

Adverse impact notification sent to Joint Commission on Administrative Rules, House Committee on Appropriations, and Senate Committee on Finance (COV § 2.2-4007.04.C): Yes Not Needed

If/when this economic impact analysis (EIA) is published in the *Virginia Register of Regulations*, notification will be sent to each member of the General Assembly (COV § 2.2-4007.04.B).



Virginia Department of Planning and Budget Economic Impact Analysis

9 VAC 25-260 Water Quality Standards
Department of Environmental Quality
Town Hall Action/Stage: 3171/5343
June 16, 2017

Summary of the Proposed Amendments to Regulation

The State Water Control Board (Board) proposes to adopt the most recent water quality standards recommended by the United States Environmental Protection Agency (EPA) for ammonia and cadmium criteria for protection of aquatic life; 94 chemical pollutant criteria, and the bacteria criteria and assessment methodology for protection of human health.

Result of Analysis

The proposed regulation may introduce substantial costs (possibly over one-half billion dollars) on affected point sources and will likely benefit aquatic life and human health. The costs that potentially impacted dischargers might have to spend on treatment upgrades to meet more stringent criteria depend on individual permit requirements that are site-specific and variable. As a result, there is insufficient data to accurately compare the magnitude of the benefits versus the costs. Detailed analysis of the benefits and costs are in the next section.

Estimated Economic Impact

This regulation establishes water quality standards for surface waters of the Commonwealth. Criteria are based on the maximum acceptable amount of pollutants, that directly affect aquatic life and /or human health, that can be discharged into receiving waters and not exceed criteria protective of designated uses. Federal and state mandates in the Clean Water

Act at §303(c), 40 CFR 131 and the Code of Virginia in §62.1-44.15(3a) require that these water quality standards be evaluated every three years. In addition, §303(a) of the Clean Water Act requires the EPA to develop and publish water quality criteria that reflect the latest scientific knowledge. EPA recommendations are purely based on protection of aquatic life and human health and do not reflect consideration of economic impacts or the technological feasibility of meeting pollutant concentrations in ambient water. These criteria are not rules, nor do they automatically become part of a state's water quality standards. States may adopt the criteria that the EPA publishes, modify the EPA's criteria to reflect site-specific conditions, or adopt different criteria based on other scientifically defensible methods. The EPA must approve any new water quality standards adopted by a state before they can be used for Clean Water Act purposes. Should a state fail to update its standards, the EPA may adopt and enforce water quality criteria on behalf of the state. In this action, the Board proposes to adopt the most recent water quality standards recommended by the EPA. Once adopted, these criteria become the basis of establishing permit limits and Total Maximum Daily Loads (TMDLs).

Freshwater Ammonia Criteria for Protection of Aquatic Life

In 2013, the EPA updated its 1999 recommendations for ambient freshwater ammonia criteria to reflect the newly discovered sensitive nature of freshwater mussels and snails to ammonia toxicity. According to the EPA¹ “Freshwater mussels are highly sensitive to ammonia toxicity and represent the most sensitive species in the dataset for the criteria recommendations. New science has demonstrated that freshwater snails are also sensitive to ammonia toxicity. Both mussels and snails are important to the environment because they serve as food sources for other organisms in the food web and provide vital services in improving and maintaining water quality. Specifically, mussels are filter feeders and can filter nutrients, toxics, and other pollutants out of the water, thereby helping to control the levels of these pollutants and reduce exposure to humans and other aquatic organisms. Snails feed on organic debris including algae, which helps to reduce the effects of eutrophication and keeps bottom substrates clean for other benthic organisms.”

