Report to Governor

CAPACITY DEVELOPMENT
for
MARYLAND PUBLIC DRINKING WATER SYSTEMS
Calendar Years 2017 - 2019

Department of the Environment
Water Supply Program

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Larry Hogan
Governor

Boyd Rutherford
Lt. Governor

Ben Grumbles
Secretary

Executive Summary

Ensuring safe and adequate drinking water supplies for Maryland's citizens is one of the primary responsibilities of the Maryland Department of the Environment (MDE). MDE oversees numerous programs and activities to make sure that public drinking water systems are constructed, operated, and maintained in a manner that ensures the drinking water produced by public water systems is safe to consume, and that there is an adequate supply to meet current and future needs. MDE's Water Supply Program (WSP) accomplishes this goal through the implementation of the federal Safe Drinking Water Act (SDWA).

SDWA requires that states develop programs to ensure that both new and existing water systems have the technical, financial, and managerial capacity to provide safe drinking water to their customers. In 1999, Maryland adopted regulations requiring owners of new water systems to demonstrate that their systems are viable and have adequate capacity. In 2001, the U.S. Environmental Protection Agency (EPA) approved Maryland's capacity development strategy to improve the capability of Maryland's existing public drinking water systems. The strategy was revised in 2009, and 2017. Maryland's primary strategy for improving capacity in existing systems is to identify the areas of greatest need and focus technical assistance and training efforts toward those areas. In addition, WSP undertakes many other activities that help water systems remain in compliance, including routine inspections, funding assistance, onsite technical assistance, operator training, laboratory certifications, source water assessment, and consolidations of water systems, where appropriate.

EPA requires states to prepare triennial reports to their Governor, focusing on two main components, capacity development authority for new public water systems, and capacity development strategy for existing public water systems. EPA may withhold 20% of a state's funding if the state fails to submit a triennial report.

This triennial implementation report details Maryland's capacity development program for new and existing water systems, and the progress made toward improving capacity; it summarizes activities for calendar years 2017 through 2019. Data pertaining to MDE's current efforts to improve water system capacity are compared with baseline data collected in 2001 to assess improvements in water system capacity. Through these efforts, Maryland has maintained one of the highest rates of compliance among all states, ensuring the safety of the drinking water for more than six million Marylanders who rely on water provided by more than 3,200 public water systems.

Introduction

Ensuring safe and adequate drinking water supplies for Maryland citizens is one of the primary responsibilities of MDE. Community water systems throughout the State provide drinking water for almost 88% of Marylanders. MDE oversees numerous programs and activities to make sure that public drinking water systems are constructed, operated, and maintained in a manner that ensures the drinking water produced by these systems is safe to consume, and that there is an adequate supply to meet current and future needs.

The 1996 SDWA Amendments required States to develop a program to strengthen the managerial, technical and financial capacity of water systems to reliably deliver safe drinking water. State capacity development programs must have two main components: (1) legal authority to ensure that new water systems have sufficient technical, managerial, and financial capacity to meet drinking water standards; and (2) a strategy to identify and assist existing water systems needing improvements in managerial, technical, or financial capacity to comply with standards. Maryland's legal authority for ensuring that new water systems have sufficient technical, managerial, and financial capacity was established in regulations adopted in 1999, Code of Maryland Regulations (COMAR) 26.04.01.36. Maryland's strategy for improving public drinking water system capacity was originally approved by the EPA in 2001, and most recently revised in 2017. In 2021, the strategy will be revised to include asset management, as required by the 2018 federal American Water Infrastructure Act, and some of our newest initiatives, such as eliminating lead in daycare drinking water and studying emerging concerns such as per- and polyfluoroalkyl substances (PFAS) and harmful algal blooms.

This triennial report on the efficacy of Maryland's capacity development strategy for public drinking water systems has been prepared for the Governor's Office in accordance with Section 1420 (c)(3) of SDWA. Reports on public water system capacity development have been submitted triennially to the Governor's Office since 2002. This report documents capacity development progress and evaluates the effectiveness of the State's capacity development strategy as reflected by inspection and compliance data collected through CY19. This report will be published through MDE's website.

The capacity of a public water system is the system's ability to consistently produce and deliver water that meets all the national primary drinking water regulations. The assessment of a water system's capacity analyzes three components: technical, managerial, and financial. Technical capacity refers to the physical infrastructure of the public water system (the adequacy of the source water, wells, water intakes, treatment, storage, and distribution), as well as the technical knowledge of system personnel and their ability to apply technical knowledge. Managerial capacity includes ownership accountability, staffing and organization, and the effectiveness of relationships with consumers and regulatory agencies. Financial capacity refers to the financial resources of the water system, including credit worthiness, fiscal controls and the ability to generate sufficient revenue.

