Report to Governor

CAPACITY DEVELOPMENT
for
MARYLAND PUBLIC DRINKING WA TER SYSTEMS

Department of the Environment
Water Supply Program

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Introduction

Maintaining safe and adequate drinking water supplies for Maryland citizens is a primary goal of the Maryland Department of the Environment (MDE). MDE undertakes numerous programs and activities to ensure that public drinking water systems are built, maintained, and operated in a manner that the water produced by these systems is safe, and that adequate supplies are available to meet all current and future needs. The Safe Drinking Water Act (SDWA) amendments of 1996 required states to develop programs to document and improve the capacity of public drinking water systems. Maryland's strategy for improving public drinking water system capacity was approved by the Environmental Protection Agency (EPA) in 2001.

This tri-annual 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 the progress that has been made toward improving the technical, managerial, and financial capacity of water systems in the state.

Reports on public water system capacity development were previously submitted to the Governor's office in September 2002 and September 2005. This report documents capacity development progress and evaluates the effectiveness of the State's capacity development strategy as reflected by data collected through calendar year 2007. This report will be made available to Maryland citizens through MDE's website.

Background

Over 86% of Maryland's population, approximately 4.8 million people, is served by a community water system. 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.

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 interdependent elements: the technical, managerial, and financial capabilities of water systems to provide safe and adequate drinking water. 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 ability of system personnel 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.

Drinking Water Statistics			
	2007	2004	2001
Population of Maryland	5,618,344	5,558,058	5,296,486
Individuals served by community water systems	4,844,668	4,846,923	4,438,335
Percent of population served by community water systems	86%	87%	84%
Percent of population served by individual wells	14%	13%	16%
Number of public water systems	3,535	3,692	3,816
Number of community water systems (CWS)	486	502	503
Number of non-community non- transient community water systems (NTNCWS)	559	576	568
Number of transient non-community water systems (TNCWS)	2,488	2,614	2,745
Number of systems using surface water	69	66	64
Number of systems using only ground water	3,464	3,626	3,752

Table 1

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 2000, the WSP developed a capacity development strategy to guide its activities related to improving the capability of Maryland's existing public drinking water systems. The goal of the State's strategy, is to improve water system compliance and public health protection through technical assistance and training targeted at public drinking water system operators and managers identified as having the greatest need.

A number of factors present challenges for capacity development in Maryland water systems. The vast majority of Maryland water systems are very small. Smaller water systems have limited resources for maintaining and improving their infrastructure, for proper maintenance and operation of the system, or for retaining qualified water system operators. Additionally, for many communities there has been inadequate planning for the rapid population growth that has occurred over the past two decades. More than 400,000 additional citizens rely on Maryland's community water systems in 2007, than did so in 2001. The increasing number and complexity of drinking water regulations creates additional challenges for all water systems to remain in compliance. Since 2001, new regulations have been promulgated for arsenic, radionuclides, disinfection by-products, surface water treatment, and ground water treatment. These new regulations often require new infrastructure, and also mean that water system operators must be knowledgeable about complex treatment processes as well as numerous reporting requirements. Relatively low salary levels along 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 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. 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 survey inspections conducted at each system.

A sanitary survey is an on-site inspection of a water system which includes an inspection of the water treatment plan, water quality tests, and reviews of operating and maintenance procedures. During Sanitary Survey inspections, WSP staff provide guidance and review 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 five years, depending on the size and type of system, and whether the source is ground water or surface water.

During sanitary survey inspections, 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 water systems in 2001, and again in 2007. Survey questions were 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 to the 2001 survey, budget restraints prohibited a similar outreach effort for the 2007 survey. The response rate for the 2007 survey was about 52%.

Data Source	Measure of Capacity		2007	2004	2001
	Technical:				
Historical SNC list[1]	Number of SNC systems (CWS & NTNC)		37 systems	26 systems	51 systems
Compliance Data[2]	Lead and copper violations (CWS & NTNC)		<13%	<10%	13%
Sanitary Survey[3]	Percentage of systems with certified operators	Community systems	86%	91%	80%
		Nontransient noncommunity systems	74%	76%	40%
Self-Assessment Survey[4]	Systems that can meet future 10 year demand with current sources and treatment		58%	N/A	72%
Sanitary Survey[3]	Percentage of major non-regulatory deficiencies resolved		90%	79%	67%
	Financial:				
Self-Assessment Survey[4]	The last time water rates were changed (CWS)		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		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 years (i.e. ground water rule, LT2ESWTR, DBP2)		45%	N/A	30%
Self-Assessment Survey[1]	Percentage of systems with service connections metered	Residential	60%	N/A	25%
		Commercial	50%	N/A	4%
Self-Assessment Survey [4]	Systems that can meet average daily demand with largest source out of service		64%	N/A	52%
Sanitary Survey[3]	Percentage of CWS systems with emergency plan of operation.		75%	75%	43%

[1]EPA prepares a list of Historical Significant Noncompliers (SNC) every three years. The most recent list was prepared in 2006.

