

**REPORT OF THE**

**STATE WATER COMMISSION**

**TO THE GOVERNOR AND  
THE GENERAL ASSEMBLY OF VIRGINIA**



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**COMMONWEALTH OF VIRGINIA**

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## **STATE WATER COMMISSION EXECUTIVE SUMMARY**

### **Commission Deliberations**

The State Water Commission (the Commission) is a 15-member legislative body established by statute that is charged with (i) studying all aspects of water supply and allocation problems in the Commonwealth, (ii) coordinating the legislative recommendations of all state entities that have responsibilities with respect to water supply and allocation issues, and (iii) annually reporting its findings and recommendations to the General Assembly and the Governor. In 2015, the Commission met twice and devoted its time to receiving testimony regarding (a) strategies for managing groundwater in Eastern Virginia, (b) the status of the state water resources plan, (c) the proposed regulations for hydraulic fracturing, and (d) local and regional approaches to ensuring the availability of future water supplies.

### ***Meeting Proceedings, July 22, 2015***

#### **A. Groundwater Sustainability: Strategies for Managing Groundwater in Eastern Virginia**

During the 2015 Session of the General Assembly, Delegate Keith Hodges introduced legislation (HB 1924) establishing the Eastern Virginia Groundwater Management Advisory Committee (the Advisory Committee). He stressed that water is a finite resource that drives the economy; therefore, it is important that decision makers obtain as much information as possible on the state of our groundwater resources. He noted that the availability of water is a key factor in a business's decision to establish, or not to establish, an operation in a particular location. Virginia's coastal population obtains 90 percent of its water supply from the Potomac Aquifer. Delegate Hodges is concerned that this water supply be properly managed to maintain its sustainability, but cautioned that it will take "years to develop and implement solutions" to protect the aquifers in the region. The urgency of the matter led him to introduce legislation to establish an expert advisory group. The legislation directs the Advisory Committee to assist the Department of Environmental Quality (DEQ) in developing, revising, and implementing a management strategy for groundwater in the Eastern Virginia Groundwater Management Area. The legislation requires the Advisory Committee to report its findings to the Commission and the Director of the DEQ by August 1, 2017, and requests that the Director of the DEQ submit a report responding to the Advisory Committee's recommendations to the Governor, the Commission, the House of Delegates and Senate committees having oversight, and the Joint Legislative Audit and Review Commission by November 1, 2017.

Mr. David Paylor, Director of the DEQ, discussed the progress being made in the development of strategies for managing groundwater in Eastern Virginia. The agency's plan includes a short-term strategy of reducing withdrawals by 57 percent, thus stabilizing "head loss." He pointed out that 14 facilities are responsible for 87 percent of the groundwater being withdrawn. In its review of the possible reductions, DEQ identified three of the largest users for immediate reductions and 11 for potential reductions. Currently, meetings are taking place with the largest users. The three largest users have agreed to reduce their withdrawals, and DEQ is negotiating possible reductions with the others.

Mr. Paylor characterized the discussions as very encouraging and believes they will result in possible solutions. The issues being discussed include the timing of reductions. The agency is working with permittees to establish a schedule that meets their business needs and enables economic development while reducing withdrawals.

During the 2015 Session, Delegate David Bulova introduced HB 1871, which required the registration of new wells drilled in a groundwater management area and outlined data integration expectations for DEQ and the Virginia Department of Health (VDH). This legislation will result in a more comprehensive groundwater database by (i) creating a single joint well construction form and a single well construction data set for both agencies and (ii) developing an online well registration system. The information collected will be shared by both agencies. Training sessions explaining the process for registration of wells will be conducted using certified water well providers. An effort will also be made to retrieve information on private wells that have been stored in paper files but previously not integrated into the database. Federal funding is being sought in order to accelerate the retrieval of this data.

In addition, there is a joint effort by the Hampton Roads Planning District Commission, NASA, the U.S. Geological Survey (USGS), and the U.S. Navy to monitor land subsidence in the coastal plain. DEQ is currently evaluating the cost of reconditioning two DEQ/USGS land subsidence monitors. In a related development, DEQ has contracted with USGS to develop a chloride (saltwater intrusion) monitoring network and strategy. It is anticipated that by 2016, DEQ will be able to assess what is needed to develop and implement such a network.

