

**Consolidated Report on the Water Quality Improvement Grants  
Required to Fund Projects to Reduce Loads of Nitrogen-  
Containing Ammonia**

*A Report to the Chairs of the House Appropriations, House  
Agriculture, Chesapeake and Natural Resources, Senate  
Finance, and Senate Agriculture, Conservation and Natural Resources  
Committees*

**Virginia Department of Environmental Quality**

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## **List of Abbreviations**

**DEQ – Virginia Department of Environmental Quality**

**DPB – Virginia Department of Planning and Budget**

**EPA – United States Environmental Protection Agency**

**MGD – Million Gallons per Day**

**O&M - Operation and Maintenance**

**POTWs - Publicly Owned Treatment Works**

**TKN – Total Kjeldahl Nitrogen**

**VAMWA - Virginia Association of Municipal Wastewater Agencies**

**VPDES - Virginia Pollutant Discharge Elimination System**

**WQIF - Water Quality Improvement Fund**

## **I. Executive Summary**

This report was prepared by the Virginia Department of Environmental Quality (DEQ) pursuant to HB 1608 and SB 340. These identical bills were approved by the 2018 session of the General Assembly and signed by the Governor on March 30, 2018. The bills provide that:

Subsequent to the implementation of any applicable regulations, permits, or the Chesapeake Bay [Total Maximum Daily Load] Watershed Implementation Plan, the [DEQ] Director may authorize disbursements from the [Water Quality Improvement Fund (WQIF)] for any water quality restoration, protection, and improvements related to point source pollution that are clearly demonstrated as likely to achieve measurable and specific water quality improvements, including cost effective technologies to reduce loads of total phosphorus, total nitrogen, or nitrogen-containing ammonia in order to meet the ammonia requirements that have not yet been adopted and that are more stringent than regulations adopted by the State Water Control Board as of January 1, 2018.

The United States Environmental Protection Agency (EPA) updated its 1999 national ambient water quality criteria recommendations for ammonia in 2013. These criteria are approximately twice as stringent as the current criteria in Virginia's Water Quality Standards Regulation (9VAC25-260-155), which are based on EPA's 1999 criteria, since they reflect added toxicity data for very sensitive freshwater mussels and snails. DEQ anticipates that the State Water Control Board will consider adopting these new nationally-recommended ammonia criteria in late 2018. Individual Virginia Pollutant Discharge Elimination System (VPDES) permits for both municipal and industrial facilities include permit requirements, special conditions, effluent limitations, and monitoring requirements determined for each facility on a site-specific basis in order to meet applicable water quality standards. Adoption of the nationally-recommended freshwater ammonia criteria may require stricter permit limits, requiring permittees to upgrade existing treatment equipment or to install new treatment equipment.

HB 1608 and SB 340 also require DEQ to prepare a preliminary estimate of the amount and timing of WQIF grants required to fund projects to reduce loads of nitrogen-containing ammonia at certain levels based on an estimate of the anticipated range of costs for all publicly owned treatment works if the State Water Control Board were to adopt the 2013 Aquatic Life Ambient Water Quality Criteria for Ammonia published by EPA. The legislation further specified that for purposes of preparing this preliminary estimate, DEQ "may rely upon readily existing information and any reasonable assumption."

A July 2015 estimate prepared for the Virginia Association of Municipal Wastewater Agencies (VAMWA) estimated capital costs of \$512 million (in 2014 dollars) to implement the 2013 nationally-recommended ammonia criteria.<sup>1</sup> While DEQ considers this estimate to be representative, the estimate was derived using a combination of underlying assumptions that are likely to be very conservative and thus may actually over-estimate the potential cost of

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<sup>1</sup> Memorandum from Clyde Wilber, P.E. to the Virginia Association of Municipal Wastewater Agencies (July 15, 2015) (on file with DEQ).

implementing the new nationally-recommended ammonia criteria.<sup>2</sup> DEQ expects that a site-specific evaluation of many facilities will demonstrate that the facility is currently meeting the proposed nationally-recommended ammonia criteria without significant capital costs.

However, it is not possible to translate a cost estimate into an estimate of the amount and timing of WQIF Grants. The provision added by HB 1608 and SB 340 only applies once Chesapeake Bay TMDL Watershed Implementation Plan needs have been satisfied, and it is uncertain when this will occur. Additionally, until the new nationally-recommended ammonia criteria are applied to permitted dischargers on a case-by-case basis, the amount of grants a facility might be eligible for is uncertain. Finally, grants that might be issued pursuant to this section are subject to the availability of funds appropriated by the General Assembly, which are unknown at this time.