A public water system is any facility that serves 25 or more individuals for more than 60 days per year. There are three types of public water systems. Community water systems (CWS), serve year-round residential consumers. Non-transient non-community (NTNCWS) water systems serve recurring consumers, such as a school or daycare, and transient non-community (TNCWS)

water systems serve different consumers each day, such as a campground or rural restaurant that have their own water source. Almost 88% of Maryland's population, approximately 5.3 million people, is served by a community water system.

Table 1 provides information about Maryland water systems and the population they serve.

Table 1

Drinking Water Statistics	2019	2016	2013	2010	2007	2004	2001
Population of Maryland	6,045,680	6,016,447	5,928,814	5,773,552	5,618,344	5,558,058	5,296,486
Individuals served by community water systems	5,370,003	5,107,864	5,057,350	4,989,406	4,844,668	4,846,923	4,438,335
Percent of population served by community water systems	89%	85%	85%	86%	86%	87%	84%
Percent of population served by individual wells	11%	15%	15%	14%	14%	13%	16%
Number of public water systems	3,251	3,295	3,396	3,432	3,533	3,692	3,816
Number of community water systems (CWS)	463	464	474	473	486	502	503
Number of non-community non- transient community water systems (NTNCWS)	541	532	544	550	559	576	568
Number of transient non-community water systems (TNCWS)	2,247	2,299	2,378	2,409	2,488	2,614	2,745
Number of systems using surface water[1]	74	65	60	59	69	66	64
Number of systems using only ground water[1]	3,177	3,230	3,336	3,373	3,464	3,626	3,752

[1]This includes consecutive systems.
Note: Data was collected on 11/20/2020 from EPA's SDWIS-State database.

WSP is responsible for implementation of SDWA in Maryland. In 2001, WSP, in response to the SDWA's requirements, developed a strategy, which was approved by the EPA, to implement capacity development for existing water systems in Maryland. In order to focus capacity development efforts, MDE identifies areas where training is most needed to improve the ability of systems to supply safe drinking water to their customers. Training and technical assistance needs are identified through various sources of information, including a system self-assessment, compliance results, and onsite inspections of water systems. Collaborative relationships with various training organizations are used to target areas of greatest need.

As new issues have arisen, which were not fully addressed by the original capacity development strategy, revisions have been made to the strategy. In 2002, Maryland experienced severe drought conditions that highlighted the need for comprehensive assessment and response activities related to drought. Recent estimates of growth potential and water availability indicate that several communities could experience water shortages unless steps are taken to better understand the hydrologic system and to carefully plan for future water needs. MDE revised the capacity development strategy to provide for enhancement of activities related to ensuring adequate and sustainable water supplies for Maryland public water systems. For public water systems with supplies that are vulnerable to drought conditions, MDE has implemented measures through its permitting process, requiring water systems to have additional capacity in reserve through securing alternative water sources, executing agreements with nearby water systems, or exploring other feasible options. Additionally, MDE developed and provided water systems with guidance on preparing for climate change.

The revised strategy continues to identify and promote appropriate training and technical assistance efforts for water systems as a primary component of Maryland's capacity development efforts. The first revision improved the existing program by enhancing the State's drought management program, conducting hydrologic studies of both the Fractured Rock and Coastal Plain regions of the State, assisting water systems with developing and implementing capacity management plans and water resource elements for their comprehensive plans, and promoting water systems' use of conservation technologies. MDE has also incorporated recommendations for climate change and resiliency, water system security, and emergency response and recovery into the training for water systems.

In 2017, House Bill 270, signed by the Governor, required regulations to be developed that require all public and non-public schools in Maryland test for lead. The capacity development plan revision for 2017 includes this new initiative.

Following this recent progress to protect children in schools, Maryland is now expanding this effort to include Child Care Centers (CCCs), which serve a younger and even more vulnerable population. With the funding appropriated under Section 1464(d) of the SDWA, amended by the Water Infrastructure Improvement Act section 2107, MDE plans to expand availability of lead testing of drinking water outlets to licensed CCCs. This will include the prioritization of CCCs serving younger children (ages 6 and under), disadvantaged and underserved communities, and facilities that are older and more likely to contain lead plumbing.

Challenges

Several factors present challenges for capacity development in Maryland water systems. Most Maryland water systems are very small. In Maryland, 341 out of 464 community water systems serve a population of 1,000 or less people. Smaller water systems typically have limited resources and expertise, which often results in postponed preventive maintenance work, limited ability to retain qualified water system operators, and lack of finances to improve infrastructure.

