Report to Governor

CAPACITY DEVELOPMENT
for
MARYLAND PUBLIC DRINKING WATER SYSTEMS

Department of the Environment
Water Supply Program

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Introduction

Ensuring safe and adequate drinking water supplies for Maryland citizens is a primary goal of the Maryland Department of the Environment (MDE). Eighty-five percent of Marylanders receive their drinking water from community water systems throughout the State. MDE undertakes numerous programs and activities to ensure that public drinking water systems are constructed, operated, and maintained in a manner that the drinking water produced by these systems is safe, and adequate to meet current and future needs of Marylanders.

The 1996 Safe Drinking Water Act (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 obtained legal authority through COMAR 26.04.01.36 in 1999. Maryland's strategy for improving public drinking water system capacity was originally approved by the Environmental Protection Agency (EPA) in 2001, and revised in 2009.

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 the SDWA. The effectiveness of Maryland's capacity development strategy is measured through analysis of various data such as sanitary survey records, compliance data, and surveys of public water systems to identify performance areas that have improved, and areas where additional capacity development efforts are needed.

Reports on public water system capacity development have been submitted triennially to the Governor's office from 2002, through 2011. This 2014 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 Calendar Year 2013 and results from a 2014 community water system self-assessment survey. This report will be made available to Maryland citizens through MDE's website.

Background

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 the Safe Drinking Water Act (SDWA). 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.

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 takes into account three categories: 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 effective 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. Community water systems (CWS), one of three categories of public drinking water systems, serve year-round residential consumers. Non-transient non-community (NTNCWS) water systems serve recurring consumers, such as in a school or daycare setting and transient non-community (TNCWS) water systems serve different consumers each day, such as in a campground or restaurant. Over 85% of Maryland's population, approximately 5 million people, is served by a community water system.

Table 1 provides basic information regarding the quantity and types of Maryland water systems and population they serve.

Table 1

Drinking Water Statistics	2013	2010	2007	2004	2001
Population of Maryland	5,928,814	5,773,552	5,618,344	5,558,058	5,296,486
Individuals served by community water systems	5,057,350	4,989,406	4,844,668	4,846,923	4,438,335
Percent of population served by community water systems	85%	86%	86%	87%	84%
Percent of population served by individual wells	15%	14%	14%	13%	16%
Number of public water systems	3,396	3,432	3,533	3,692	3,816
Number of community water systems (CWS)	474	473	486	502	503
Number of non-community non- transient community water systems (NTNCWS)	544	550	559	576	568
Number of transient non-community water systems (TNCWS)	2378	2,409	2,488	2,614	2,745
Number of systems using surface water	60	59	69	66	64
Number of systems using only ground water	3,336	3,373	3,464	3,626	3,752

Implementation of the SDWA in Maryland is the responsibility of the Water Supply Program (WSP), located within the Maryland Department of the Environment (MDE). In 2001, the Water Supply Program, in response to the SDWA's requirements, developed a strategy to implement capacity development for existing water systems in Maryland. The strategy approved by the U.S. Environmental Protection agency in 2001, focused capacity development efforts on directing appropriate training and technical assistance toward operators and managers of existing systems. Using various sources of information, including a system self-assessment, compliance results, and onsite inspections of water systems, MDE identified areas where training was most needed to improve the ability of systems to sustainably supply safe drinking water to their customers. Through collaborative relationships with various training organizations, training was targeted toward these areas of greatest need.

Over time, however, new concerns have arisen which were not fully addressed by the original capacity development strategy. In 2002, Maryland experienced severe drought conditions that

highlighted the need for comprehensive assessment and response activities related to drought. Recent estimations of growth potential and water availability indicate that a number of Maryland communities could experience water shortages unless steps are taken to better understand the hydrologic system and to carefully plan for future water needs. In 2009, MDE revised the Capacity Development Strategy for Existing Systems 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. In addition 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 new approach adds to 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 water 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.