## **II. Background and Analysis**

The federal Clean Water Act requires that states reevaluate their water quality standards every three years. During the current evaluation, DEQ proposed the adoption of EPA's new 2013 freshwater ammonia-nitrogen criteria for the protection of aquatic life. EPA's new criteria are substantially more stringent than the current Virginia criteria, which are consistent with EPA's earlier criteria, adopted in 1999. EPA's new criteria are based in part on new data that reflect the sensitivity of freshwater mussel species to ammonia-nitrogen. DEQ anticipates that the State Water Control Board will consider adopting these new nationally-recommended ammonia criteria in late 2018. The adoption and implementation of the now-proposed nationally-recommended ammonia criteria will have substantial impacts on publicly owned treatment works (POTWs) and other wastewater treatment facilities. Individual Virginia Pollutant Discharge Elimination System (VPDES) permits for both municipal and industrial facilities include permit requirements, special conditions, effluent limitations, and monitoring requirements determined for each facility on a site-specific basis in order to meet applicable water quality standards. Adoption of the nationally-recommended ammonia criteria may require stricter permit limits. More stringent VPDES permit limits for ammonia-nitrogen will require capital upgrades, additional operations, and operation and maintenance (O&M) expenses for many of these facilities.

The primary and most widespread potential cost increase associated with adoption and implementation of the nationally-recommended ammonia criteria would be from meeting more stringent ammonia limits for municipal dischargers to comply with the revised ammonia criteria. A permit holder may reduce the ammonia discharge through nitrification, which would convert ammonia into nitrate-nitrogen and then discharge nitrate into the water. If nitrate cannot be discharged into the water because of permit limits, then the facility may install a nitrification/denitrification system, convert nitrate-nitrogen from the first step into the harmless gas form of nitrogen, and discharge into the air instead of water.

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<sup>2</sup> Adoption of the nationally-recommended ammonia criteria may also result in VPDES permit limits that require upgrades at industrial facilities, but that analysis is beyond the scope of this report.

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A majority of the larger municipal wastewater plants in the Chesapeake Bay watershed (with design flows of 0.5 million gallons/day (MGD) or greater west of the fall line and 0.1 MGD or greater east of the fall line) have been retrofitted with nitrogen reduction technology, which includes the ammonia control stage (nitrification). The remaining facilities in the Bay watershed most likely to be affected are those with design flows less than 0.1 MGD located east of Interstate 95 and those with design flows less than 0.5 MGD west of Interstate 95. The more widespread financial impact may be on permittees located outside of the Bay watershed, particularly those facilities that are large in volume compared to the receiving stream. None of the facilities outside the Bay watershed have been required to address total nitrogen reduction and if they have an ammonia effluent limit it is based on the current, less stringent, freshwater criteria. Implementation of the new nationally-recommended ammonia criteria may require additional treatment capability at many of these plants, but it is also likely that some will be able to comply by making operational changes rather than capital upgrades at their facilities. Until the individual permit limits are determined and the existing plant capabilities are known a definitive cost estimate and scope of the financial impact cannot be estimated.

There are approximately 220 discharge permits issued in the Chesapeake Bay watershed with either ammonia limits or ammonia monitoring requirements. It may be assumed that the majority of the municipal facilities located east of Interstate 95 with a design flow equal to or greater than 0.1 MGD or located west of Interstate 95 with a design flow equal to or greater than 0.5 MGD have previously upgraded to nitrify/denitrify in order to comply with the total nitrogen waste load allocations established under the Chesapeake Bay Total Maximum Daily Load. Those waste load allocations are contained in the Water Quality Planning Management Regulation (9VAC25-720 *et seq.*) and the Chesapeake Bay Watershed General Permit Regulation for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading (9VAC25-820). Those facilities utilizing a nitrification/denitrification wastewater treatment process to meet total nitrogen concentration limits greatly reduce the ammonia concentrations in effluent to very low levels and consequently will most likely meet the more stringent ammonia criteria without additional effort.

There are approximately 20 facilities east of Interstate 95 with flows less than 0.1 MGD. It is anticipated that these facilities have the greatest likelihood to incur impacts due to more stringent ammonia criteria. Of these, 17 now have numeric ammonia limits and it is likely they have nitrification capability to meet current limits. However, an upgrade and/or operational procedure modification may be necessary to comply with newer, more stringent ammonia limits.

There are approximately 119 facilities west of Interstate 95 in the Bay watershed with design flows less than 0.5 MGD. It is anticipated that these facilities have the greatest likelihood to incur impacts due to more stringent ammonia criteria. All but two have numeric ammonia limits now and it is likely that the facilities with numeric limits have nitrification capability to meet current limits; however, an upgrade and/or operational procedure modification may be necessary to comply with newer, more stringent ammonia limits. It is unknown how many of these would install a simple nitrification system or an advanced nitrification/denitrification system.