Additionally, growth has led to several new housing and commercial developments in rural areas, exacerbating already limited resources. Population is a challenge that has been taxing for small and medium sized communities. For example, since 2014, the population served by Maryland's community water systems has increased by approximately 217,000, translating to an additional demand of 19 million gallons per day. In some cases, water supply systems' sources or treatment plants are inadequate to meet projected needs. Additionally, aging infrastructure, shrinking resources, ever-increasing regulatory compliance requirements, and potential climate change impacts, are sometimes more than small systems can manage. For example, since 2001, 10 new regulations which originated at the federal level, have been promulgated, some of which required new infrastructure. According to the latest survey by the EPA in 2015, Maryland's total capital need for the next 20 years is $9.3 billion!

Changes in treatment technology and complex regulations require water system operators to increase their knowledge and receive additional training to keep up with the new requirements. Relatively low operator salary levels, combined with a shrinking pool of qualified workers have made it increasingly difficult for water systems to attract and retain competent operators.

Emerging contaminants are another major challenge in MDE's efforts to ensure the safety of Maryland's drinking water. MDE has recently initiated the first phase of a statewide assessment to assess the occurrence of PFAS in a subset of CWSs. MDE is also starting a project to assess harmful algae toxins in 19 Maryland drinking water reservoirs (pre-treatment).

The Effectiveness of Maryland's Strategy

The effectiveness of Maryland's capacity development strategy is measured through analysis of the progress that has been made toward improving the technical, managerial, and financial capacity of water systems in the State. To that end, information gathered from program databases, sanitary survey inspection records, and surveys of public water systems are used to identify performance areas that have improved, and areas where additional capacity development efforts are needed.

The sources of baseline values included a self-assessment survey, regulatory compliance data, operator certification statistics and information from sanitary survey inspections. A list of 2001 baseline values and comparable 2019 values can be found in Table 2. The following is a discussion of the sources of each of the major components of the baseline:

In 2016, MDE replaced the legacy database, Public Drinking Water Information System with the federal database, SDWIS-State. The SDWIS-State database includes information about water system compliance with water quality standards as well as monitoring and reporting requirements. This database, which has enhanced compliance tracking tools, will help WSP continuously monitor the progress of water systems in developing technical and managerial capacity.

A sanitary survey is an onsite inspection of a water system that includes an inspection of the sources, the water treatment plant, the storage and distribution systems, and a review of water quality test results and operating and maintenance procedures. Sanitary surveys allow staff to identify significant sanitary defects as well as deficiencies that are not regulatory violations, but have potential public health impacts, and may be an indication of problems with technical capacity. WSP works with water systems to help them correct deficiencies and improve their capacity to provide safe and adequate water to their customers.

During sanitary surveys, WSP provides guidance and review of standard operating procedures, emergency plans, and other technical and managerial documentation. In addition to improving the technical capacity of the water system, the sanitary survey is often used as a tool for initiating improvements in managerial and financial capacity. The frequency of sanitary surveys ranges from approximately once per year to once every three or five years, depending on the size and type of system, and whether the source is groundwater or surface water.

A self-assessment survey was circulated to all community water systems in 2001, 2007, 2014, and 2020. Survey questions were initially formulated by a workgroup of representatives from local, state and federal public agencies, and private industry to solicit information about the technical, managerial and financial capacity of Maryland's public water systems. It should be noted that while efforts were made by MDE to improve the response rate for the 2020 survey, a final response rate of 46% was achieved, similar to the 2007 survey response. Efforts to increase the response rate included administering the 2020 survey electronically, using an internet-based

survey application, reducing the number of the questions, and making follow up calls to offer assistance. The COVID-19 pandemic may have influence/impacted survey responses/results.

Table 2 provides a summary of the measurement of 12 technical, financial and managerial baseline criteria since 2001:

Table 2

Data Source	Measure of Capacity		2019	2014	2007	2001
	Technical:					
Enforcement Targeting Tool (ETT) list[1]	Number of ETT systems (CWS & NTNC)		4	9	NA	NA
Historical Significant Noncompliance (SNC)[1]	Number of Historical SNC Systems (CWS & NTNC)		NA	NA	37	51
Compliance Data[2]	Lead and copper violations (CWS & NTNC)		8.4%	13%	<13%	13%
Sanitary Survey[3]	Percentage of systems with certified operators	Community systems	90%	91%	86%	80%
		Non-transient non-community systems	67%	76%	74%	40%
Self-Assessment Survey[4]	Systems that can meet future 10 year water quantity demands with current sources and treatment		92%	69%	58%	72%
Sanitary Survey[3]	Percentage of major non-regulatory deficiencies resolved		80%	97%	90%	67%
	Financial:					
Self-Assessment Survey[4]	The last time water rates were changed (CWS)		Average Years: 3	Average Years: 1	Average Years: 1	Average Years: 4
Self-Assessment Survey[4]	Systems that have financial records reviewed at least annually by an independent financial auditor		75%	90%	78%	53%
	Managerial:					
Self-Assessment Survey[4]	CWS respondents aware of whether additional treatment or equipment will be required because of SDWA regulations that will come into effect in the next few years		24%	55%	45%	30%
Self-Assessment Survey[4]	Percentage of systems with service connections metered	Residential	64%	74%	60%	25%
		Commercial	71%	71%	50%	4%
Self-Assessment Survey[4]	Systems that can meet average daily demand with largest source out of service		83%	69%	64%	52%
Sanitary Survey[3]	Percentage of CWS systems with emergency plan of operation		81%	83%	75%	43%

[1] EPA no longer requires states to submit Historical SNC (HSNC) lists. This measure has been changed to report EPA's newest measure, the Enforcement Tracking Tool (ETT). This does not compare directly with the number of HSNC systems reported in previous years.
[2] Data from Table 9 of the 2016 LCR Annual Compliance Report.
[3] MDE staff conduct sanitary surveys of public water systems on a regular basis. Frequency ranges from more than once a year to once every five years. The current federal requirement is a minimum of one sanitary survey per system every three years for community systems and once every five years for non-community water systems.
[4] Self-assessment surveys were conducted in 2001, 2007, 2014 and 2019. This table includes a selection of answers to questions from that survey. Surveys are conducted every six years.

Discussion of Maryland Capacity Development baseline as outlined in Table 2.

Technical Measures

1. **Number of Enforcement Targeting Tool systems (CWS & NTNC).** During FY11, EPA developed and implemented a new enforcement tool known as the Enforcement Targeting Tool (ETT). WSP now maintains and reports data using this tool. Any system with 11 or more points on the ETT is considered to be in significant noncompliance. Compliance with drinking water quality has the highest priority, but a water system that routinely fails to monitor or report as required by the regulations might also be included on the priority list. The enforcement status is tracked and reported on a quarterly basis, as opposed to historically significant noncompliance, which was reported every three years. As of December 31, 2019, four systems had an ETT score of 11 or more. New regulations frequently result in increased violations for systems, as they seek to learn and respond to new requirements, identify funding to address infrastructure needs, and meet other challenges. WSP provides information to water suppliers about available training opportunities, and gives presentations at training events around the State. MDE will continue to focus training efforts on ensuring that all systems are aware of their responsibilities for new and existing regulations.

   Prior to the development and implementation of ETT, EPA produced a list of water systems with a history of SNC every three years. A system was considered to be a SNC if it violated one or more National Primary Drinking Water Regulation in any three quarters within the most recent three year period.

2. **Lead and copper violations (CWS & NTNC).** Complex monitoring and treatment technique requirements for lead and copper are difficult for small water systems. Each system's monitoring requirements can vary widely from year-to-year and as a result, more violations occur in some years than in others. There were 88 lead and copper violations at 85 systems in CY19, most of which were monitoring-related violations. WSP will continue to focus on reducing the number of violations by providing technical assistance and training. In addition, formal enforcement actions are being taken and penalties assessed for systems in SNC.

3. **Percentage of systems with certified operators.** Regulations require that community and non-transient non-community water systems be operated by State-certified operators. Through Maryland's certification program, water system employees are evaluated, trained and certified to operate water systems based on the complexity of the water treatment plant. Having a knowledgeable operator is critical to ensuring that water systems provide safe drinking water and meet federal and State requirements. In collaboration with the Board of Water and Wastewater Systems Operators, WSP began an initiative in 2013 to improve the passing rate of operators who take the certification exam. Measures that have already taken place include: identifying study subjects such as math that operators have the most difficulties with, evaluation of relevancy and appropriateness of questions in relation to the category of exam, standardizing the exam questions and scoring through contracting with the Association of Boards of Certification, and transferring the Board to the Water Supply Program. WSP continues to

provide technical assistance to water systems regarding operator certification requirements and notifies water systems of available technical training that may be of benefit to their operators. MDE provides funding for a number of training classes for operators. WSP also works closely with Board staff to improve operator certification compliance.

In CY19, 90% of community water systems and 67% of non-transient non-community water systems employed certified operator(s). This is a dramatic increase from the 2001 baseline of 80% and 40%, respectively. Most water systems that do not currently have certified operators are very small water systems served by wells with minimal or no treatment. In CY19, the rate of compliance for community water systems that serve 3,300 or more people was 97%.