Mr. Paylor concluded his remarks by informing the Commission that 24 individuals have been selected as members of the Advisory Committee. He characterized the members as "high-level decision-makers." The members will examine how the state manages water and what strategies most effectively ensure the sustainability of groundwater. He anticipates that these individuals will be assisted by technical experts. The initial meeting of the Advisory Committee occurred on August 18, 2015. A final report will be submitted to the Commission by November 1, 2017.

## B. Findings of the State Water Resources Plan

Mr. Scott Kudlas, Director, Office of Water Supply, Department of Environmental Quality, began his presentation with a brief history of water planning in the Commonwealth. There was a very active planning effort in the 1940s–1960s by what was known as the Virginia Conservation Commission, the predecessor of the State Water Control Board (SWCB). The Virginia Conservation Commission issued a number of annual and semiannual reports on the status of water resources, measuring volumes of water and providing some information on groundwater. Under the SWCB, the first watershed plans were created as a result of the extensive drought in the 1960s. The watershed program was eliminated in the late 1980s due to budget cuts. An active planning effort commenced again during the drought period of 1998–2002. The drought led to recognition by DEQ and the Commission of the need for better planning in order to respond to fluctuations in water resources. Legislation was developed and supported by the Commission and DEQ to require the development and submission of local and regional water supply plans, with data in these plans organized into the proposed State Water Resources Plan (the Plan).

Mr. Kudlas discussed a number of caveats regarding the Plan. The Plan is an effort not just to report how much water "is out there" but also to examine projected local needs and what that means for our statutorily protected "beneficial uses." A second caveat or concern is that no hard and fast conclusion should be drawn on future availability of our water resources. Rather, the data represents "potential future outcomes." It is important to realize that the Plan is not a regulatory document but a planning document intended to provide information that only the state could develop. It is seen by Mr. Kudlas as an essential element in fostering an ongoing dialogue with localities aimed at assisting the localities in planning for their future needs, by having the data necessary to make informed decisions. The goal of the Plan is to identify potential risks to beneficial uses.

He cautioned that there are still challenges that must be addressed and that future management decisions may require the development of new tools that will be useful in analyzing impacts to off-stream uses, water quality, aquatic life uses, and high use watersheds. It will require greater coordination and different management approaches during periods of low flow. The Plan identifies the following challenges:

- Understanding the impact of water withdrawals that do not currently require a permit;
- Quantifying current and future risks to groundwater availability outside the current groundwater management areas;
- Recognizing that more water withdrawals have occurred than have been reported to DEQ;
- Understanding the impact of consumption use on water supply; and
- Promoting increased water efficiency to reduce long-term and short-term demand.

Any effective plan will have to take into account such factors as (i) infrastructure deficiencies that can result in the loss of up to 50 percent of treated water; (ii) sea level rise, changes in precipitation patterns, and land subsidence; (iii) source water protection; (iv) conflict resolution; and (v) public education and outreach.

A draft of the State Water Resources Plan was posted on the DEQ website for public comment. The comment period closed May 8, 2015, with the agency having received 31 comments. Mr. Kudlas stated that the comments were generally supportive "but reflect the uncertainties associated with doing something new." Comments reflected recognition that such a planning effort is a complex task, and those submitting the local/regional plans acknowledged that the creation of the Plan is an important tool in water supply planning. There is still some uncertainty as to the intent of the Plan and the role of state government and localities in carrying out the Plan. The state has awarded \$400,000 in grants to assist localities in developing their local/regional plans; however, localities have indicated the need for continued financial support.

Citing sections of the Code of Virginia, Mr. Kudlas emphasized that localities have the lead role in providing water supply while the state plays a supportive role. The VDH mission is to protect public health by ensuring that all people in Virginia have access to an adequate supply of affordable, safe drinking water that meets federal and state drinking water standards. DEQ is charged with managing programs that ensure that (a) water quality standards are met

(monitoring) and (b) instream flow is available over the long term for both instream and off-stream uses (planning and permitting).

