in the development and implementation of WHP plans that are customized to their community. During the 2020 calendar year, nine public water systems received Public Water Supply Section approval of their WHP Plans developed with assistance from the N.C. Rural Water Association. Of these plans, seven were renewals of previously approved plans. The expectation is that these plans will assist in reducing the susceptibility of these sources of public drinking water to contamination.

4.0 Assessing Outcomes and Results

The Public Water Supply Section uses monitoring and MCL compliance rates as indicators of water system capacity and as indicators on how effective the Public Water Supply Section’s strategies have been toward achieving its mission. A variety of metrics are available for this analysis, and these include: the percentage of noncompliant systems, the population served by compliant community systems, the performance of new public water systems, and the performance of systems that have been active since the beginning of the Capacity Development Program.

4.1 Overall Compliance Rates of Water Systems

Figure 8 below provides compliance information for public water systems in North Carolina regarding federal and state drinking water regulations. Data from 1999 are included as the baseline for comparison since the Capacity Development Program began on October 1, 1999. The percentage of water systems receiving monitoring notices of violation has decreased significantly since 1999, while the percentage of water systems receiving MCL notices of violation is lower and has remained relatively stable. These results are significant considering federal requirements have become more stringent during the same period.

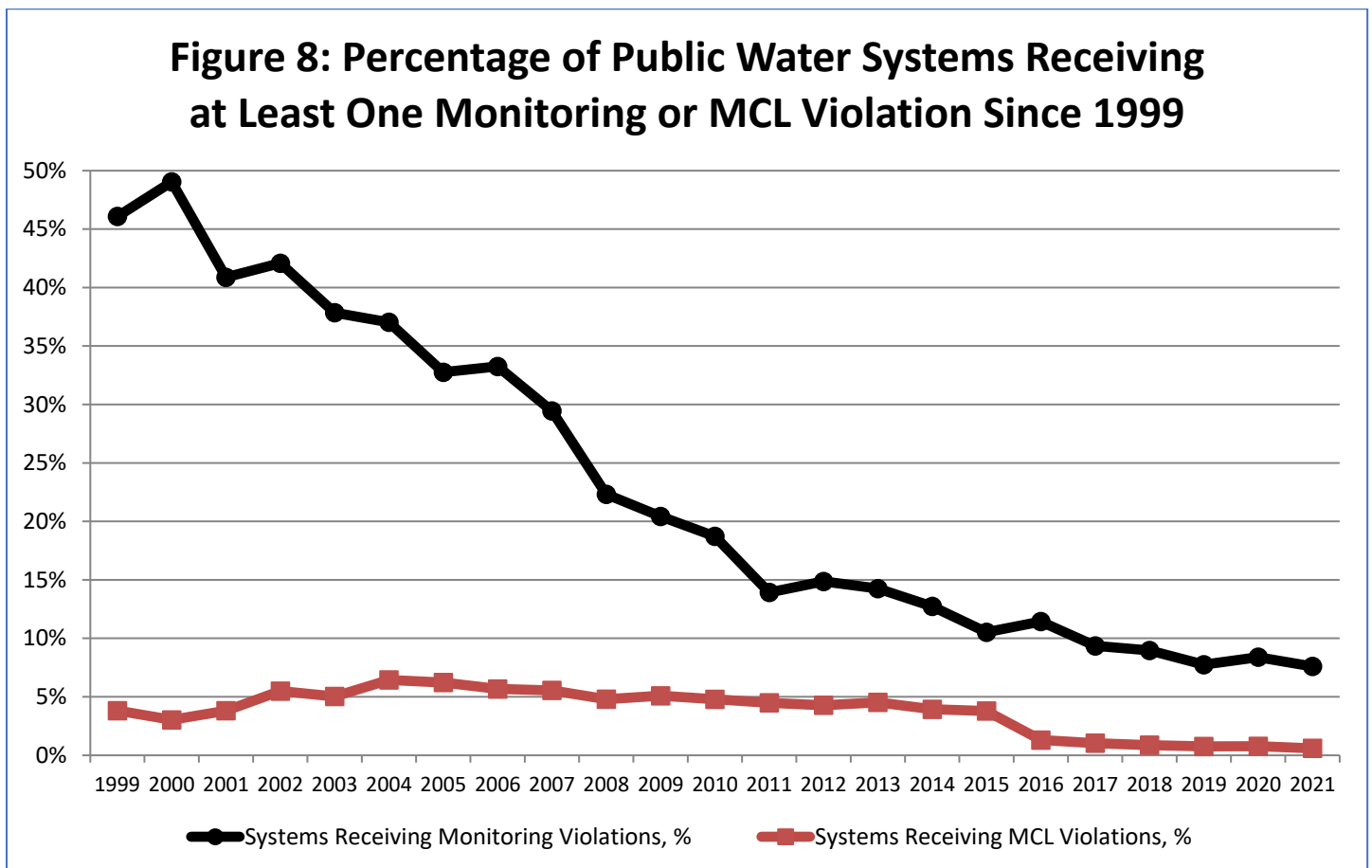


Table 2 (page 26) shows the number of water systems with at least one MCL or monitoring violation received in a calendar year. Calendar year 1999 is included as the baseline year, followed by data from the four most recent years. Systems are categorized by type and size of population served. Table 2 also shows the percentage of systems that received a notice of violation as compared to the total number of active water systems within each system category.