[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. Current federal requirement is a minimum of one sanitary survey per system every five years for groundwater systems and one every three years for surface water systems.

[4] Self-assessment surveys were conducted in 2001 and 2007. This table includes a selection of answers to questions from that survey. Surveys will be conducted every six years.

Technical Measures

1. **Number of SNC systems (CWS & NTNC).** Every three years, EPA produces a list of systems with a history of significant noncompliance (SNC). A system is considered to be in SNC if it has violated one or more National Primary Drinking Water Regulations in any three quarters within the last three years. The 2006 Historical SNC list included 36 systems; whereas 26 systems were on the list in 2003 and 51 systems on the 2000 list. New regulations frequently result in increased violations for systems, as they struggle to learn new requirements, identify funding to address infrastructure needs, and meet other challenges. The Arsenic Rule, which went into effect in 2006, resulted in a number of systems exceeding the revised drinking water standard. Many of these systems needed to either build new treatment facilities or drill new wells in order to comply with the regulations. Although most of these systems have since returned to compliance, a number of systems did not meet the timeline for compliance specified in the regulation.

   Every year since 2005, the WSP has produced and mailed a schedule of regional water system training events and training resources to all community and non-transient non-community water systems. In addition, the WSP provides presenters for training events around the State. MDE will continue to focus training efforts on ensuring that all systems are apprised of the requirements of new regulations.

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. The number of violations in 2007 was 133, which is an improvement over the 201 violations reported in 2001, but an increase over the 110 violations reported in 2004. Systems are required to monitor on a schedule established by the WSP. The number of systems that must sample varies widely from year to year. As a result, more violations occur in some years than in others. The Water Supply Program will continue to focus on reducing the number of violations.

3. **Percentage of systems with certified operators.** Regulations require all community and non-transient non-community water systems to have 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 (WTP). Having a knowledgeable operator is critical to ensuring that water systems provide safe drinking water and meet federal and State requirements.

   Federal and State operator certification regulations allowed many operators to receive a "grandfathered" certification. Unfortunately, some operators did not renew their certifications at the end of the three year certification period, resulting in a reduction in the number of systems with certified operators. WSP staff will continue to update systems on certification requirements for operators and to notify systems of available technical training that may be of benefit to their operators. In June of 2008, WSP and the Maryland Rural Water Association (MRWA) developed a training program geared specifically to operators of small ground water systems (many of whom had received the "grandfathered" status). This class will be offered through 2009 and is expected to reduce the number of systems without certified operators.

4. **Systems that can meet future 10-year demand with current sources and treatment.** The number of systems that reported they will be able to meet future demand decreased since 2001. This is likely a reflection of two factors: first, water systems are more aware of their needs and capabilities than they previously were, and second there continues to be considerable growth pressure on some water supplies. Over the past two years, 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 available of a sustainable water supply. The WSP has been working individually with a number of water systems whose water use is close to their capacity limits 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 survey inspections deficiencies that do not constitute regulatory violations but may nevertheless have a significant public health impact are often identified. Deficiencies are characterized as major, moderate, and minor based on the significance to health or comfort of the system's customers and the frequency at which the problems are likely to occur. Examples of possible major deficiencies include extremely low pressure in the distribution system on a routine basis, a storage tank with a leak and a well that is likely

to be flooded. WSP field engineers work individually with systems to assist them in addressing deficiencies. The percentage of major deficiencies resolved increased from 67% in 2001 to 90% in 2007.

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 (i.e. ground water rule, LT2ESWTR, DBP2).** Responses indicate that more managers are aware of how upcoming regulations will affect their operations now than in 2001. 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 2007. MDE has focused efforts on educating water systems about upcoming regulations or new requirements that impact them. For example, WSP individually contacted each system that was expected to exceed the revised arsenic standard and held regional public informational meetings to inform water systems about the requirements and treatment options. A similar educational effort is being made to systems that will be impacted by new surface water treatment and disinfection byproduct regulations. 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.

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. Additionally, water systems can use metering to identify water losses occurring from distribution system leaks, theft, or other unauthorized uses. The percentage of water systems with 100% of their residential customers metered increased from 25% in 2001 to 60% in 2007. This percentage is expected to continue to increase as demand escalates.