The allowable total ammonia nitrogen level depends on several factors (i.e. whether it is for acute or chronic levels, whether trout are absent or present, various combinations of pH and

¹ <https://www.epa.gov/sites/production/files/2015-08/documents/flexibilities-for-states-applying-epa-s-ammonia-criteria-recommendations.pdf>

temperature levels, whether mussels and early life stages of fish are absent or present). Thus, the proposed regulation contains hundreds of ammonia criteria in tables for various combinations of the relevant factors. The proposed ammonia criteria are more stringent than the current limits by a factor of between 2.2 times and 5.9 times for all possible combinations of pH and temperature. However, the proposed criteria are about twice as stringent as the current criteria based on an assumed pH of 7 and temperature of 20 degrees Celsius. Criteria that are more stringent can result in more stringent effluent limits for Virginia Pollutant Discharge Elimination System (VPDES) permitted dischargers. Those sources with monitoring requirements in their permit may also be affected if their discharges have the potential to exceed the proposed ammonia criteria. According to DEQ, the estimated number of potentially affected facilities due to the proposed amendments to the ammonia criteria is 370 and includes those facilities with effluent limitations and those with monitoring requirements but no limits.

The primary and most widespread potential cost increase associated with all of the proposed amendments in this action 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.

The facilities most likely to be affected are those in the Chesapeake Bay watershed with design flows less than 0.1 million gallons/day (MGD) located east of Interstate 95 and those with design flows less than 0.5 MGD west of I-95. Permittees with discharges outside of the Bay watershed, particularly those facilities that are large in volume compared to the receiving stream, may also have similar potential financial impacts.

According to DEQ, there are approximately 220 discharge permits issued in the Chesapeake Bay watershed with either ammonia limits or ammonia monitoring requirements. Although ammonia limits or monitoring requirements are part of the permits, it may be assumed those facilities with ammonia limits east of Interstate 95 with a design flow equal to or greater than 0.1 MGD and those with ammonia limits west of I-95 with a design flow equal to or greater

than 0.5 MGD either currently have ammonia control requirements or will be required to nitrify/denitrify to comply with the total nitrogen waste load allocations of 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). DEQ believes that 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 I-95 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 2 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. All but 8 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.

As an example, for a totally new 0.7 MGD plant, roughly 50% of the cost of the new oxidation ditch, and 100% of the submerged diffused outfall, etc., is attributed to the cost for ammonia removal. In this case, roughly 9% of the total cost can be attributed to ammonia removal or roughly \$500,000 of the \$5,655,000 construction bid price.

In another example, a facility design flow upgrade from 4.0 to 6.5 MGD, the cost attributable to ammonia removal, is more complicated because the oxidation ditch volume is set, with no expansion of the aerator volume, but there is a hydraulic increase of the overall facility. Roughly, 30% of the aeration system, filter, and digester upgrade costs, and 100% of the integrated fixed-film activated sludge costs are attributable to ammonia removal. This adds up to about \$1,720,700 or approximately 13% of the overall bid price of \$13,278,600. It is estimated the cost per gallon of ammonia removal in the examples given above for the new construction is \$0.71/gallon and cost per gallon for the upgrade is \$0.26/gallon.

The Virginia Association of Municipal Wastewater Agencies (VAMWA) has prepared an estimate of economic impact of the proposed ammonia criteria on its members and other sewage treatment facilities. Utilizing the capital and operating and maintenance costs estimated by the EPA for various design ranges, the VAMWA's study estimates that capital costs will reach \$512.3 million and ongoing operating and maintenance costs will be \$33.6 million per year for 490 affected facilities in 2014 dollars. These costs are expected to be distributed over a 10-year period as VPDES permits are reissued with compliance schedules. The study projects much higher relative costs for smaller facilities such as schools and public rest stops compared to larger facilities. The VAMWA estimate does not address upgrades and costs for commercial or industrial facilities with direct discharge permits, upgrades and costs for pretreatment that public treatment facilities may require of commercial and industrial facilities that discharge into public collection systems, and development and implementation costs of TMDLs for additional waters that may be listed for aquatic life impairment as a result of more stringent criteria.

A TMDL is a plan to improve the quality of an impaired water body. Development of TMDLs requires significant amounts of labor to collect data, to determine land uses, animal

densities, crop densities, the number of septic systems, contributions from point and nonpoint sources, and construction of a simulation model. DEQ usually incurs the development costs, but some funding is provided from the federal government. Implementation of a TMDL may represent significant costs to pollution sources as well. For example, fencing may be required to prevent direct deposition into water from cattle, a buffer area may be needed to function as a filter for agricultural runoff, and failing septic systems may have to be fixed. In addition to these, the implementation involves public participation, and staff travel which add to the overall costs. There are various cost share and incentive programs for TMDL implementation. The magnitude of TMDL costs varies from project to project and is pollutant specific. For example, the cost of a bacteria TMDL project costs range from \$41,000 to \$145,000.