Monitoring violations occur when a water system fails to collect a required sample or to complete analytical tests within the required monitoring period. A typical community system monitors at least monthly and must conduct a significant number of required tests. A public water system missing a single analytical test during a given year would appear on the table as having a monitoring violation. Table 2 indicates that transient non-community water systems, which are not subject to the capacity development milestones discussed in Section 2.0 of this report, generally average a greater percentage of monitoring violations relative to the number of water systems of each type.

Maximum contaminant level violations indicate the number of systems with at least one contaminant exceeding permissible levels during the given year. Maximum contaminant level violations can be either acute, meaning the exceedance poses an immediate health risk, or chronic, meaning the exceedance poses a health risk if exposure continues for an extended amount of time. A typical system has many opportunities to test various contaminant levels throughout the year. Most systems receiving bacteriological MCL violations return to compliance by their next compliance period. A public water system receiving at least one violation during the year will appear in Table 2. This table has previously showed that transient non-community water systems averaged a greater percentage of MCL violations relative to the number of water systems of each type, until the year 2016. During 2016, the revised total coliform rule was implemented, eliminating the total coliform MCL violation type, which was the predominate MCL violation type for transient non-community water systems. See Appendix A for a schedule of new rule implementation.

Table 2: The Number of Public Water Systems with Maximum Contaminant Level (MCL) and Monitoring (MR) Violations

Calendar Year	Population	Community					Non-Transient Non-Community					Transient Non-Community					Totals				
		Systems	MCL	%	MR	%	Systems	MCL	%	MR	%	Systems	MCL	%	MR	%	Systems	MCL	%	MR	%
1999 (baseline)	< 500	1700	44	3%	483	28%	541	23	4%	174	32%	6038	265	4%	3322	55%	8279	332	4%	3979	48%
	500 - 9,999	555	9	2%	154	28%	132	1	1%	28	21%	87		0%	34	39%	774	10	1%	216	28%
	10,000 - 49,999	92	4	4%	15	16%											92	4	4%	15	16%
	≥ 50,000	24	1	4%	2	8%											24	1	4%	2	8%
	Totals	2371	58	2%	654	28%	673	24	4%	202	30%	6125	265	4%	3356	55%	9169	347	4%	4212	46%
2018	< 500	1341	12	1%	51	4%	268	4	1%	27	10%	2709	9	0%	259	10%	4318	25	1%	337	8%
	500 - 9,999	478	13	3%	52	11%	50	1	2%	3	6%	42	0	0%	4	10%	570	14	2%	59	10%
	10,000 - 49,999	110	4	4%	20	18%											110	4	4%	20	18%
	≥ 50,000	31	0	0%	3	10%											31	0	0%	3	10%
	Totals	1960	29	1%	126	6%	318	5	2%	30	9%	2751	9	0%	263	10%	5029	43	1%	419	8%
2019	< 500	1351	10	1%	71	5%	269	3	1%	20	7%	2726	4	0%	214	8%	4346	17	0%	305	7%
	500 - 9,999	479	10	2%	50	10%	49	1	2%	2	4%	42	0	0%	3	7%	570	11	2%	55	10%
	10,000 - 49,999	112	8	7%	7	6%											112	8	7%	7	6%
	≥ 50,000	31	1	3%	6	19%											31	1	3%	6	19%
	Totals	1973	29	1%	134	7%	318	4	1%	22	7%	2768	4	0%	217	8%	5059	37	1%	373	7%
2020	< 500	1357	8	1%	68	5%	273	1	0%	34	12%	2749	7	0%	246	9%	4379	16	0%	348	8%
	500 - 9,999	484	15	3%	47	10%	50	0	0%	10	20%	42	0	0%	6	14%	576	15	3%	63	11%
	10,000 - 49,999	113	7	6%	17	15%											113	7	6%	17	15%
	≥ 50,000	31	1	3%	1	3%											31	1	3%	1	3%
	Totals	1985	31	2%	133	7%	323	1	0%	44	14%	2791	7	0%	252	9%	5099	39	1%	429	8%
2021	< 500	1364	5	0%	62	5%	276	2	1%	22	8%	2790	9	0%	244	9%	4430	16	0%	328	7%
	500 - 9,999	485	10	2%	41	8%	51	0	0%	9	18%	42	0	0%	3	7%	578	10	2%	53	9%
	10,000 - 49,999	115	4	3%	9	8%											115	4	3%	9	8%
	≥ 50,000	31	1	3%	2	6%											31	1	3%	2	6%
	Totals	1995	20	1%	114	6%	327	2	1%	31	9%	2832	9	0%	247	9%	5154	31	1%	392	8%

4.2 Population Served by Compliant Community Water Systems

Another method of evaluating the status of the state’s public water systems, their compliance, and associated public health protection is to examine the number of people served by compliant public water systems. Table 3 below provides the population served by compliant community water systems as a percentage of the total population served by community water systems. As shown in Table 3, the percentage of the total population served by community water systems that are compliant with all applicable health-based drinking water standards in North Carolina has exceeded 95 percent for the last four years. In fact, the percentage of the total population served by compliant community water systems in North Carolina did not drop below 95 percent from 2013 through 2021.