Challenges

A number of factors present challenges for capacity development in Maryland water systems. The vast majority of Maryland water systems are very small. For example 353 out of 474 community water systems serve a population of 1,000 persons or less. Smaller water systems typically have limited resources and expertise which often result in postponed preventive maintenance work, limited ability to retain qualified water system operators, and lack of finances to improve infrastructure. In addition, until recently, lack of proper planning, led to a number of new housing and commercial developments in rural areas, exacerbating their already limited resources. Population growth is also another challenge that has been extremely taxing for small to medium size communities. For example, since 2010, the population served by Maryland's community water systems has increased by more than 155,000 translating to an additional demand of 16 million gallons per day. In some cases, water supplies are not adequate to meet projected needs. The uncertainty of climate change impact, aging infrastructure, shrinking resources, and ever increasing regulatory compliance requirements, are sometimes more than small water systems can handle. For example since 2001, eight new regulations have been promulgated, often requiring new infrastructure. According to the latest survey by the USEPA, Maryland's total capital need for the next 20 year is $6.9 billion. In addition, these complex rules 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.

The Effectiveness of Maryland's Strategy

The capacity development strategy established criteria to evaluate water systems' capacity and the effectiveness of the strategy. Information gathered from program databases, sanitary survey 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 WSP will target future training programs and technical assistance activities to the areas of greatest need. Data collected for each evaluation criteria is summarized below.

Maryland's extensive Public Drinking Water Information System database includes information about water system compliance with water quality standards as well as monitoring and reporting requirements. This database also retains information about water system operators, emergency plans, and information from routine sanitary surveys conducted at each system. In 2012, MDE contracted to replace the public water system database with a federal database, SDWIS-State (Safe Drinking Water Information System-State); the tentative completion date is 2015 for the project.

A sanitary survey is an on-site inspection of a water system which includes an inspection of the sources, the water treatment plant, the storage and distribution systems, and a review of water quality tests and operating and maintenance procedures. During sanitary surveys, WSP staff provides guidance and reviews 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 ground water or surface water.

During sanitary surveys, staff may identify deficiencies that are not regulatory violations, but nevertheless have potential public health impact, and provide an indication of problems with technical capacity. WSP staff work with water systems to help them correct deficiencies and improve their capacity to provide safe and adequate water to their customers.

A "self-assessment" survey was circulated to all community water systems in 2001, 2007, and again in 2014. 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 obtain close to a 100% response for the 2014 survey, a final response rate of 47% was achieved, similar to the 2007 survey response. Efforts to increase the response rate included administering the 2014 survey electronically, using an internet based survey application, reducing the number of the questions, and making follow up calls to offer assistance.

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**		**2013**	**2010**	**2007**	**2004**	**2001**
	Technical:						
ETT list[1]	Number of Enforcement Targeting Tool systems (CWS & NTNC)		22 systems	NA	NA	NA	NA
Historical SNC[1]	Number of Historical Significant Noncompliance (SNC) Systems (CWS & NTNC)		NA	50 systems	37 systems	26 systems	51 systems
Compliance Data[2]	Lead and copper violations (CWS & NTNC)		14%	13%	<13%	<10%	13%
Sanitary Survey[3]	Percentage of systems with certified operators	Community systems	91%	86%	86%	91%	80%
		Non-transient non-community systems	75%	69%	74%	76%	40%
Self-Assessment Survey[4]	Systems that can meet future 10 year water quantity demands with current sources and treatment		69%	N/A	58%	N/A	72%
Sanitary Survey[3]	Percentage of major non-regulatory deficiencies resolved		91%	81%	90%	79%	67%
	Financial:						
Self-Assessment Survey[4]	The last time water rates were changed (CWS)		Average Years: 1	N/A	Average Years: 1	N/A	Average Years: 4
Self-Assessment Survey[4]	Systems that have financial records reviewed at least annually by an independent financial auditor		90%	N/A	78%	N/A	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 within the next few		55%	N/A	45%	N/A	30%
Self-Assessment Survey[1]	Percentage of systems with service connections metered	Residential	74%	N/A	60%	N/A	25%
		Commercial	71%	N/A	50%	N/A	4%
Self-Assessment Survey[4]	Systems that can meet average daily demand with largest source out of service		69%	N/A	64%	N/A	52%
Sanitary Survey[3]	Percentage of CWS systems with emergency plan of operation		83%	77%	75%	75%	43%

[1] EPA no longer requires states to submit Historical SNC (HSNC) lists. This measure has been changed to report EPA's new measure, the Enforcement Tracking Tool (ETT). This does not compare directly with the number of HSNC systems reported in previous years.

[2] Data from MDE's Public Drinking Water Information System database.

[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 and 2014. This table includes a selection of answers to questions from that survey. Surveys will be conducted every six years. The survey was administered this year in 2014 in an effort to get the most up to date information possible for this report.