According to DEQ, there is currently one outstanding aquatic life use impairment attributed to ammonia that has yet to be prioritized. There are no ammonia related TMDLs at this time. However given the more stringent values proposed by this regulation, that situation could change. DEQ does not know the potential impact of this change on development and implementation costs of TMDLs because a TMDL determination is site specific.

There appears to be general consensus that the proposed ammonia criteria may have a substantial economic impact particularly on smaller facilities. In addition, there appears to be a general agreement on the unit cost estimates provided above for various facility design sizes. However, there appears to be a difference of opinion on how many facilities will be able to meet the proposed criteria without having to build a new facility or upgrade. For example, the VAMWA study presumes that a substantial number of major Chesapeake Bay watershed facilities that currently nitrify will not be able to meet permit limits while DEQ believes that they will.

The EPA allows certain flexibilities in adopting water quality criteria. For example, states are allowed to adopt site-specific criteria to take into account absence or presence of sensitive species. After consultation with the Virginia Department of Game and Inland Fisheries, Virginia Department of Conservation and Recreation, and United States Fish and Wildlife Service, the Board concluded that it would assume the presence of freshwater mussels in any perennial freshwater stream in Virginia but does propose to allow point sources to demonstrate an absence of sensitive species on a site-by-site basis. Thus, some sources may be able to avoid compliance

costs if they can demonstrate lack of sensitive species in their locations. However, such a demonstration would likely cost some money.

The Board also proposes to allow compliance schedules longer than 5 years under certain conditions for reissuance of existing permits. These flexibilities would help sources comply with the new criteria to some degree.

Freshwater & Saltwater Cadmium Criteria for Protection of Aquatic Life

In 2016, the EPA updated its 2001 recommended cadmium aquatic life ambient water quality criteria in order to reflect the newest toxicity data for 75 new species and 49 new genera. The Board proposes to adopt the EPA's recommended standard for cadmium. There are four aquatic life criteria (i.e. acute and chronic limits for freshwater and saltwater). The proposed cadmium criteria are more stringent than the current limits by a factor between 1.1 times and 2.2 times. Criteria that are more stringent may mean additional treatment is needed to remove more cadmium before discharging effluent into surface waters. Those permitted treatment plants with monitoring requirements in their permit may also be affected if their discharges have the potential to exceed the proposed criteria.

According to DEQ, there are 24 active discharge permits with either numeric cadmium limits or monitoring requirements. Of these, 10 have effluent limits and 14 have monitoring requirements but no limits. Monitoring requirements without discharge limits typically result from a permit review using a "Reasonable Potential Analysis" that indicates the facility may have a particular parameter in its effluent, ergo the monitoring requirement. The monitoring data is used in subsequent permit reissuances to determine if discharge limits should be included. Given that the cadmium freshwater criteria are becoming more stringent it is assumed facilities with only monitoring requirements may be the most likely to be affected.

Furthermore, the most likely impact expected is for industrial dischargers. However, DEQ has no cost information on retrofits for these types of facilities and each would be unique due to the type of industry, wastewater characteristics and treatment technology used. Thus, there are no available estimates for the potential costs at this time. As far as TMDL costs, there is one aquatic life use impairment near Lake Anna with cadmium listed as the impairment cause, but it has yet to be put on the priority list and as such an active TMDL has yet to be developed. A more stringent cadmium standard may add additional waters to the impaired waters list but DEQ does

not know if that is the case at this time because such determinations are site specific. On the other hand, more stringent cadmium criteria based on latest scientific information will likely provide better protection for aquatic life.