In 2021, systems with no MCL violations served approximately 99 percent of the state’s community water system service population, and community water systems with no monitoring violations served approximately 91 percent of the service population. Community water systems that received more than one MCL violation served approximately 0.54 percent of the service population. Four community systems, comprising approximately 0.61 percent of the service population, received an MCL violation for acute contaminants. Acute contaminants differ from chronic contaminants because they can cause an immediate health risk. The issuance of MCL violations to community water systems for acute contaminants is rare in the State of North Carolina.

Table 3: Population Served by Compliant Community Public Water Systems

Calendar Year	Citizens Served by Community Public Water Systems having No MCL* Violations		Citizens Served by Community Public Water Systems having No MR† Violations		Total Service Population
	Population‡	Percent	Population	Percent	
1999 (baseline)	6,475,188	97.5	5,806,471	87.4	6,641,864
2018	8,773,934	98.9	7,787,349	87.8	8,867,297
2019	8,861,667	97.5	7,869,205	86.6	9,087,039
2020	8,990,296	96.8	8,799,265	94.7	9,289,933
2021	9,304,183	98.6	8,628,407	91.4	9,436,496

* “MCL” means a violation with regards to the maximum permissible contaminant level in water delivered by a public water system.

† “MR” means a failure to monitor for required water quality tests as defined by federal and state regulations and for 1999 through the first half of 2005 includes systems that failed to report on time.

‡ 1999 population data is based on last available record prior to Oct. 1, 2005.

4.3 New System Performance

The Public Water Supply Section evaluates performance of new public water systems by tracking compliance rates following their initial date of operation. Table 4 (page 29) compares new system performance to the performance of all systems during the period from 2019 through 2021, and indicates what percentage of these systems are considered “small” systems. Small systems are public water systems that regularly serve less than 500 people. These data show that new community and non-transient non-community water systems, which have completed the capacity development milestones and benefited from Public Water Supply staff outreach, exhibit similar compliance with MCL requirements as existing systems.

Table 5 (page 30) shows the beginning year of new systems and the historic compliance trends of those systems that have remained active. In general, these systems exhibit improving compliance rates as time increases, meaning that the longer a system is in operation, the more capable it is to comply with state and federal regulations. This implies that the planning inherent in the capacity development process, the technical assistance delivered by the Public Water Supply Section during the process, and increased familiarity and experience helps to improve the compliance of new water systems. However, the compliance trends displayed also show remaining room for improvement, which the Section will continue to seek in its ongoing effort to support compliance and achieve its mission.

Table 4: Comparison of Contaminant and Monitoring Violations for Existing Active Public Water Systems and Systems Permitted Between 2019 to 2021

System Type	Compliance Period (Years)	Community Systems						Non-Transient Non-Community Systems						All Active Systems (Totals)					
		Systems	SS*	MCL	%	MR	%	Systems	SS	MCL	%	MR	%	Systems	SS	MCL	%	MR	%
Compliance for All Active Systems	2019-2021	1,996	69%	64	3%	377	19%	327	84%	7	2%	90	28%	2,323	71%	71	3%	467	20%
Compliance for New, Properly Permitted Systems	2019-2021	34	91%	0	0%	8	24%	9	67%	0	0%	3	33%	43	86%	0	0%	11	26%

* *Small Systems (SS)* indicates percent of systems that serve less than 500 persons and operated during the indicated year.

Table 5: The Number of Public Water Systems Beginning Operation Between 2014 and 2021 with Contaminant and Monitoring Violations

