Economic Impact Analysis
Virginia Department of Planning and Budget

9 VAC 25-260– State Water Control Board
Water Quality Standards
January 31, 2002

The Department of Planning and Budget (DPB) has analyzed the economic impact of this proposed regulation in accordance with Section 9-6.14:7.1.G of the Administrative Process Act and Executive Order Number 25 (98). Section 9-6.14:7.1.G requires that such economic impact analyses include, but need not be limited to, the projected number of businesses or other entities to whom the regulation would apply, the identity of any localities and types of businesses or other entities particularly affected, the projected number of persons and employment positions to be affected, the projected costs to affected businesses or entities to implement or comply with the regulation, and the impact on the use and value of private property. The analysis presented below represents DPB's best estimate of these economic impacts.

Summary of the Proposed Regulation

The State Water Control Board proposes to amend the water quality standards in the Commonwealth. The proposed substantive changes are following:

- Mixing zone size requirements will be established for discharges into saltwater.
- Class VII waters, currently known as "wetlands," will be recognized as "swamp waters" and a less stringent pH criteria will be adopted for them.
- Water quality criteria will be established for 33 new compounds and 30 existing water quality criteria will be revised.
- Taste and odor criteria will apply at the drinking water intake instead of applying to the entire public water supply.
- Two new bacteria criteria for secondary contact recreational waters will be established.

- A site-specific copper standard will be adopted for Little Creek Harbor, Hampton Roads Harbor, and Elizabeth River.

Estimated Economic Impact

The purpose of the water quality standards is to protect the state waters for designated uses including fish consumption, shellfishing, aquatic life, swimming, drinking water, and conservation in general. The standards include narrative and numerical criteria for physical, chemical, and biological characteristics of water set at levels to protect aquatic life and human health. Numerous changes are proposed. These changes are discussed below.

Mixing Zones

The proposed changes will establish mixing zone criteria for discharges to saltwater. A mixing zone is a limited area or volume of water where initial dilution of a discharge takes place and where numeric water criteria can be exceeded, but lethality is prevented. Currently, the Department of Environmental Quality (the department) does not have appropriate water quality criteria for mixing zones in salt water. Mixing zones in salt water are established in one of three ways: analysis of a submerged diffuser, analysis of an existing mixing zone by dye tracer, and application of default dilution ratios.

In many cases, permit discharge limits are established by application of the default dilution ratios (two times the standard water quality criteria for acute limits and 50 times the normal standards for chronic limits). This method relies on the assumption that dilution ratio of 2:1 for the acute limits and 50:1 for the chronic limits are appropriate for all mixing zones regardless of the size and other pertinent stream conditions. However, this level of dilution may not be available in smaller tidal creeks. Especially, discharge of large quantities of effluents into small salt waters may be potentially harmful for the aquatic life and human health.

The proposed regulations will add mixing zone size requirements for discharges to saltwater that can be technically analyzed and are scientifically more appropriate. For new or expanded large discharges (>0.5 million gallons per day) of freshwater to saltwater, it is proposed that the effluent be discharged via a submerged diffuser. This will likely provide for reliable and effective mixing that may not otherwise be obtained. This proposed rule is separately discussed below. For all other discharges that do not fall under the diffuser requirement, the boundary of the mixing zone is proposed to be no more than five times the

average depth along a line extending 1/3 of the way across the receiving water from the discharge point to the opposite shore.

The proposed mixing zone size requirement will apply to current and any future Virginia Pollutant Discharge Elimination System permit applications. This will result in re-evaluations of mixing zones for all tidal discharges where mixing zones have not been defined. Since the permits have to be renewed, all of the current permits for all types of water quality criteria will be reevaluated over the next five years. Thus, the proposed changes will not have an immediate impact on current permittees, but will have a gradual impact. However, this requirement may be waived if the actual extent of the mixing zone is demonstrated to be acceptable. In addition to current permits, mixing zone size requirements will apply to any new permits for saltwater discharges as well.

Also, there is likely to be a differential impact on acute and chronic water quality criteria. The proposed mixing zone requirement is likely to have proportionally more impact on chronic limits. Conversations with the industry and the department indicate that currently required dilution ratio of 50:1 for chronic limits is too lenient and is not binding for most dischargers. The proposed mixing zone rule is expected to result in much more stringent standards for the chronic limits than for the acute limits.

Some economic effects on permitted discharges to saltwater are expected because of the new mixing zone requirements. Some discharges are not likely to meet the required amount of dilution determined by the proposed mixing zones for saltwater. Large discharges into small tidal creeks are particularly likely to be affected. There are currently 100 individual permits for discharges to tidal waters. The department estimates that at least 60 of these permits may be found to have dilution ratios that would not support the water quality criteria when mixing zones are established. The permittees who do not meet the proposed mixing zone size standard will most likely have to install treatment equipment to cope with available dilution, or somewhat less likely , reduce the amount of discharge into the tidal waters.

Although the proposed mixing zone requirement is expected to be protective of aquatic life resources for all of the criteria pollutants, the main effect is likely to be on ammonia limits for sewage discharges that are large in volume compared to the receiving tidal stream. Ammonia is a toxic, colorless gas with a very sharp odor and may originate from both manmade sources

and nature. High ammonia levels may kill fish, adversely affect fish reproduction, and may have negative effects on plant life. The purpose of the water quality ammonia standard is to protect aquatic life from toxicity.