In conclusion, Mr. Kudlas highlighted several instances in which a locality's plan has resulted in the development of strategies essential in maintaining its water supply. For instance, Rockingham County's water supply plan indicates that the county will face a possible deficit of 1.272 million gallons per day by 2020. Its plan recommends certain alternative strategies to address the deficit, such as the development of new wells and treatment facilities, plant upgrades to provide additional supply and treatment capacity, and the development of water purchase agreements with neighboring jurisdictions. In Nottoway County, population and demands are projected to increase through 2040. However, existing water sources are expected to meet projected demands. Henrico County's population and demands also are projected to increase through 2040; in this case, as the county was developing its plan it was involved in the construction of a reservoir that will provide storage for public water supply projects.

While all of the plans submitted to DEQ were found to be in compliance with the agency's guidance document, DEQ will periodically analyze the data to ensure that the latest information has been included. The agency plans to target outreach efforts to localities and withdrawers in high-risk areas and work with all localities and withdrawers to improve (1) the cumulative impact analysis and (2) coordination during critical periods.

### C. Proposed Draft Regulations for Hydraulic Fracturing

Mr. Michael Skiffington, Program Support Manager, Department of Mines, Minerals and Energy, began his presentation with a description of the Virginia Department of Mines, Minerals and Energy's (DMME) organizational structure and the agency's mission, "to enhance the development and conservation of energy and mineral resources in a safe and environmentally sound manner to support a more productive economy." He turned to the subject of hydraulic fracturing: the use of pressurized liquids or gases, such as nitrogen, to stimulate or fracture rock formations to release natural gas or oil. The composition and volume of fluids used depends on many geological factors. Sand is often pumped in with fluids to help prop open the fractures in the rock. According to Mr. Skiffington, fracturing, along with horizontal drilling, has made previously inaccessible natural gas and petroleum resources economically producible. Over the past decade, the application of such technologies has greatly expanded U.S. oil and natural gas production. In Virginia, "fracking" has been utilized since the 1960s. In Southwest Virginia, over 8,000 wells have operated using this technique. Mr. Skiffington informed the Commission that there has been no documented instance in Virginia of surface or groundwater degradation as a result of fracking. The amount of water needed to frack a well in Virginia is 0–300,000 gallons. By contrast, to frack a well in the Marcellus Shale regions will require up to 4–5 million gallons of water. Operators are increasingly utilizing nitrogen-based fuel to frack wells.

The USGS estimated that there is 1.06 trillion cubic feet of natural gas in the Taylorsville Basin. That is about 2.5 times greater than Virginia's total annual consumption of natural gas. By comparison, the Marcellus Shale in Pennsylvania, New York, and West Virginia is estimated to contain 410 trillion cubic feet of natural gas.

Mr. Skiffington provided the Commission with an update of the oil and gas regulations. A comprehensive rewrite of the regulations began in 2007 and was completed in 2013. In the fall

of 2013, DMME initiated a new regulatory action to review the requirements for oil and gas drilling. The review included an analysis of (i) chemical disclosure requirements, (ii) selected industry practices, and (iii) whether additional requirements are necessary for different regions of the Commonwealth. A notice of regulatory action was published on January 13, 2014. The agency received over 200 comments during the 30-day comment period. The comments supported greater disclosure of the ingredients used in the fracking process.

Following the Notice of Intended Regulatory Action (NOIRA), DMME established a regulatory advisory panel (RAP) to assist in reviewing regulations. The panel was composed of a variety of stakeholders representing the environmental community, state agencies, local government, and industry. It held six meetings, all of which were open to the public. The panel reached consensus on 14 recommendations. Thirteen of the 14 recommendations have been incorporated into the draft proposed regulations.

The RAP's significant recommendations included:

- Disclosure of ingredients used in fracking;
- Use of the website FracFocus to facilitate disclosure;
- Establishment of a separate state registry containing Virginia data that has been included in the national FracFocus website;
- Disclosure of ingredients before a well is fracked; currently, disclosure occurs upon the completion of drilling;
- Submission of information classified as trade secrets;
- Expansion of the groundwater testing radius to 1/4 mile;
- Requirement for one post-completion groundwater monitoring test;
- Allowance for a second test if exceedances are detected;
- Requirement for pressure testing of production casing;
- Requirement for enclosure of temporary wastewater storage pits; and
- Requirement for certification of compliance with local land use ordinances.