System Begins (Year)	Compliance Period (Year) †	Community						Non-Transient Non-Community						Transient Non-Community						TOTALS					
		Systems	SS*	MCL	%	MR†	%	Systems	SS	MCL	%	MR	%	Systems	SS	MCL	%	MR	%	Systems	SS	MCL	%	MR	%
2014	2014	4	75%	0	0%	2	50%	2	50%	0	0%	0	0%	22	100%	2	9%	6	27%	28	93%	2	7%	8	29%
	2015	4	75%	0	0%	1	25%	2	50%	0	0%	1	50%	21	100%	1	5%	4	19%	27	93%	1	4%	6	22%
	2016	4	75%	0	0%	0	0%	2	50%	0	0%	0	0%	20	100%	0	0%	4	20%	26	92%	0	0%	4	15%
	2017	4	75%	0	0%	2	50%	1	0%	0	0%	0	0%	19	100%	0	0%	1	5%	24	92%	0	0%	3	13%
	2018	4	75%	0	0%	1	25%	1	0%	0	0%	0	0%	19	100%	0	0%	1	5%	24	92%	0	0%	2	8%
	2019	4	75%	0	0%	0	0%	1	0%	0	0%	0	0%	19	100%	0	0%	2	11%	24	92%	0	0%	2	8%
	2020	4	75%	0	0%	0	0%	1	0%	0	0%	0	0%	18	100%	0	0%	1	6%	23	91%	0	0%	1	4%
	2021	4	75%	0	0%	0	0%	1	0%	0	0%	1	100%	19	100%	0	0%	2	11%	23	92%	0	0%	3	13%
2015	2015	5	100%	0	0%	0	0%	1	100%	0	0%	0	0%	21	100%	2	10%	7	33%	27	100%	2	7%	7	26%
	2016	5	80%	0	0%	0	0%	1	100%	0	0%	0	0%	20	100%	0	0%	6	30%	26	96%	0	0%	6	23%
	2017	5	80%	0	0%	0	0%	1	100%	0	0%	0	0%	20	100%	0	0%	2	10%	26	96%	0	0%	2	8%
	2018	5	80%	0	0%	1	20%	1	100%	0	0%	0	0%	20	100%	0	0%	3	15%	26	96%	0	0%	4	15%
	2019	5	80%	0	0%	1	20%	1	100%	0	0%	0	0%	20	100%	0	0%	2	10%	26	96%	0	0%	3	12%
	2020	5	80%	0	0%	0	0%	1	100%	0	0%	0	0%	20	100%	0	0%	2	10%	26	96%	0	0%	2	8%
	2021	5	80%	0	0%	0	0%	1	100%	0	0%	0	0%	20	100%	0	0%	1	5%	26	96%	0	0%	1	4%
2016	2016	14	93%	1	7%	2	14%	0	0%	0	0%	0	0%	38	100%	0	0%	17	45%	52	98%	1	2%	19	37%
	2017	13	92%	1	8%	2	15%	0	0%	0	0%	0	0%	36	100%	0	0%	3	8%	49	98%	1	2%	5	10%
	2018	13	92%	0	0%	1	8%	0	0%	0	0%	0	0%	35	100%	0	0%	3	9%	48	98%	0	0%	4	8%
	2019	13	92%	0	0%	3	23%	0	0%	0	0%	0	0%	35	100%	0	0%	2	6%	48	98%	0	0%	5	10%
	2020	13	92%	0	0%	1	8%	0	0%	0	0%	0	0%	35	100%	0	0%	1	3%	48	98%	0	0%	2	4%
	2021	13	92%	0	0%	0	0%	0	0%	0	0%	0	0%	35	100%	1	3%	1	3%	48	98%	1	2%	1	2%
2017	2017	9	78%	0	0%	1	11%	2	50%	0	0%	1	50%	29	100%	0	0%	5	17%	40	93%	0	0%	7	18%
	2018	9	78%	0	0%	0	0%	2	50%	1	50%	0	0%	29	100%	0	0%	4	14%	40	93%	1	3%	4	10%
	2019	9	78%	0	0%	0	0%	2	50%	1	50%	0	0%	29	100%	0	0%	1	3%	40	93%	1	3%	1	3%
	2020	9	78%	0	0%	1	11%	2	50%	0	0%	1	50%	29	100%	0	0%	2	7%	40	93%	0	0%	4	10%
	2021	9	78%	0	0%	0	0%	2	50%	0	0%	1	50%	29	100%	0	0%	1	3%	40	93%	0	0%	2	5%
2018	2018	19	79%	0	0%	5	26%	3	100%	0	0%	1	33%	30	100%	0	0%	6	20%	52	92%	0	0%	12	23%
	2019	19	79%	0	0%	1	5%	3	100%	0	0%	0	0%	30	100%	0	0%	3	10%	52	92%	0	0%	4	8%
	2020	19	79%	0	0%	1	5%	3	100%	0	0%	1	33%	30	100%	0	0%	3	10%	52	92%	0	0%	5	10%
	2021	19	79%	0	0%	0	0%	3	100%	0	0%	0	0%	30	100%	0	0%	6	20%	52	92%	0	0%	6	12%
2019	2019	13	85%	0	0%	3	23%	0	0%	0	0%	0	0%	23	100%	0	0%	5	22%	36	94%	0	0%	8	22%
	2020	13	85%	0	0%	2	15%	0	0%	0	0%	0	0%	23	100%	1	4%	3	13%	36	94%	1	3%	5	14%
	2021	13	85%	0	0%	0	0%	0	0%	0	0%	0	0%	23	100%	0	0%	2	9%	36	94%	0	0%	2	6%
2020	2020	12	92%	0	0%	2	17%	5	60%	0	0%	2	40%	23	100%	0	0%	4	17%	40	93%	0	0%	8	20%
	2021	12	92%	0	0%	0	0%	5	60%	0	0%	1	20%	23	100%	0	0%	3	13%	40	93%	0	0%	4	10%
2021	2021	9	100%	0	0%	1	11%	4	75%	0	0%	1	25%	35	100%	0	0%	9	26%	48	98%	0	0%	11	23%