4. **Systems that can meet future 10-year water quantity demands with current sources and treatment.** Of the water systems that responded to the 2020 survey, 92% say they have adequate water source and treatment capacity to meet their demand for the next 10 years. This number has increased from 58% in 2007, and 69% in 2014. This is a direct attribution to a number of initiatives undertaken by MDE and WSP that encourage systems to evaluate their capacity in relation to the development within their systems. In 2006, MDE developed guidance for community water systems on assessing their system capacity and planning for future needs. Water capacity can be limited by several factors, including the capacity of the water treatment plant or the wastewater treatment plant, limits established by the system's water appropriation permit, and/or the actual availability of a sustainable water source. WSP has continued to work with water systems whose water use is close to their ability to meet the demand (80% or greater) to assist them in identifying new sources, upgrading their infrastructure, or reducing demand in order to ensure that the systems will be able to provide sufficient water to meet projected demand.

5. **Percentage of major non-regulatory deficiencies resolved.** During sanitary surveys, deficiencies that do not constitute regulatory violations, but may nevertheless have a significant public health impact are identified. Deficiencies are characterized as major or minor, based on the potential to affect the public health or comfort of the system's customers and the frequency at which the problems are likely to occur. Possible major deficiencies for a water system may include low pressure in the distribution system on a routine basis that makes the water system vulnerable to cross connection, a deteriorated water storage tank, inadequate or unreliable treatment, or a well that is vulnerable to flooding. WSP works with systems to assist them in addressing deficiencies. Eighty percent of significant deficiencies have been resolved as of the end of CY19.

Financial Measures

1. **Last time water rates were changed (CWS).** Frequent review and adjustments of water rates allows systems to cover rising water system costs, and provide adequate funds for future system improvement. The results of the most recent self-assessment survey indicate that water systems are continuing to adjust their rates more frequently than in the past. WSP has supported training efforts to educate water systems about the importance of establishing appropriate rate structures. Responses to the 2019 survey indicated that

the water systems had revised their rates on average within three years, which is similar to the 2007 survey results, and more frequent than four years for the 2001 survey.

2. **Systems that have financial records reviewed at least annually by an independent financial auditor.** Independent audits of a system's financial records is sound financial practice. The surveys found the percentage of systems that have their financial records reviewed annually changed from 78% in 2007 to 90% in 2014 to 75% in 2019. All three years show a markedly higher number of independent audits than the base point of 53% in 2001.

Managerial Measures:

1. **Awareness of whether additional treatment or equipment will be required because of SDWA regulations that will come into effect within the next few years.** The 2014 survey responses indicate that more managers are aware of how upcoming regulations will affect their operations. In 2001, 30% of systems knew whether or not they would need additional treatment as a result of upcoming regulations, compared to 45% in the 2007 survey, 55% in the 2014 survey, and then a decrease to 24% in the 2019 survey. We believe that the recent decrease in awareness could be the result of turnover at the drinking water systems. MDE has focused efforts on educating water systems about new or upcoming regulations or requirements that impact them. MDE will continue to target educational efforts toward ensuring that water system managers and operators are aware of upcoming changes to federal and State laws and regulations. The Maryland Center for Environmental Training offers an MDE-funded training class for superintendents of small water systems, which continues to help small water systems become more informed about regulatory and reporting requirements. In addition, the Maryland Rural Water Association and Water and Wastewater Operators Association provides regulatory updates in training classes and at their annual conferences for all water system operators and superintendents.

2. **Percentage of systems with service connections metered.** Metering is a fundamental tool for managing water use by community water systems. Many smaller systems do not have service connection metering that measures the amount of water used by each customer. Individual metering provides the customer with information about how much water they use and allows the water system to charge more when the customer uses excessive amounts of water (to encourage water conservation). Additionally, water systems can use metering to identify water losses occurring from distribution system leaks, theft, or other unauthorized uses. About 64% of the systems that responded to the 2019 survey reported that 100% of their residential customers are metered and 71% of the systems reported that 100% of their commercial customers are metered. These are dramatically higher than they were in the first survey in 2001. This percentage is expected to continue to increase as water conservation and demand escalates.

3. **Systems that can meet average daily demand if the largest source is out of service.** Some water systems use multiple sources to supply customers. This is a critical factor for ensuring the reliability of a water system in case one source goes out of service due to a mechanical/electrical failure or another unforeseen reason. The percentage of systems that reported that they can meet average daily demand with their largest source

out of service increased from 52% in 2001 to 64% in the 2007 survey to 69% in 2014. Eighty-three percent of the systems that responded to the 2019 survey reported that they can achieve this. WSP works directly with water systems to assist them with ways to improve their reliability. WSP will continue to encourage water systems to provide sufficient backup capabilities for their supplies.