Water Quality Criteria for Protection of Human Health

In 2015, the EPA published water quality criteria for the protection of human health for 94 chemical pollutants. The revisions stemmed from the latest scientific information and the EPA policies, including updated body weight, drinking water consumption rate, fish consumption rate, bioaccumulation factors, health toxicity values, and relative source contributions. Each pollutant has two criteria (i.e. one for public water supply and one for all other waters) for a total of 188 individual criteria concentrations. 57 of these criteria would become less stringent, 127 would become more stringent, 2 would be unchanged, and 2 are new additions and do not have criteria in the current regulation.

Though 127 criteria that are more stringent have the potential to increase compliance costs, according to DEQ, the majority of the human health criteria pollutants tend to be rather exotic compounds and discharger specific. Thus, the potential compliance cost to dischargers is unknown at this time. In addition, it is noted that many of the human health criteria toxins are not monitored routinely unless there is a known or suspected problem. DEQ does not believe there will be additional TMDL designations because of this change but that expectation is uncertain.

Due to anti-backsliding rules, existing permit limits cannot be made less stringent. Thus, 57 less stringent criteria are unlikely to have an effect on current permit limits. However, potential new sources discharging one of these pollutants will be subject to less stringent limits and may avoid installing treatment systems. Thus, new sources may realize some cost savings in potential treatment costs.

127 more stringent and 2 new human health criteria have the potential to help reduce many types of illnesses including cancer. However, some of these rather exotic pollutants may not be present in the Commonwealth's surface waters. If this is the case, no immediate significant impact is likely to be realized, but if any discharge containing these chemicals is discovered, health risks originating from the drinking water and fish consumption may be reduced and the source may have to incur some additional compliance costs.

In short, very few limits are based on human health criteria so no significant impact from the amendments is expected. However, given the large number of human health criteria amendments, it is difficult to determine with certainty at this time what the cost savings or expenses may be.

Bacteria Criteria for Protection of Human Health

The Board proposes to revise the bacteria criteria and assessment methodology for protection of human health. *E. coli* and Enterococci concentrations are used as bacteria indicators for the presence of illness inducing pathogens in fresh- and saltwater respectively.

The aim of the proposed changes is to align Virginia's methodology and criteria with those recommended by EPA, which are expressed in terms of a statistical threshold value (replacing the single sample maximum) and a geometric mean. The current assessment methodology for the single sample maximum allows no more than 10% of the total samples to exceed the criteria over the assessment period that is typically a six-year monitoring database. The proposed statistical threshold value is a similar measure utilized by EPA. Under the proposed regulation, no more than 10% of the total samples may exceed the statistical threshold value using all monitoring data collected up to a 90-day period. Bacteria criteria are also expressed in terms of a geometric mean, which can only be calculated under the current water quality standards using at least 4 observations taken within a 30-day period. The geometric mean standard is a "never-to-be-exceeded" value. Its exceedance puts the water body on the impaired waters list. The intent of the amendment is to switch to a 90-day assessment period to enable the use of more monitoring data, which will maximize the number of monitoring stations that are assessed against both geometric mean and statistical threshold value criteria. The proposed amendment will adopt 2012 EPA recommended statistical threshold values for *E. coli* and Enterococci concentrations and are higher than the current values used for the single sample maximum. The geometric mean concentrations remain unchanged.

The rationale behind the amendment is the proposed bacteria criteria represent the most recent scientific basis for criteria designed to protect primary contact recreational uses. Also, the Federal BEACH Act of 2000 requires that, not later than 36 months after the date of publication by the EPA of new or revised water quality criteria for pathogens or pathogen indicators, each state having coastal recreation waters shall adopt and submit to the EPA new or revised water

quality standards for the coastal recreation waters of the state for all pathogens and pathogen indicators to which the new or revised water quality criteria are applicable. In this case, the most recent EPA criteria were published in 2012.

One of the consequences resulting from these changes is that more waters may be assessed as impaired for the recreational use. Exceedances of the bacteria criteria are the leading cause of TMDL designations; about 80% of existing impairments are due to high bacteria concentrations. There are currently 441 bacteria impairments that are waiting for a development of a TMDL. It is not expected amendments to bacteria criteria will affect dischargers as end-of-pipe limits for bacteria are set at the criterion. However, the number of TMDLs that must be developed may increase.