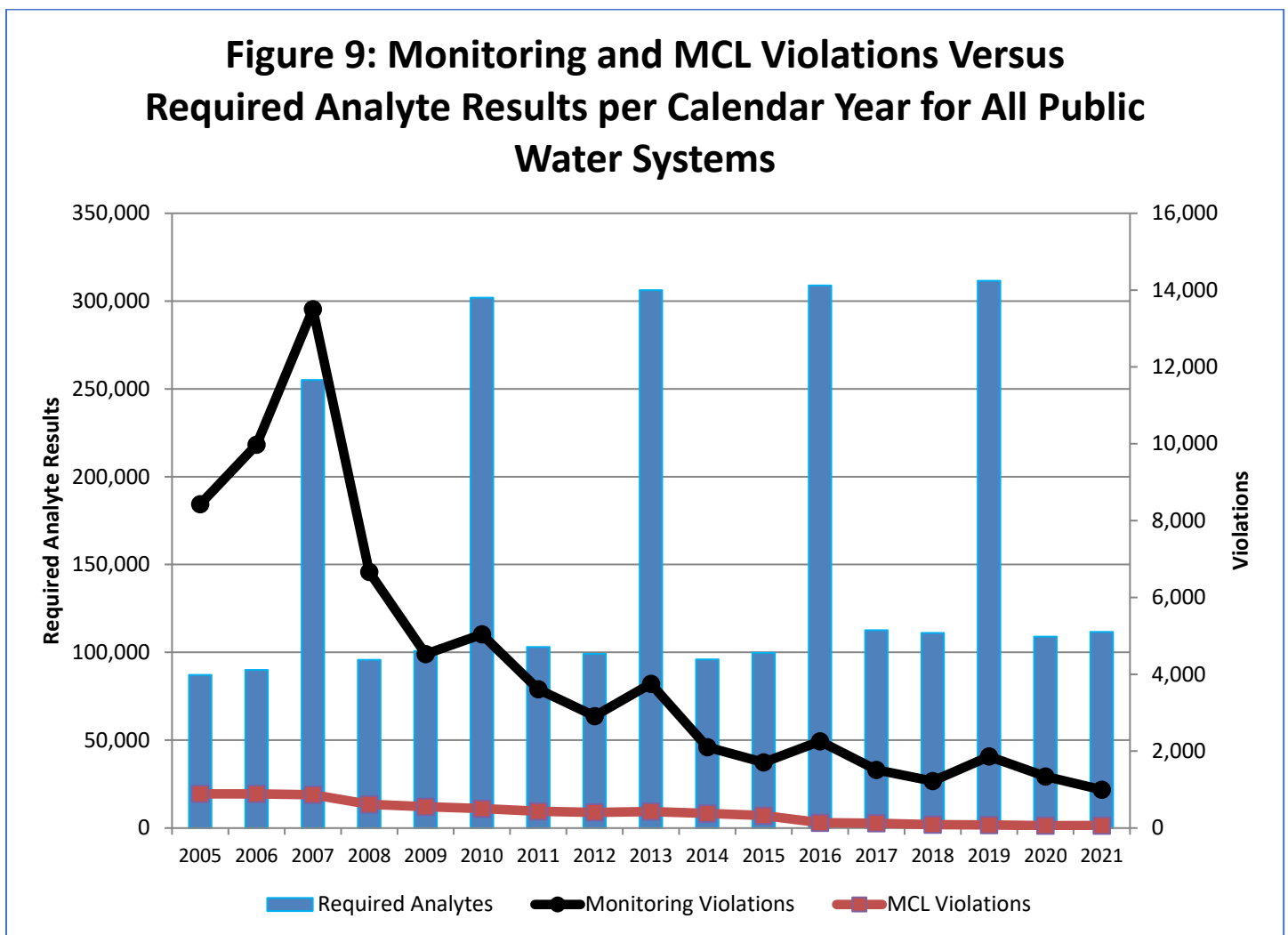
* *Small Systems (SS)* indicates percent of systems that serve less than 500 persons and operated during the indicated year.

† *Compliance Period (Year)* summarizes the number of new systems that remain active and their compliance for each subsequent compliance period. For example, in 2020, only 13 of the 14 community systems that began operation in 2016 were still active.

4.4 Violations Versus Required Contaminant Sampling Events

The Public Water Supply Section analyzed contaminant monitoring schedules from 2005 through 2021 with respect to the total number of analytes, because many contaminant schedules include multiple analytes. Each analyte is a chemical compound, element, or specific biological group required for analysis under state and federal rules, and omission of a single analyte results in a violation. Staff compared the number of analytes required for analysis to the number of monitoring and MCL violations issued for each calendar year during 2005 through 2021.

Figure 9 shows the total number of required analyte results as bars (referenced by the scale on the left axis) versus the number of monitoring and MCL violations as lines (referenced by the scale on the right axis) issued to water systems during each calendar year. This figure shows that despite the substantial number of analyte results required for analysis, the number of violations has decreased significantly since 2005. Many federal drinking water rules require three-year cyclical sampling to be performed and reported by the end of the three-year compliance periods ending in 2007, 2010, 2013, 2016, 2019, etc. The large increases of required analyte results in 2007, 2010, 2013, 2016, and 2019 are due to these three-year compliance periods. Triennial samples that were not collected in 2007 resulted in the large spike in monitoring violations. The 2010, 2013, 2016, and 2019 data do not show as significant of a spike, which implies that activities performed by regional office staff, outreach efforts by central office staff, training events hosted by the Public Water Supply Section, and other programs had a positive effect on monitoring compliance. Note that MCL violations dropped from 889 to 63, which denotes a 93 percent reduction in MCL violations over the 16-year period.



4.5 Compliance Oversight Analysis

The population of North Carolina continues to grow, and with the influx of new consumers, there is continual emphasis on providing safe and sustainable drinking water. In fact, the availability of safe and sustainable drinking water is likely one of the drivers of the state's growth. Therefore, the mission of the Public Water Supply Section remains relevant. It is reasonable to assume that as the Public Water Supply Section implements activities to achieve its mission, the percentage of consumers being served safe water from compliant public water systems will increase. This appears to be the case when either maximum contaminant level violations or monitoring violations are used to indicate potential problems with the water system.