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

Technical Measures

1. **Number of Enforcement Targeting Tool systems (CWS & NTNC).** During FFY2011, EPA developed and implemented a new enforcement tool known as the Enforcement Targeting Tool (ETT). The 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 who 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 historical significant noncompliance which was reported every three years. As of December 31, 2013, 22 systems had an ETT score of 11 or more. New regulations frequently result in increased violations for systems, as they seek to learn new requirements, identify funding to address infrastructure needs, and meet other challenges. The 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.

   Number of Historical Significant Noncompliance systems (CWS & NTNC). Prior to 2011, the EPA produced a list of water systems with a history of significant noncompliance (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 present a particularly vexing problem for small water systems. Each water 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 155 Lead and Copper violations at 143 systems in CY 2013, most of which were monitoring-related violations. The 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 significant noncompliance.

3. **Percentage of systems with certified operators.** Regulations require that community and non-transient non-community water systems are 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 2013 the WSP in collaboration with the Board of Water and Wastewater Systems operator began an initiative 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 ABC (Association of Boards of Certification), and transferring the Board to the Water Supply Program.

WSP staff will continue to provide technical assistance to water systems regarding operator certification requirements and notify systems of available technical training that may be of benefit to their operators. In 2008, the WSP and the Maryland Rural Water Association (MRWA) developed a training program geared specifically to operators of small groundwater systems (many of whom had received the "grandfathered" status). In addition, the Maryland Center for Environmental Training developed several new classes geared toward operators of small systems (serving fewer than 3,300 persons). The WSP continues to provide funding for these organizations to ensure operators are receiving proper trainings as part of our technical capacity development. The WSP also contracted with the Delaware Technical and Community College to offer classes to operators of small Maryland water systems, but unfortunately due to the expiration of the federal Expense Reimbursement Grant, the free training imitative ended December 31, 2012 since alternative funding was not available.

In CY 2013, 91 percent of community water systems and 75 percent of non-transient non-community water systems employed certified operator(s). This is a dramatic increase from the 2001 baseline of 80 percent and 40 percent respectively. The rate of compliance for community water systems that serve 3300 or more people is 100%.

4. **Systems that can meet future 10-year water quantity demands with current sources and treatment.** Of the water systems who responded to the survey, 69 percent have adequate water source and treatment capacity to meet their demand for the next 10-years. This number has increased from 58% in 2007. This is a direct attribution to a number of initiatives undertaken by MDE and the 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 a number of 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 supply. The WSP has continued to work with water systems whose water use is close to their capacity limits (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. In 2011, the WSP hired an engineering contractor to assist up to fifty communities in developing Capacity Management Plans (CMPs). This program was completed in April, 2013 and a total of 42 CMPs were prepared at no charge to the community water systems.

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 field engineers work with systems to assist them in addressing deficiencies. Ninety-one percent of significant deficiencies have been resolved as of the end of CY 2013.

Managerial Measures:

1. **CWS respondents aware 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, only 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, and 55% in the 2014 survey. MDE has focused efforts on educating water systems about upcoming regulations or new 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 a 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, Maryland Rural Water Association, American Water Works Association, and Water and Wastewater Operators Association all provide 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 at a community water system. 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, and typically encourages water conservation. Additionally, water systems can use metering to identify water losses occurring from distribution system leaks, theft, or other unauthorized uses. About 74% of the systems that responded to the 2014 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 percentages have both increased significantly since the last survey and are dramatically higher than they were in the first survey in 2001. This percentage is expected to continue to increase as water demand escalates and the goal is 100% metering of all customers.

3. **Systems that can meet average daily demand with largest source out of service.** This is a critical factor for ensuring the reliability of a water system. The percentage of systems increased from 52% in 2001 to 64% in the 2007 survey, and 69% of the systems that responded to the 2014 survey reported that they can meet average daily demand with their largest source out of service. WSP field engineers work individually with water systems to encourage and assist them to improve their reliability. MDE will continue to encourage water systems to provide sufficient backup capabilities for their water 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 or water contamination. It also includes telephone and contact numbers for key personnel including water system managers, chemical suppliers, equipment manufacturers, well drillers, alternative water suppliers, and MDE. Plans for responding to specific emergencies such as security attacks and microbiological contamination can also be included. The 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 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, 83% of community water systems have an emergency plan of operation. The WSP will continue to work with systems to encourage appropriate emergency planning.