The draft regulations are currently under review by the Governor's office. Upon the Governor's approval and subsequent publication, a 60-day comment period will commence. Mr. Skiffington anticipates that at least one public hearing will be held during this period. Following the comment period, DMME will review the comments and submit the final regulations for review by the executive branch. He indicated that the regulations will not become final for 12 to 18 months.

### ***Meeting Proceedings, December 8, 2015***

#### **Local and Regional Approaches to Ensuring Future Water Supply**

To learn more about efforts that are being undertaken to ensure that there will be adequate water supply over the next several decades to meet the needs of Virginia residents and provide a level

of water resources needed to support continued economic development in the Commonwealth, the Commission invited several local officials to discuss their various approaches/strategies for accomplishing this goal. Those who testified described a range of urban and rural-based initiatives that are designed to meet water supply needs of users into the future.

#### A. Fairfax Water

Mr. Steven Edgemon, Deputy General Manager, and Ms. Jamie Hedges, Director of Planning and Engineering Division of Fairfax Water, discussed the agency's approach in providing water to two million residents in northern Virginia. Mr. Edgemon explained that Fairfax Water has nearly \$2 billion in infrastructure assets with a production capacity of 345 million gallons per day (mgd), which includes two treatment plants, one serviced by the Potomac River (225 mgd) and the second by the Occoquan Reservoir (120 mgd). In addition, in 2014, Fairfax Water entered into an agreement to become a wholesale customer of the Washington Aqueduct, purchasing 30 mgd, bringing the total capacity of the system to 375 mgd. An average of 157 mgd is delivered to customers. Its annual operating budget is \$93 million, and it plans to spend in excess of \$72 million over the next 10 years to replace infrastructure.

Ms. Hedges discussed the water supply system in operation for the metropolitan Washington area. Fairfax Water is one of the three major suppliers for the area; the others are the Washington Suburban Sanitation Commission (WSSC) and the U.S. Army Corps of Engineers Washington Aqueduct. In the 1970s, researchers developed models that showed that cooperative management of the region's water supply would allow Fairfax Water to meet the public's demand for water during drought situations. As a result, a low flow allocation agreement was signed by the federal government, Maryland, Virginia, District of Columbia (D.C.), Fairfax Water, and WSSC that defines how withdrawals would be allocated in the event that the Potomac River flows could not meet the water supply needs of the region. In 1982, Fairfax Water, the federal government, WSSC, D.C., and the Interstate Commission on the Potomac River Basin (ICPRB), realizing greater coordination of system operations was necessary in order to optimize their resources, became signatories to the Water Supply Coordination Agreement (Agreement). The Agreement acknowledged the need to cooperatively plan for the future and provided for shared funding for the maintenance of reservoirs and future water supply projects that will ensure adequate water supplies for the region. Every five years, the region's water suppliers commission a study to evaluate the future reliability of the region's water supply. The 2010 study was the foundation for the northern Virginia regional water supply plan submitted to DEQ in 2012.

The 2015 ICPRB Water Supply Study indicated that by 2035 the current Potomac River Basin Water supply system will experience considerable stress, due in part to climate change and an increase of consumptive use because of industrial and population growth. If there is a reduction in the stream flow of 10 percent or more, mandatory use restrictions will be required. Even though the population in the Washington metropolitan area has increased by approximately 700,000 in the last 25 years, total water use has stayed the same because of declining per unit use. Demand forecasts for the region suggest a 20 percent reduction in water use over the next several decades, due in large measure to a trend toward the installation of more water use efficiency programs, such as Energy Star, in the new housing stock.



An element of the Agreement is the identification of alternatives to address possible future deficits. Those alternatives include upstream reservoirs, estuary treatment, and reuse of retired rock quarry for water supply storage.

Ms. Hedges emphasized that Fairfax Water's strategy of watershed-based water supply planning has been effective in providing water resources that meet the needs of residents and businesses in the region by adopting a cooperative approach. The Agreement is an important example of coordinated planning that permits a sharing of benefits, risks, and resource costs. In addition, this regional approach in responding to drought situations is the key to avoiding inter-jurisdictional confrontation and public confusion.