Figure 10 (page 33) and Figure 11 (page 34) demonstrate long-term trends regarding drinking water resources. Both figures show a general upward trend of the State's population being served by fully compliant community water systems. The charts also show a steady decrease in the population not served by a community system, beginning around 2005. It is interesting to note that the population consuming water from a system that was issued a violation appears to fluctuate. So, although there may be variations in violations issued, the long-term averages remain low and are below recent EPA expectations provided to state programs.

Maintaining public health requires ongoing and scheduled testing for contaminants in the finished water. This occurs regularly for public water systems. In contrast, private wells are typically sampled only once, and this occurs at the time of installation. Therefore, water provided by compliant public water systems is deemed safer when the analysis demonstrates contaminants are below regulatory thresholds, which as discussed reflects the vast majority of public water systems in the state. In general, the data show that an increasing number of consumers are being served safe and sustainable drinking water.

Figure 10: NC Population with Access to Safe Water at Home - MCL

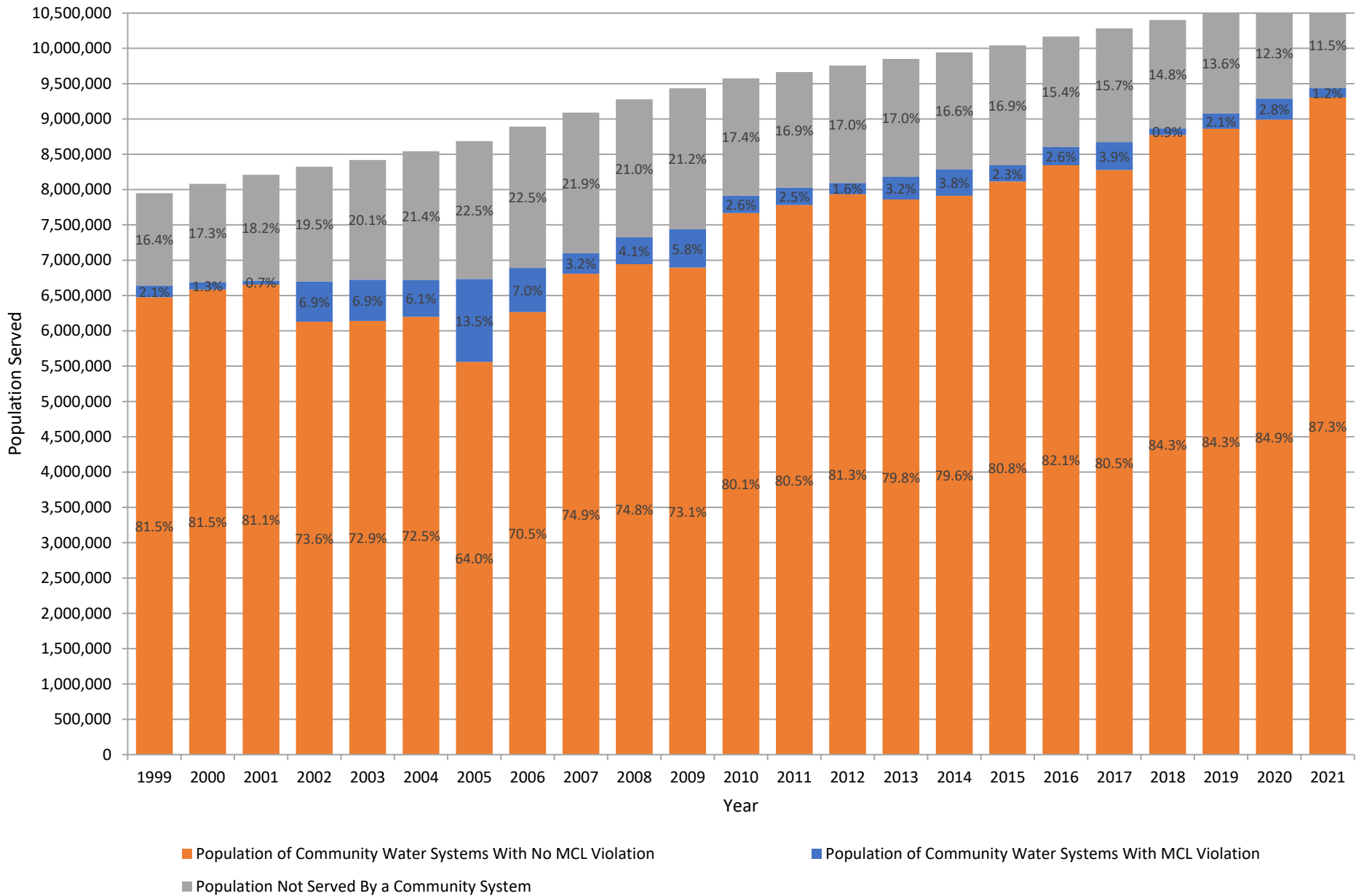
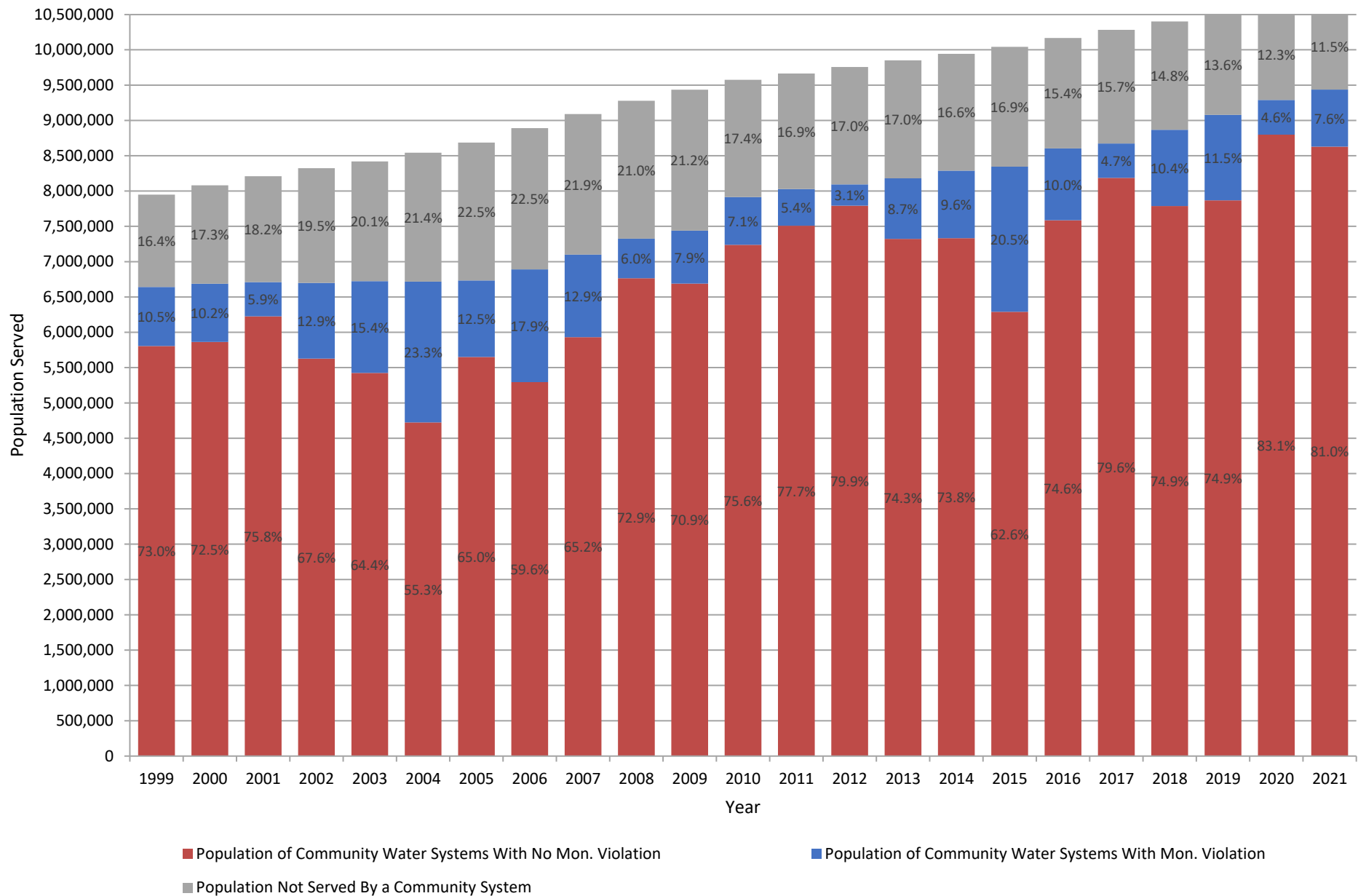