Financial Measures

1. **The 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, with costs rising, water systems are continuing to adjust their rates more frequently than in the past. The WSP has supported training efforts to educate water systems about the importance of establishing appropriate rate structures. Responses to the 2014 survey indicated that the water systems had revised their rates on average within one year, 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 audit of a system's financial records is sound financial practice. The 2014 survey found the percentage of systems that have their financial records reviewed annually continued to increase from 78% in 2007 to 90% in 2014, and is markedly higher than the starting point of 53% in 2001.

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 training classes cover areas of greatest need, as outlined in the 2014 water system's survey.

- Provide additional technical resources accessible to water systems on MDE's web site. The WSP's two nearly complete databases will allow water systems to access specific information regarding their drinking water compliance and water appropriation permit using web-based tools.

- In the wake of the West Virginia Elk River spill, assess how MDE and water systems can minimize the risk of chemical spill contamination from occurring in MD.

- Provide training and technical assistance for water systems on newly adopted drinking water regulations.

- Continue monitoring hydrologic conditions and routinely update MDE's drought web pages. Encourage water systems to anticipate and prepare for potential conditions under climate change.

Conclusion

The Maryland Department of the Environment's Water Supply Program focusses 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 supporting consolidation of water systems.

Maryland water systems continue to maintain a very high compliance rate of over 95% with health-based standards. Through a survey that water systems completed, we learned that water system managers are more aware of new regulations along with treatment needs associated with them, and 69% of water systems believe they currently have sufficient 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 a number of 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 continue improving Maryland water systems' technical, financial and managerial capacity.

Appendix A

CAPACITY DEVELOPMENT CASE STUDIES

Maryland's statewide capacity development strategy focuses on working with public water systems to prevent violations by improving technical, managerial and financial capacity and address their violations with short and long-term solutions. The WSP encourages consolidation to correct capacity and non-compliance problems. As regulatory requirements continue to become more numerous and complex, it is becoming increasingly more difficult for smaller, independent systems to maintain compliance. Whether two or more small systems merge into one larger system, or a large system extends its service area to a smaller one, consolidation affords systems the advantage of having a greater pool of resources to provide a safer and more reliable water supply. The case studies in Appendix A provide some insight into the ways in which the Water Supply Program continually works with water systems to improve their technical, managerial, and financial capacity.

Allegany County - Mount Savage

Mount Savage is a community of over 500 people in Allegany County. It was served by nine wells and three springs, all of which are very low yielding and therefore susceptible to community wide water shortages. Even during mild drought conditions the community was forced to haul water using tanker trucks. This was a common and almost annual occurrence. The solution to Mount Savage's water shortage is a connection to the City of Frostburg through Allegany County's distribution system. MDE modified Frostburg's appropriation permit to ensure that additional capacity would be available to supply Mt. Savage. The transmission line, constructed by Allegany County, was completed in 2012 with the distribution system to follow by mid 2014. MDE provided low cost loans and grants to the County to finance these improvements. Upon completion, this project ensures a safe and reliable water supply to the community of Mt. Savage.

Caroline County - Caroline Acres MHP

A sanitary survey was performed at this facility in September of 2012. During the survey, several significant deficiencies were documented including storage tanks in poor condition, corroded pipes in both water treatment plants, and well pumps cycling on and off at a high frequency. In 2013, both well pumps were replaced with variable speed pumps and both tanks were replaced with new and much smaller tanks. Because of the improvements, the water system is now reliable and consistent.

Caroline County - Nelpine Heights

Nelpine Heights is a community water system in Caroline County consisting of one well and twenty-two connections. A brief history of the community is as follows: Upon the death of the owner in 2002, his heirs refused ownership. Several years later, the property was purchased at a Caroline County tax sale by an individual who refused to recognize the existence of - and therefore refused to maintain and operate - the community's water system. After several legal battles, Caroline County finally obtained ownership in late 2008. The water system had been in

need of upgrade for almost a decade. In addition the adjacent community of Jonestown was served by individual wells, many of which were contaminated. A water system project to serve both Jonestown and Nelpine Heights was planned by the county and MDE, with MDE providing over $900,000 in grant funding. The new Jonestown water system was completed in 2013.