#### B. Bedford Regional Water Authority and the Western Virginia Water Authority

A regional approach for providing a reliable source of water supplies has also been instituted by smaller, less urbanized communities. Mr. Brian Key, Executive Director of the Bedford Regional Water Authority (BRWA), described BRWA efforts to provide water resources in the western portion of the state. In 2009, the City of Bedford began the process of reversion to a town, driven in large measure by the need to provide reliable water and sewer services. An engineering study was completed in 2012 that indicated there were no major obstacles to establishing a new joint water and sewer authority. The reversion provided an opportunity to blend the county system with the city's water and sewer utilities department, resulting in formation of the BRWA. The BRWA facilities included four water treatment plants, two water intake pump stations, one reservoir, nine water storage tanks, three wastewater plants, and two administrative office buildings. The BRWA serves 13,500 water customers and 4,500 wastewater customers and employs 60 full-time and three part-time staff.

In the Roanoke area, similar concerns were being raised regarding the ability to meet the water supply needs of the residents. In the 1990s, Roanoke County and the City of Roanoke began discussing a possible collaborative effort to provide water and sewer services to the area. The drought provided the impetus for examining a most reliable cost-effective strategy. The result was the formation of the Western Virginia Water Authority (WVWA), which began operations July 1, 2004. The WVWA was the first authority in the Commonwealth formed from two existing entities to treat and deliver water and wastewater services to the City of Roanoke and Roanoke County; the Counties of Franklin and Botetourt joined the WVWA in 2009 and 2015, respectively. The WVWA currently serves 159,000 water customers and 122,000 wastewater customers. Its distribution and collection systems include 1,123 miles of water lines and 891 miles of sewer lines. The WVWA is staffed by 272 full-time and 66 part-time employees. It is approximately four times the size of the BRWA.

In an effort to reduce each authority's operating costs, including costs of purchasing water from the various localities in the region, the BRWA and WVWA examined the option of entering a partnership to design and build a water treatment plant. They recognized the benefit of working together and agreed to build a new treatment facility using Smith Mountain Lake as its water source. Both authorities had approximately the same number of customers being served on each side of the lake. An additional benefit was that water service would be enhanced by allowing homes and businesses that used public water service to connect along the routes where new water lines would be constructed, providing an opportunity for additional fire suppression capability with the siting of more fire hydrants. It is estimated that the cost of construction will

be approximately \$30 million, financed solely by local funds, with a projected savings of \$28 million over a 50-year period. The partnership agreement between the two authorities was executed on May 7, 2014. The water treatment plant design and construction costs will be shared equally by the two authorities.

### C. Hampton Roads Sanitation District

In Eastern Virginia, the major concern is ensuring the long-term availability of groundwater. Mr. Ted Henifin, General Manager of the Hampton Roads Sanitation District (HRSD), discussed a strategy that he characterized as "sustainable water recycling" as a means to protect groundwater aquifers in the region. The notion of water recycling has become more attractive as the ability to treat wastewater is approaching the limits of technology and as treatment facilities are expensive to build and costly to operate. As HRSD faces the higher water quality standards for waters that are discharged into the Chesapeake Bay, the organization has begun to investigate an alternative strategy that would treat wastewater to drinking water standards and inject the treated water into the aquifers in the region. The big question that HRSD is seeking an answer is whether recharge is feasible in the Eastern Virginia aquifer system. Currently, natural aquifer recharge is not keeping up with the amount of groundwater being withdrawn. Twenty percent of the water treated by the HRSD facilities is groundwater. Such withdrawals may contribute to land subsidence and saltwater contamination of the aquifers. The depletion of groundwater in Eastern Virginia has been well documented. The greatest head loss in groundwater occurs in Franklin and West Point where paper mills operate.

According to Mr. Henifin, there are two potential solutions for restoring groundwater: reduced withdrawal and aquifer recharge. Taking the latter approach, he proposed a closed loop water recycling system. Groundwater would be withdrawn and treated so that it meets drinking water standard and then returned to the aquifer through an injection well. This approach has several benefits:

- Significant reduction in nutrient discharges into the Chesapeake Bay;
- A sustainable source for groundwater replenishment;
- Potential reduction in the rate of land subsidence; and
- Protection of groundwater from saltwater contamination.