Figure 11: NC Population with Access to Safe Water at Home - Monitoring



5.0 Conclusion

Water system compliance has increased significantly since the Public Water Supply Section began implementing the proactive strategies outlined in this report. The Section continues to use data to identify areas requiring more intensive technical and compliance assistance. In addition, Section staff continue to pursue a wide range of activities designed to accomplish the mission of assuring that the public receives adequate drinking water from water systems that are properly located, constructed, operated, and maintained. The Section's approach has resulted in more consumers being served safe and sustainable drinking water than ever before. This conclusion remains true, even amid a backdrop of increasing population and more regulatory constraints on the state's public water systems.

The Public Water Supply Section historically expends effort to implement new and/or revised federal drinking water rules, and this activity will likely intensify, especially considering the current national focus on unregulated compounds. New outreach strategies developed by the Section are a function of outcomes from an established process by EPA to study the occurrence, health impacts, treatment and economic ramifications of new regulations. Section staff are knowledgeable of and remain involved with EPA's process to collect information used to support any new regulatory requirements. For example, the Section has a partnership agreement with EPA to assist with the Unregulated Contaminant Monitoring Rule (UCMR), which results in occurrence data of compounds at water systems across the state. Although regulatory changes often add complexities to water facility operations, the Public Water Supply Section continues to add new initiatives to assist water systems in further improving compliance. These efforts appear to be working. For example, compliance with sample collection and monitoring requirements has increased from 55 percent of systems in 1999 to 92 percent of all systems in 2021, while compliance with MCLs is already lower than EPA targets and has remained roughly constant over time.

In summary, the Public Water Supply Section focuses the intent of all activities to increase water system compliance and the protection of public health such that its mission is achieved. General activities that provide the backbone of our activities require engagement from all staff, and these include:

- Regional office site visits;
- Inspections, technical assistance site visits, trainings and outreach activities;
- Providing instruction for operators at state operator schools;
- Review and approval of water system infrastructure plans;
- Certification and training of water system operators; and
- Partnerships with other institutions to increase system outreach activities and develop tools to aid in achieving and maintaining compliance.