Cecil County – Chesapeake City

Chesapeake City in Cecil County, Maryland has a population of about 1000 and is located on the Chesapeake and Delaware Canal. The city straddles the canal and therefore its water supply has historically been broken into two systems, Chesapeake City North and Chesapeake City South. Wells containing high concentrations of iron served both sides with complex iron removal treatment that was only marginally effective. Customer complaints for discolored water were not uncommon and additionally, the water treatment plants and storage tower had fallen into disrepair. The cost of replacing all treatment systems and storage was weighed against the cost of connecting the entire city to Artesian Water Company's groundwater system. Interconnection was chosen and MDE funded the project with over $700,000 in low interest loans. This not only eliminated Chesapeake City's aging water treatment plants with a supply of superior quality and reliability, but also extended the water line several miles south of the city to connect the Bohemia Manor High School complex that had struggled with poor water quality and quantity in their wells for years. This project was completed in 2013.

Cecil County – Manchester Park

This community in Cecil County serves over 400 people and was supplied by up to 6 low yielding wells. Often some wells were fouled with iron and unable to yield more than several gallons per minute. During drought years, Manchester Park often went on water restrictions and several times was in very real danger of running out of water. On many occasions during times of low yielding wells, Water Supply Program met on site with system operator and former owner to formulate strategies for increasing water production. These measures included the establishment of a yearly maintenance routine for cleaning well screens and encouraging site specific water restrictions for the community. On November 14, 2012, Manchester Park was purchased by Artesian Water. A transmission line from another Cecil County system has been constructed and is now in use to permanently serve Manchester Park. The wells have been disconnected and will be abandoned. This project realistically eliminates any chance of future water outages in the community.

Charles County – Strawberry Hills

In July 2013, two Charles County-owned water systems were interconnected to minimize stress on the declining Patapsco aquifer. Prior to the connection, the Strawberry Hills community water system served 1,500 people and utilized two wells in the sensitive aquifer. The Patapsco aquifer provides water for numerous public water systems, including towns, communities and schools, as well as some private residences. Strawberry Hills was inter-connected with the nearby Bryans Road community water system (pop 3,500), which uses a deeper aquifer. Because of this project the Strawberry Hills water system discontinued its withdraw from the declining Patapsco aquifer.

Dorchester County - Reliance MHP

This water system started experiencing intermittent total coliform problems in 2011, and again in the spring of 2012. A sanitary survey in the summer of 2012 identified several significant deficiencies. As a result, the park cleaned the well head, securely fastened the well cap, replaced its three undersized and waterlogged bladder tanks with five larger new tanks, filled in a sink hole, removed a cross connection at a homeowner's swimming pool, and their operator has applied for certification. Since the improvements to the water system have been made, there have been no further positive bacteria samples.

Frederick County – City of Brunswick

The City of Brunswick is located in southwestern Frederick County and serves 6,394 people via 2,122 connections. The water system has two plants, one using the Potomac River, the other using a spring. Historically the system has had high levels of disinfection byproducts (DBPs) periodically, but no violations under the current standards. More stringent standards are currently being phased in, and under these standards the system would have been unable to achieve compliance. A major plant upgrade came on line at the end of 2012, but this by itself did not significantly reduce the system's levels of DBPs. MDE provided Brunswick with extensive DBP performance based training (PBT). PBT is a unique training process, in which the participants are required to implement changes at their water plants based on a series of lessons and techniques that are taught in training classes. Brunswick's PBT concluded in October 2013. As a result of operational changes made as a part of the training, water plant efficiency and removal of DBP precursors increased and DBP levels in the system have been reduced by approximately 48%. Brunswick should be able to maintain compliance with the new DBP regulations with the help of their new operational practices.

Garrett County – Thayerville

Thayerville is located in Garrett County, Maryland near Deep Creek Lake and serves a population of about 950 people. Low yielding private wells served the connections and many home owners and businesses had to re-drill their wells to deeper depths and were still unable to adequately increase yield. Additionally, many of the wells in the area were of poor quality with high iron and some with arsenic detects. Garrett County was petitioned in 2005 to construct a public water system to serve Thayerville. Two wells were drilled and a treatment plant constructed using MDE funding and the water system went on line in late 2013.

Wicomico County – Pittsville

The Town of Pittsville is located in Wicomico County and supplies 1,200 people through 741 connections. The Town wells have high iron levels (13 mg/L). Prior to 2013, the aging treatment plant frequently produced water that did not meet the secondary standard for iron, resulting in numerous complaints. Treatment capacity limitations also sometimes resulted in the need to issue water use restrictions during summer months. With technical and financial assistance from MDE, plant upgrades were completed in spring 2013 with the installation of new filter media. MDE continued to provide on-site technical assistance in 2013 and water quality has improved dramatically and is now consistently well below the secondary standard for iron and production capacity is also markedly improved.