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 2007. 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 emergency plan of operation.** An emergency response plan is a document that organizes a community water system's response to various possible emergencies such as power outage or water contamination. It usually 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 specific emergencies such as security attacks and microbiological contamination can also be included. WSP has focused a considerable amount of energy into providing guidance and technical assistance to water systems regarding this need. During sanitary survey inspections, field engineers encourage water

systems to develop emergency plans, and provide technical assistance as needed. The percentage of systems with emergency plans increased from 43% in 2001 to 75% in 2007. MDE 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 set aside funds for future system improvement. The results of the most recent self-assessment survey indicate that, with costs rising, water systems are adjusting 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 survey indicated that the water systems had revised their rates on average within one year, compared with about 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 percentage of systems that have their financial records reviewed annually increased from 53% in 2001 to 78% in 2007.

Next Steps

MDE has taken or plans to take a number of steps to further improve water system capacity.

- The Water Supply Program is in the process of updating Maryland's Capacity Development Strategy to ensure the strategy addresses the changing needs of water systems in throughout the State.

- During 2008, MDE worked with the Maryland Rural Water Association to develop a new training program geared specifically to operators of small ground water systems. This training focuses on technical issues such as ground water availability, wells, pumps, and storage issues, and regulatory requirements for monitoring and reporting. The program is expected to result in an increased number of certified operators for these small ground water systems.

- The 2007 capacity development survey clearly pointed to a continuing need for more training related to new regulations and upcoming requirements. A federal grant will be used to provide training without cost to operators of small water systems, at no cost to the operators, through agreements with several training organizations. Agreements are currently being negotiated with the Maryland Center for Environmental Training and the Delaware Technical & Community College (which serves operators on the Eastern Shore).

- Maryland hired a consultant to assist with the development of a Security Strategic Plan and Emergency Response Plan for the WSP. These plans should be final by the end of 2008. In addition, over the next year the WSP will purchase emergency sampling

equipment to assist water systems with emergency situations, and, through a contractor, will offer emergency response training exercises for local water suppliers.

- Guidance for water systems on evaluating and managing their water supplies was issued in 2008. Water systems that are currently exceeding 80% of their permitted water allocation or design capacity have been asked to develop a capacity management plan and submit the plan to MDE.

- New requirements for local governments to incorporate Water Resources Elements into their comprehensive plans were adopted in 2006. MDE has been working with local governments to provide technical assistance and plan review. This requirement is expected to assist local governments in ensuring that adequate water resources are available to meet current and future needs.

Conclusion

Public water systems in Maryland have realized significant improvement in their capacity over the past six years. While these improvements provide evidence that the State's capacity development strategy has been working, we also see indications that the rate of progress is slowing. The slowing of measurable progress is attributible primarily to three factors: temporary non-compliance as a result of new regulatory standards; management constraints related to the challenges of maintaining adequately trained operators, and the fact that many of the easiest steps have already been taken and further progress will require more innovative and resource-intensive approaches. MDE's Water Supply Program will continue to provide technical assistance to water systems and work closely with training organizations to target training to the areas of greatest need.

Appendix A

CAPACITY DEVELOPMENT CASE STUDIES

Maryland's Statewide capacity development strategy focuses on working with public water systems to address their violations with short and long-term solutions. The following case studies illustrate some of the successes of this approach in the last three years.

Allegany County – Frostburg - In June 2004, the Water Supply Program (WSP) performed a Comprehensive Performance Evaluation (CPE) at the City of Frostburg's Water Treatment Plant. A CPE is a detailed evaluation of a surface water plant by a team of WSP engineers where the design, operation, maintenance and management of the plant are assessed. During the evaluation of the filtration system, it was discovered that the media layering in one of the filters was distorted and varied in depth well beyond industry standards. Upon further investigation by the utility, it was discovered that the filter's under-drain system was malfunctioning, causing the uneven media layering, and ultimately, a potential weak link in the treatment train. New under-drain systems were installed in two of the filters the following year, and in the remaining two filters in 2008.

Anne Arundel County - Epping Forest –Two miles north of Annapolis, the Epping Forest water system supplies about 200 homes. For many years only one person knew how to operate the system and there were no written standard operating procedures. Visits to the water system in 2008 revealed that several pieces of equipment were in poor condition and the system had experienced recurring power outages that resulted in a loss of water service. Boil water advisories were issued when service was restored and remained in effect until testing indicated the water was safe for drinking. To improve continuity, the operator developed written standard operating procedures and trained others on the basic operation of the system. A climate control system that helps reduce corrosion was installed in the treatment building. The sedimentation tank, pressure filters, and the storage vessel were rehabilitated. A propane generator, which is capable of powering the wells and the treatment equipment, was also installed. As a result of these measures the technical and managerial capacity of the system has improved.