4. **Percentage of CWS systems with an emergency plan of operation.** An emergency plan of operation is a document that outlines how a community water system responds to various possible emergencies such as power outage, hurricane, terrorism, or water contamination. It also includes telephone and contact numbers for key personnel, including water system managers, local emergency responders, chemical suppliers, equipment manufacturers, well drillers, alternative water suppliers, and MDE. WSP has focused a considerable amount of energy into providing guidance and technical assistance to water systems regarding this need. During sanitary surveys, field engineers encourage water systems to develop and update emergency plans and provide technical assistance as needed. In 2013, the WSP completed a contract with the Maryland Rural Water Association to help 66 small CWSs update their vulnerability assessments and emergency response plans. Currently, 81% of community water systems have an emergency plan of operation. WSP will continue to work with systems to encourage appropriate emergency planning.

Next Steps

In addition to continuing with the many ongoing water system capacity development related activities, MDE plans to take the following steps to further improve water system capacity:

- Work with training organizations so that classes cover areas of greatest need.
- Provide additional technical resources accessible to water systems. Increase internet accessibility of training tools.
- Provide training and technical assistance for water systems on newly adopted drinking water regulations.
- Continue monitoring hydrologic conditions and routinely update MDE's drought webpages. Encourage water systems to anticipate and prepare for potential conditions under climate change.
- MDE requires all community water systems with more than 10,000 customers to perform annual water audits to determine the efficiency of the water system. In addition, many water systems whose use has exceeded 80% of their water appropriation permit are required to perform water audits.
- In the wake of Flint, Michigan, MDE continues to closely monitor lead issues, any changes in treatment processes, and customer complaints.
- Augment efforts to protect children from lead in drinking water by adopting measures for child care centers following recent legislation to ensure safe levels of lead in Maryland's public and nonpublic school buildings.
- Continue to investigate and address emerging contaminants such as PFAS and harmful algal blooms.
- In support of "One Water" management, MDE will foster interdisciplinary collaboration on topics such as drinking water, water quality restoration, water conservation and

beneficial reuse, water-related climate change action, and other topics across programmatic boundaries.

Conclusion

WSP focuses on many activities to assist public water systems in improving their technical, managerial and financial capacity, ultimately resulting in protection of public health. Efforts include providing financial assistance, technical and compliance support, targeted training based on need, encouraging water systems to practice water conservation and improve their capacity to meet drought year demands, and by assisting water systems looking to consolidate.

Maryland water systems continue to maintain a very high compliance rate of 99% with health-based standards. Water system managers are more aware of new regulations along with treatment needs associated with them, and 92% of water systems believe they currently have enough capacity to meet demands 10 years from now. Efforts aimed at assessing and improving water systems' capacity for potential drought periods has improved their resiliency for future climate control conditions. Water systems have identified several training topics of interest that include drinking water regulations, asset management, accounting for leaks and emergency response. MDE plans to work with training providers to ensure that these topics are covered in future training opportunities. MDE looks forward to continuing improving Maryland water systems' technical, financial and managerial capacity.

Appendix A

CAPACITY DEVELOPMENT CASE STUDIES

The case studies in Appendix A provide some insight into the ways in which WSP continually works with water systems to improve their technical, managerial, and financial capacity.

Anne Arundel County – Severndale Replacement Well

A well failure caused water quantity concerns at the Severndale Water Treatment Plant, a groundwater treatment plant operated by the Anne Arundel County Department of Public Works (DPW). This plant serves north-central Anne Arundel County, and is supplied by wells in two different aquifers. A new well, 3R, was drilled in 2018 to replace the old, failed well. Both the old well and the new replacement well withdraw from the lesser-used "Upper Patapsco" aquifer. MDE raised concerns about the new Well 3R's water quality due to high levels of radiological contaminants. Working with limited technical capacity from the county, Engineering and Technical Assistance Division (ETAD) used available information (historical pumpage records, historical radionuclide compliance data, etc.) to determine a conservative maximum "blending ratio" for use of the new Well 3R, blending flow in a controlled manner alongside the other "Lower Patapsco" aquifer wells, which have lower levels of naturally-occurring radionuclides. MDE's approval to place Well 3R into service, with operating conditions (including the maximum blending ratio), was given to the county in September 2018.