There are approximately 150 discharge permits issued outside of the Chesapeake Bay watershed with either ammonia limits or ammonia monitoring requirements. It is possible that those with only monitoring requirements will incur costs should more stringent effluent limits be necessary.

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All but eight have numeric ammonia limits now and it is likely these facilities have nitrification capability to meet current limits; however, an upgrade and/or operational procedure modification may be necessary to comply with newer, more stringent ammonia limits.

DEQ estimates that a simple nitrification system costs about \$372,000 for a 0.10 MGD sewage treatment plant. The cost of an advanced treatment system capable of both nitrification and denitrification can range from \$750,000 to \$8,195,000 depending on the current level of treatment and volume of discharge. These costs are one-time capital expenditures and are unlikely to recur during the useful life of the equipment; however, operations and maintenance costs would be ongoing. Operations and maintenance costs for nitrification/denitrification could be \$23,000/a year for a 0.10-MGD plant to \$195,000/a year for a 0.60-MGD plant.

### **III. Compliance Costs and WQIF Grants**

A July 2015 estimate prepared for the Virginia Association of Municipal Wastewater Agencies (VAMWA) estimated capital costs of \$512 million (in 2014 dollars) to implement the 2013 nationally-recommended ammonia criteria.<sup>3</sup> While DEQ considers this estimate to be representative, the estimate was derived using a combination of underlying assumptions that are likely to be very conservative and thus may actually over-estimate the potential cost of implementing the new nationally-recommended ammonia criteria.<sup>4</sup> DEQ expects that a site-specific evaluation of many facilities will demonstrate that the facility is currently meeting the proposed nationally-recommended ammonia criteria without significant capital costs.

The estimate prepared for VAMWA did not account for implementation variances or other mitigating factors. Other legislation approved by the 2018 General Assembly (HB 1475 and SB 344) and signed by the Governor on March 29, 2018, required the State Water Control Board to include a “Phased Implementation Program” (PIP) in the ammonia criteria rulemaking. The intent of this PIP is to address the potential impacts on permitted dischargers across the state that will need extended compliance schedules and may be affected by fiscal stress. The PIP must be consistent with, and permissible under the federal Clean Water Act (33 U.S.C. § 1251 *et seq.*), and any relief given under the PIP must ensure that the priority for compliance with the revised criteria “as soon as possible” is still maintained. The proposed PIP has been made publicly available for review with a comment period ending October 5, 2018, along with two public hearings held in September 2018. Options that may offer relief to dischargers affected by the revised ammonia criteria include staggered periods of time following the effective date of the amended criteria for dischargers to develop the information required to apply for coverage under the PIP; extended compliance schedules; consideration of multi-purpose facility upgrades and prioritization of other water quality and water infrastructure needs. DEQ staff intends to present the revised ammonia criteria and PIP to the State Water Control Board for final adoption at their December 13, 2018 meeting.

In addition to the PIP, there are other options that may provide some flexibility to dischargers facing implementation challenges. The two most relevant are: (1) development of a water quality

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<sup>3</sup> Memorandum from Clyde Wilber, P.E. to the Virginia Association of Municipal Wastewater Agencies (July 15, 2015) (on file with DEQ).

<sup>4</sup> Adoption of the nationally-recommended ammonia criteria may also result in VPDES permit limits that require upgrades at industrial facilities, but that analysis is beyond the scope of this report.

standard variance, which would allow dischargers the time to make incremental water quality improvements reflecting the best that can be achieved in a given time period, with accountability measures to ensure that progress will occur; and (2) a recalculation of the applicable ammonia criteria if the absence of freshwater mussels at a particular site can be demonstrated.

It is not possible to translate this cost estimate into an estimate of an amount and timing of WQIF Grants. As a result of HB 1608 and SB 340, § 10.1-2131 of the Code of Virginia now provides in part that:

Subsequent to the implementation of any applicable regulations, permits, or the Chesapeake Bay TMDL Watershed Implementation Plan, the Director may authorize disbursements from the Fund for any water quality restoration, protection and improvements related to point source pollution that are clearly demonstrated as likely to achieve measurable and specific water quality improvements, including cost effective technologies to reduce loads of total phosphorus, total nitrogen, or nitrogen-containing ammonia in order to meet the requirements of regulations associated with the reduction of ammonia that have not yet been adopted and that are more stringent than regulations adopted by the State Water Control Board as of January 1, 2018.

This provision only applies once Chesapeake Bay TMDL Watershed Implementation Plan needs have been satisfied, and it is uncertain when this will occur. Additionally, until the new ammonia criteria are applied to permitted dischargers on a case-by-case basis the amount of grants a facility might be eligible for is uncertain. Finally, grants that might be issued pursuant to this section are subject to the availability of funds, which are unknown at this time.