Businesses and Entities Affected

The proposed amendments particularly affect municipal wastewater treatment facilities and industrial plants that discharge to surface waters of the Commonwealth.

The estimated number of potentially affected facilities due to proposed amendments to the ammonia criteria is 370 (approximately 220 discharge permits issued in the Chesapeake Bay watershed and 150 discharge permits issued outside of the Chesapeake Bay watershed).

According to DEQ, there are 24 active discharge permits with either numeric cadmium limits or monitoring requirements.

The number of potentially effected facilities due to the amended human health criteria and bacteria criteria is not known.

The proposed changes may also affect new and expanded point sources as well as nonpoint sources in the future.

Localities Particularly Affected

The proposed changes apply statewide. Localities with permits that may have to upgrade or install new equipment will be particularly effected.

Projected Impact on Employment

The net impact on employment is not known. A facility requiring an upgrade or monitoring under the proposed regulations will have to hire labor to accomplish those goals.

However, increased costs may also discourage expansion or the building of new plants reducing demand for labor.

Effects on the Use and Value of Private Property

Facilities likely to be affected the most are municipal wastewater treatment facilities. To the extent the proposed more stringent requirements introduce additional compliance costs on privately owned facilities, their asset values should decrease.

The proposed changes also have the potential to affect private property prices through improvements in environmental quality. However, such effects are usually contingent upon noticeable improvements. Since the magnitude of likely effects on environment is not known, no conclusive statements can be made about the effect on the value of private property.

Real Estate Development Costs

The proposed amendments do not directly affect real estate development costs.

Small Businesses:

Definition

Pursuant to § 2.2-4007.04 of the Code of Virginia, small business is defined as “a business entity, including its affiliates, that (i) is independently owned and operated and (ii) employs fewer than 500 full-time employees or has gross annual sales of less than \$6 million.”

Costs and Other Effects

Some of the industrial plants that discharge to surface waters of the Commonwealth will be associated with small businesses. The costs and other effects on them are the same as discussed above.

Alternative Method that Minimizes Adverse Impact

There are no clear alternative methods that would both comply with the Clean Water Act and cost less.

Adverse Impacts:

Businesses:

The adverse impact on businesses is the additional compliance costs discussed above.

Localities:

The adverse impact on localities is the additional compliance costs discussed above.

Other Entities:

The proposed amendments will not adversely affect other entities.

Legal Mandates

General: The Department of Planning and Budget has analyzed the economic impact of this proposed regulation in accordance with § 2.2-4007.04 of the Code of Virginia (Code) and Executive Order Number 17 (2014). Code § 2.2-4007.04 requires that such economic impact analyses determine the public benefits and costs of the proposed amendments. Further the report should include but not be limited to: (1) the projected number of businesses or other entities to whom the proposed regulatory action would apply, (2) the identity of any localities and types of businesses or other entities particularly affected, (3) the projected number of persons and employment positions to be affected, (4) the projected costs to affected businesses or entities to implement or comply with the regulation, and (5) the impact on the use and value of private property.

Adverse impacts: Pursuant to Code § 2.2-4007.04(C): In the event this economic impact analysis reveals that the proposed regulation would have an adverse economic impact on businesses or would impose a significant adverse economic impact on a locality, business, or entity particularly affected, the Department of Planning and Budget shall advise the Joint Commission on Administrative Rules, the House Committee on Appropriations, and the Senate Committee on Finance within the 45-day period.

If the proposed regulatory action may have an adverse effect on small businesses, Code § 2.2-4007.04 requires that such economic impact analyses include: (1) an identification and estimate of the number of small businesses subject to the proposed regulation, (2) the projected reporting, recordkeeping, and other administrative costs required for small businesses to comply with the proposed regulation, including the type of professional skills necessary for preparing required reports and other documents, (3) a statement of the probable effect of the proposed regulation on affected small businesses, and (4) a description of any less intrusive or less costly alternative methods of achieving the purpose of the proposed regulation. Additionally, pursuant to Code § 2.2-4007.1, if there is a finding that a proposed regulation may have an adverse impact on small business, the Joint Commission on Administrative Rules shall be notified.

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