Baltimore County - Chapel Hill Nursing Home Compliance Assistance

MDE has continued to work with this facility, which has had multiple nitrate Maximum Contaminant Level (MCL) violations. After helping the facility to find licensed operators and develop Standard Operating Procedures (SOPs), WSP provided technical assistance to on-site staff, operators and contracted engineering firms/water conditioning companies who were working on identifying the source of nitrate contamination, and assessing treatment options. WSP worked with the administrative staff and their engineer to create a compliance plan that took all steps of the process into account. These steps included source evaluation, treatment options, evaluating loading on the septic system, construction permit process, construction/installation, and operations. A WSP engineer helped identify what may have led to the nitrate problem, and then worked with the system and their contractors to develop solutions to these problems. The system should return to compliance when the compliance plan is fully implemented.

Calvert County – Cavalier Country Iron Treatment

This small county DPW operated system has had issues with iron since the subdivision was built in the 1980s. Despite the county flushing regularly and using a polyphosphate to sequester iron, the residents were not happy with the water quality. In 2017, the community petitioned the County Council to improve water quality, and the Council tasked the County's DPW with fixing the problem by the end of 2017. Calvert County DPW immediately reached out to technical experts and MDE to find the best solution, and a pathway to get it done as quickly as possible. Filtration and sludge disposal equipment was evaluated, and a meeting was set up to expedite the

construction permit process. The design was finalized by the end of the year, and the filtration equipment was constructed and put into service in July 2018. Since the project has been completed, the community has given positive feedback to the county about improved water quality.

Carroll County – Westminster Gesell Well

Westminster has struggled with water quantity challenges, and was moving forward in early 2017 to bring an additional well into service. A new treatment plant was constructed, providing only chlorination treatment. In-depth sampling and analysis revealed the well to be under the direct influence of surface water, which requires additional treatment. The city proposed installing a membrane ultrafiltration system to provide the additional required treatment. MDE worked closely with the city and their consulting engineers to provide guidance and design review on an accelerated schedule. MDE's approval was given in February 2018 to bring the source and the newly-upgraded treatment plant online. As a result, consistently high-quality water has been produced and made available to the city to meet their growing water needs.

Carroll County - Freedom District Disinfection Byproduct (DBP) optimization exercise

Freedom District is a regional water system in southeastern Carroll County that draws water from Liberty Reservoir, and supplies water to the local area as well as the Town of Sykesville and the consecutive system of Springfield Hospital. The water system has had a challenge meeting the Disinfectant Byproduct Rule (DBPR) and went out of compliance in July 2018. WSP visited the water plant several times in 2019 to assist the new superintendent in several ways to improve capacity. Monitoring and operational requirements for the surface water were outlined, and suggestions were made to improve chemical feed and DBP sampling throughout the plant. In addition, WSP coordinated an instructional site visit to Cumberland's water plant in March 2019 that provided the new superintendent with insight about the successful Dissolved Air Flotation (DAF) operation. Although Freedom District is currently still on EPA's ETT list, the water system's violation for DBPR exceedance was returned to compliance in June 2019. MDE is considering additional optimization efforts in the distribution system and at the treatment plant.

Cecil County – Rising Sun Water Shortage

Rising Sun is currently supplied by five wells that are unable to meet the maximum-day-drought-demand. Additional water is needed, and a building moratorium has been in place restricting further growth. This is unfortunate because the town's elementary school, and 18 nearby homes have high nitrate concentrations in their wells and could benefit from access to public water. After studying all options to increase capacity of the water system, a project was approved by MDE in 2017 for the connection of Rising Sun to the Chester Water Authority in Pennsylvania. Rising Sun became a consecutive water system once the connection was fully operational in December 2018. With the Chester Water connection, the moratorium was lifted and the residences and school with nitrate concerns have the opportunity for connection to the expanded Rising Sun water system.

Charles County – Waldorf Water Resource Study

Waldorf withdraws water from three different aquifers; two of these aquifers have been impacted by excessive withdrawals in the past decade. MDE required Charles County to evaluate source water options and limit pumpage to minimize further impact on the aquifers and nearby users. As a result of MDE's direction and technical assistance, the county's engineer recently finalized a Water Source Feasibility Study, which evaluated potential source options, including new surface water sources and wholesale purchasing, to address future demand.

Additionally, MDE technical assistance staff provided the county with resources and guidance during inspections and other meetings to assist them with implementing capacity-related improvements at 15 other community water systems owned by the county. A county-wide asset management plan with automated Preventative Maintenance Plan and hydraulic mapping of various distribution systems was developed and can be used by county plants that vary in size and condition to improve water quality issues. With enhanced capacity, the county also finalized its connection to a small deteriorated CWS with the use of the State Revolving Loan Fund.