Mr. Henifin pointed out water recycling is not an unusual practice. His proposal would combine waters that had undergone advanced water treatment, wastewater treatment, and drinking water treatment and return these waters to the aquifer at the HRSD treatment plant. Examples of water recycling being used to recharge groundwater via direct injection include the groundwater replenishment system in Orange County, California; the Scottsdale Water Campus in Arizona; and Hueco Bolson in El Paso, Texas. Based on hydrologic models, the direct injection approach will exert enough pressure so as to have a positive impact on the Potomac aquifer as far north as Maryland and as far south as North Carolina. Similar injection technology has been used on a much smaller scale in Virginia by the City of Chesapeake as a component of its groundwater storage and recovery program. Since 1987, Chesapeake has injected 28 billion gallons into the aquifer for storage and future use.

A key factor in such an operation is that the water injected into the aquifer must be compatible with the "native" groundwater and the aquifer material. Various treatment processes produce water with varying levels of aquifer compatibility. Thus, prior to implementing any injection project, a geochemical evaluation will have to be conducted to compare the qualities of the water from the various treatment processes to the native groundwater.

Mr. Henifin estimated that the project costs will total approximately \$1 billion and that the project will inject about 120 mgd into the aquifer. He estimated annual operating costs at between \$21 million and \$43 million. He suggested that the operating costs could be recovered with the imposition of "reasonable" withdrawal permit fees.

The next phase of the HRSD effort will include additional analyses of various treatment technologies, pilot testing, and modeling. The HRSD will seek the endorsement of the project by the Eastern Virginia Groundwater Advisory Committee in 2017. It is anticipated that a one mgd, two-year demonstration project will begin in 2018 that will assess both the effectiveness of the advanced treatment technology and aquifer injection. If the demonstration project is successful, the construction phase is expected to begin in 2020, with the expectation that the injection project will be fully operational by 2030.

#### D. Loudoun Water

Loudoun Water is a water and wastewater authority that also provides reclaimed water to offset potable water when necessary. Mr. Mark Peterson, Executive Director for Stakeholder Relations for Loudoun Water, characterized the company's operation as medium-sized, serving 250,000 customers, and delivering an average of 23 mgd, with a maximum daily demand of 43 mgd. He expects that over the next 25 years population increase will double the demand for water. This presents a number of challenges that will require the agency to "sustainably manage the resource," while continuing its commitment to protect public health, the environment, and the quality of life. One way to meet the challenge of keeping pace with growth, according to Mr. Peterson, is through collaboration and partnerships. This not only means the continued development of a system that involves construction of additional water and wastewater facilities, but also the purchase of water at a wholesale rate from Fairfax and the Blue Plains plant in the District of Columbia and sharing of the Potomac River as a source of water. A key element in expanding the system is understanding the land use plan for the county and how it will affect Loudoun Water's plans for expansion. This will result in more effective financial planning and ensure that the costs of expansion are met.

Over the past 15 years, the use of quarries as storage facilities has become an essential element of Loudoun Water's water supply planning. A partnership has been established with Luck Stone to use its retired quarries to store water to offset potable water use in certain situations. In low-flow or drought conditions, the "banked" water would undergo an enhanced treatment process at the county's Bull Run reclamation plant. The reclaimed water could then be returned to the Potomac River as part of the effort to augment low-flow conditions. A second option is to sell the reclaimed water to local data information centers for cooling purposes at a cheaper price than the businesses would pay to use drinking water to cool their industrial operations.

Any strategy for developing a sustainable water future must also include demand management initiatives that encourage wise water consumption, according to Mr. Peterson. The goal of the demand management policy is to reduce water usage during the hot summer months by (i) instituting a customer education program, (ii) adopting a tiered rate structure that provides customers with incentives to reduce their usage, and (iii) implementing a new metering system that allows customers to receive a profile of their water use.

This executive summary serves as the report of the State Water Commission. This report will be filed as a state document.