Although public drinking water will never be a product with zero-risk, the activities discussed in this report continue to result in safer drinking water for consumers throughout the state by providing an ever-growing percentage of systems that meet all monitoring requirements and federal regulatory standards. These activities will continue to be crucial to achieving and maintaining water system compliance and public confidence in the product they provide.

Appendix A

Table A.1: Schedule of New Rule Implementation by EPA

Calendar Year	Rule	New Monitoring Requirements	New Level (MCL or Treatment Technique) Requirements	System Description
2002	Arsenic		MCL lowered from 0.05 mg/l to 0.01 mg/l	CWS, NTNC
2002	Disinfectants and Disinfection Byproducts Rule (DDBP)	THM and HAA quarterly sampling	THM MCL lowered from 0.10 mg/L to 0.080 mg/L as a running annual average (RAA). HAA MCL established at 0.060 mg/L as RAA.	CWS, NTNC Subpart H, population ≥ 10,000
2002	DDBP	Disinfectant residual monthly sampling (with total coliform rule schedule)	Chlorine and chloramines maximum residual disinfectant level established at 4.0 mg/L as RAA.	CWS, NTNC Subpart H, population ≥ 10,000
2002	DDBP	Total organic carbon (TOC) monthly monitoring	Treatment technique for TOC removal; ratio of actual to required removal ≥ 1.00 as RAA.	CWS, NTNC Subpart H, population ≥ 10,000
2002	DDBP	Bromate monthly monitoring	Bromate < 0.010 as RAA.	CWS, NTNC Subpart H using ozone, population ≥ 10,000
2002	Interim Enhanced Surface Water Treatment Rule (IESWTR)	Profiling and benchmarking		All system types Subpart H, population ≥ 10,000
2002	IESWTR	Turbidity	Maximum turbidity level lowered from 5 NTU to 1 NTU. 95% turbidity level lowered from 1 NTU to 0.3 NTU.	All system types Subpart H, population ≥ 10,000
2004	DDBP	THM and HAA quarterly or annual sampling	THM MCL lowered from 0.10 mg/L to 0.080 mg/L as RAA. HAA MCL established at 0.060 mg/L as RAA.	CWS, NTNC Subpart H including populations < 10,000; Groundwater
2004	DDBP	Disinfectant residual monthly sampling (with TCR schedule)	Chlorine and chloramine maximum residual disinfectant levels established at 4.0 mg/L as RAA.	CWS, NTNC Subpart H including populations < 10,000; Groundwater
2004	DDBP	TOC monthly monitoring	Treatment technique for TOC removal; ratio of actual to required removal ≥ 1.00 as RAA.	CWS, NTNC Subpart H including populations < 10000
2004	DDBP	Bromate monthly monitoring	Bromate < 0.010 as RAA.	CWS, NTNC Subpart H including populations < 10,000; Groundwater

Cont'd on page A-3

Table A.1 cont'd: Schedule of New Rule Implementation by EPA

Calendar Year	Rule	New Monitoring Requirements	New Level (MCL or Treatment Technique) Requirements	System Description
2005	Long Term 1 Surface Water Treatment Rule (LT1SWTR)	Profiling and benchmarking		All system types Subpart H, populations < 10,000
2005	LT1SWTR	Turbidity	Maximum turbidity level lowered from 5 NTU to 1 NTU. 95% turbidity level lowered from 1 NTU to 0.3 NTU.	All system types Subpart H, populations < 10,000
2008	Radionuclides	Radium 228, monitored at each entry point	Although new radionuclides monitoring requirements do not take effect until 2008, a number of systems began monitoring early in order to grandfather data. Early monitoring led to additional MCL violations.	CWS
2009	Ground Water Rule	Microbial source water monitoring	Introduces source water monitoring requirements and treatment technique requirements for groundwater systems.	All system types Not Subpart H
2012	Stage 2 Disinfectant / Disinfection Byproducts Rule (Schedule 1 and 2 systems)	Location-specific sampling points in the distribution system	MCLs and regulated contaminants do not change but compliance is calculated by locational running annual average. Every sampling site must be compliant with MCL.	CWS and NTNC, populations ≥ 50,000 and purchasing systems
2013	Stage 2 Disinfectant / Disinfection Byproducts Rule (Schedule 3 and 4 systems)	Location-specific sampling points in the distribution system	MCLs and regulated contaminants do not change but compliance is calculated by locational running annual average. Every sampling site must be compliant with MCL.	CWS and NTNC, populations ≤ 49,999
2014	Stage 2 Disinfectant / Disinfection Byproducts Rule (Required <i>Cryptosporidium</i> monitoring systems)	Location-specific sampling points in the distribution system	MCLs and regulated contaminants do not change but compliance is calculated by locational running annual average. Every sampling site must be compliant with MCL.	CWS and NTNC systems required to collect <i>Cryptosporidium</i> samples under §141.701(a)(4) or (a)(6)
2016	Revised Total Coliform Rule (RTCR)	Number of repeat and additional routine samples standardized	Level 1 and Level 2 assessments replace treatment technique violations for the presence of total coliform.	All system types