Frederick County - City of Frederick DBP optimization

Frederick City has three surface water plants that supply an expanded distribution system that includes several interconnected former CWSs. In 2013, the city exceeded the MCL for Total Haloacetic Acid (HAA5) at three out of their eight sample sites. In 2018, one of the small consecutive systems that purchase water from the city also had an HAA5 MCL violation. Since the first violation, the city has been seeking solutions to their DBP issue. In 2013, the city changed the location of the pre-chlorination feed from pre-flocculation to top of filters. In 2016, the city contracted with an engineering firm to investigate ways to reduce DBPs. The engineering study investigated distribution water age and water quality, as well as in plant production of DBPs and Total Organic Carbon (TOC) reduction with different coagulants. The study developed a prioritized list of recommendations, with tank aeration, coagulant and pre-oxidant changes among the recommendations. In January 2019, the city met with MDE to present the findings of the study and is proceeding with switching coagulants at two of its three water treatment plants

Kent County - Rock Hall capacity development

Rock Hall is a historic waterfront town that was without a properly certified operator for several years and for years had deferred much of the maintenance of its water plant. The town's iron removal filter system has been performing poorly, with some components deteriorated to the point of failure. WSP issued significant deficiencies in August 2019 for critical treatment failure, improper ventilation that created a corrosive environment, which led to filter failure, and insufficient operational staffing. After WSP met with the new mayor and town manager several times, the ventilation and staffing issues have been resolved. WSP, working with the town and the regional Rural Community Assistance Partnership (RCAP), was able to procure funding for filter improvements.

St. Mary's County - St. Mary's County Metropolitan Commission (MetCom) SOPs

MetCom is a quasi-governmental agency that operates 28 community water systems in St. Mary's County. The organization has undergone administrative changes within the last year, including the appointment of a new water superintendent. Through evaluations during sanitary surveys, WSP identified that new and updated standard operating procedures (SOPs) needed to be prepared and posted for each of the water systems. WSP has worked closely with the new superintendent on preparing SOPs and provided guidance on operator visit frequency and process control monitoring. All water systems now have updated SOPs posted inside each plant, and operators are following the protocols successfully. In addition to preparing and posting updated SOPs, WSP also worked with the new superintendent to have short descriptions of each system written up that include information on how the system operates. This has helped all operations staff to have a better understanding of individual systems and operations overall. Both endeavors have resulted in more consistent operations of individual systems, and built a relationship between WSP and the new administrative and operations staff at MetCom.

St. Mary's County - Mt. Pleasant system failure

This small water system with 42 connections in rural St. Mary's County suffered from a lack of a licensed operator and poor maintenance. In 2019, this small water system suffered an outage and the owner was unable or unwilling to take steps to correct the problem. The local health department alerted MDE on the second day of the outage. When efforts to convince the owner to fix the problem failed, MDE reached out to a local agency, MetCom, to help restore water pressure. After water pressure was restored, MDE arranged for Maryland Environmental Service, a quasi-governmental agency to repair and operate the system. The well controls and chlorinator were repaired and a new compressor was connected to the system's hydropneumatic tank.

Wicomico County - Town of Pittsville discolored water problems

Pittsville began experiencing discolored water in April 2019 due to elevated iron levels. At the end of March, their certified operator had resigned and a temporary operator was operating the plant. WSP made several site visits in response to complaints from residents and to assist the town. A significant deficiency was issued in June in regards to management and operations, inadequate treatment, and the distribution system. Elevated iron levels continued into September. Since then, the town has hired Singh Operations in October to operate the plant and the iron levels have been consistently under the secondary standard since October 21, 2019.

Worcester County - Ocean Pines Water Conservation

MDE notified the Ocean Pines community water system, which is owned and operated by the Worcester County DPW, that it did not have enough source and storage capacity to meet critical demand. MDE required the utility to perform annual water audits and evaluate excessive water loss. One recent initiative, following a discussion with WSP, was to reduce the discharge from continuous chlorine analyzers at all five water plants. This resulted in conservation of about 2 million gallons per year. This valuable technical assistance is conserving water and provides the community with additional capacity during droughts and other critical times.

Worcester County - Pocomoke City DBP technical assistance

Pocomoke City is a historic town with old infrastructure and a low median income. Shortly after a new superintendent was hired in 2018, the system fell out of compliance with the DBPR. WSP provided guidance on distribution system management and visited with the superintendent and engineer several times in 2019 to discuss improvements to plant operations, including changes to chemical feed and sampling for residual management. Following MDE's recommendations, DBP numbers went down. The water system was returned to compliance with the DBPR in March 2019.