Carroll County - City of Westminster - The City of Westminster water system serves about 38,000 people. Under 2002 drought conditions and during the summers of 2005 and 2006, the City was unable to meet demand without imposing voluntary restrictions. In addition, flow-by requirements of the City's water appropriation permit were violated in the Cranberry Branch of the West Branch Patapsco River. The City and MDE have entered into a consent agreement to improve the system's drought reliability and limit allocation for new development. The WSP requested that the City formulate a Capacity Management Plan and has been meeting with City staff, their consultants, and County Health Department staff regarding the significant capacity deficit. The City's updated capacity management plan proposes several prospective new sources (near-term and long-term solutions) to address the capacity deficit. The City has worked cooperatively with Carroll County to implement water conservation methods to reduce drought year demands. A final implementation schedule has not yet been established. During 2007, the water system greatly improved its treatment capabilities as a result of the enforcement activities of the WSP.

Cecil County - Manchester Park - A section of Manchester Park, had been having some minor water discoloration problems, due to iron, for several years. In May 2006, the problems worsened as dark brown water stained laundry and plumbing fixtures. To further complicate the issue, customer complaints were not being addressed by the owners of the system. WSP staff arranged an onsite meeting with the system operator and determined that hydrant flushing was needed in this portion of the distribution system. With WSP's guidance, additional hydrants were added and an improved method of communicating with customers and responding to customer complaints was established. Water quality was dramatically improved and customer complaints ceased.

Dorchester County - Vienna – In February and March of 2005, MDE received several complaints of pink water and rusty water from residents of Vienna. In response to the complaints, an evaluation of the water system was conducted by WSP staff. WSP staff worked with the Maryland Rural Water Association and the Town to identify areas that needed improvement, such as plant management, operation and maintenance. Several upgrades to the plant were completed, including replacement of the filter media, installation of new tower and well controls, and replacement of the plant's auto-dialer. Upon completion of all the upgrades, plant performance significantly improved and has remained consistently better in the years since.

Garrett County - Northern Middle School – A source evaluation of the supply well at Northern Middle School detected bacteriological contamination in the raw water. The well, which serviced about 500 students and staff, was later found to be under the direct influence of surface water and thus at risk for contamination by bacteria, viruses, and protozoa. Initially the school drilled a replacement well away from surface water sources; however insufficient yield and arsenic contamination prevented the new well from being used for potable purposes. The school was instructed to discontinue use of the existing well and use an interconnection with the adjacent high school until a permanent solution could be found. Since the high school well could not sustain an adequate yield to supply all users, a permanent solution was needed. The WSP encouraged the Board of Education to continue exploring options, including working with the county utility on extending a water line from a nearby community water system. In early 2006, the county utility completed a water line extension from the Town of Grantsville to the area and connected Northern Middle School and Northern High School to the system. This extension also allowed several nearby residents with water quality problems to be served by the municipal supply. MDE made available a $1.5 million low-interest loan to help pay for the project (other funds were eventually used). Persistent encouragement and technical assistance by the WSP helped resolve quality and quantity problems at this school.

Harford County - Fountain Green Mobile Home Park - The water treatment plant at Fountain Green MHP, a community with 24 mobile homes, was in need of repair. In addition, plant operation was hindered by a leaking roof and worn out equipment. WSP convinced the new owner that permanent repairs were needed. In September 2006, the new plant was completed and a November site visit confirmed that the equipment and plant was on-line and producing a safer environment for the operator and a much more reliable water system.

Queen Anne's County - Kent Towne Market - Kent Towne Market is a strip mall located in Queen Anne's County that includes some fast food restaurants, a grocery store, and other shops. Arsenic levels of up to 46 ppb were detected in the well (the drinking water standard for arsenic

is 10 ppb). There were plans to connect the mall to a public water system when a new Safeway store was constructed. WSP had discussions with the management firm and Queen Anne's County Sanitary District and encouraged the expedition of the public water connection. Although construction on the new Safeway was not yet underway, the public water connection to the mall occurred on March 31, 2006, two months after the adoption of the new arsenic MCL.

Wicomico County - Filtronic-Comtek - In September of 2004, nitrate levels in excess of the MCL were detected in the well servicing Filtronic-Comtek, a manufacturing facility located in Wicomico County. The facility's septic system drainage area was about 300 feet away and uphill from the well and was the suspected source of some of the contamination. Since the well was screened in a shallow aquifer, an alternate nitrate limit was not considered an option, and the system was added to the EPA's SNC list. WSP requested that a new well be drilled in the appropriate aquifer. Although nitrates were not detected in the new well, there were elevated iron levels and treatment was desired. WS P provided technical and other assistance to guide the system through the process of obtaining a construction permit so that treatment could be installed. The old well was abandoned and the new well was placed on-line in April 2006.