If ammonia limits are found high then the permit holder may reduce the ammonia discharge through nitrification, which would convert ammonia into nitrate-nitrogen and then discharge nitrate into the water. This process reduces the toxicity contributed by ammonia, but contributes to nitrate-nitrogen discharges into water. However, nitrate-nitrogen is a plant nutrient, and higher nutrient levels add to the eutrophication problem in the Chesapeake Bay. Eutrophication leads to excess algal growth. When the algae die, they fall to the bottom, decompose and cause an oxygen demand. The lower levels of dissolved oxygen can kill aquatic life and reduce the amount of habitat available in deep waters. Too much algae also causes the water to be too turbid and reduces the amount of sunlight able to reach the submerged aquatic vegetation. Vegetation provides important habitat for aquatic life and their presence is considered a measure of good water quality.

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. In these cases, low ammonia discharge is expected to be an environmentally positive contribution to the Chesapeake Bay.

A simple nitrification system costs about $250,000 for a 0.10 million gallon/day (MGD) sewage treatment plant.[1] The cost of an advanced treatment system capable of both nitrification and denitrification can range from $0.5 to $5.5 million 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. In addition to these, the facility would incur ongoing operation and maintenance costs once the system is installed. Operation and maintenance costs of a simple nitrification system at a small facility are estimated at $6,000 per year. Operation and maintenance costs for a nitrification/denitrification system vary from $23,000 for a 0.10 MGD plant to $195,000 for a 0.60 MGD plant. It is estimated that up to 35 permittees may be required to comply with lower ammonia limits due to the new mixing zone

[1] Source of this and other cost information in this paragraph: the Department of Environmental Quality.

requirements. However, it is not known how many of these will install a simple nitrification system or an advanced nitrification/denitrification system.

There is a chance that the proposed generic mixing zone size requirement might be too small for some dischargers and actual stream conditions may require a specific mixing area. Any permittee who is faced with less dilution will have an option to do a mixing study to propose a site-specific mixing zone and waive the generic size requirements. A mixing study could be a dye study, desktop computer model, or some other type of study. The cost of a mixing study for acute criteria varies from $15,000 to $75,000 depending upon its complexity.[2] Chronic mixing zone studies may cost up to $250,000 depending on the data needs.[3] It is not known how many permit holders will choose to do a mixing study to waive the proposed size requirement.

Moreover, the department indicates that the mixing zone rule may also affect toxic limits in permits. The toxic limits in some of the permits may become more stringent due to mixing zone size requirements than the current levels, but the extent of this possibility is not known. Thus, the potential impact on point sources is not known as well. It should be noted that more stringent toxic limits would not affect non point sources. This is because toxic discharges generally do not originate from non-point sources. Any required reductions in toxic discharges would probably come from the point sources. Thus, potential costs associated with development and implementations of TMDLs are not expected.

Furthermore, new and expanding large dischargers into saltwater will be subject to additional mixing requirements. Large discharges that will be affected are those that discharge freshwater effluents greater than 0.5 MGD into saltwater. Existing large facilities will not be affected, but may be subject to this rule in the future if they wish to increase their flow. These new or expanded large dischargers will be required to install a subsurface diffuser. They will be required to install a diffuser because freshwater does not mix well with the salt water due to weight difference. The diffuser will facilitate mixing of these large effluent discharges into saltwater in order to obtain reliable mixing. Also, no specific mixing zone size is proposed for these areas because the range of the diffuser can be adjusted to provide adequate dilution. The mixing zone sizes for these areas will be established on a case-by-case basis. According to the

[2] Source: The U.S. Navy.
[3] Source: Hampton Roads Sanitation District.

department, on average, a 300-400 foot diffuser would be sufficient in saltwater areas for these large flows of effluent. A diffuser with this capacity is believed to cost about $3,000 to $4,000.[4] However, the number of new facilities that will come online and the number of facilities that will apply to increase their flow are not known.

Finally, the proposed changes are expected to introduce small costs associated with rewriting the mixing zone guidance document and developing a simple computer model for the permit writers to use when establishing effluent limits. The department plans to do these with existing staff resources.

pH Criteria and Swamp Waters

Another amendment is proposed to recognize Class VII waters as "swamp waters" instead of “wetlands” and adopt a less stringent pH criterion for these waters. According to the department, the term “wetlands” are broad and inclusive of the swamp waters. There are nine black water swamps in Chowan Subbasin listed in the 303d impaired waters list because of low pH levels.[5] If the concentration levels for a pollutant measured in a water body exceed the criteria more than 10% of the time, the stream, creek, lake, or river is classified as impaired. For the impaired waters, a total maximum daily load (TMDL) must be developed and implemented to bring the water body into compliance with pH water quality standard. A TMDL reflects the total pollutant loading a water body can receive and still meet the water quality standards. TMDLs are pollutant specific and in this case they must be developed for the pH standard. A TMDL establishes the maximum allowable pollutant loading from both point and nonpoint sources for a water body, allocates the load among the pollutant contributors, and provides a framework for taking actions to restore water quality. While the TMDL program has significant implications for the point sources, probably the most significant effect is on the nonpoint sources. This is because the point sources are subject to discharge limits under permits issued to them. Their discharges could be reduced through the permits without the need of a TMDL.

This proposed change will remove swamp waters from the impaired waters list for pH standard, and consequently, no TMDL will be developed for the swamp waters low in pH. However, all of these swamps are on the impaired waters list also for dissolved oxygen standard.

[4] Source: The department.
[5] Source: Ibid.

So they will continue to be on the list. According to the department, these swamps are naturally low in pH levels and the development of a TMDL is not appropriate. If this proposed change provides for a more accurate water quality assessment of these swamps, then there is likely to be some savings to both point and non-point sources near these swamps from not implementing TMDLs. There is lack of information on the range of implementation costs for pH TMDLs because none has been done in Virginia. However, an earlier report prepared by the department contains an estimate of $400,00 to $800,000 to implement a TMDL in a watershed.[6] At this time this range is the best estimate for the potential cost savings to point and non-point sources per TMDL. In addition, the department is likely to realize some cost savings in terms of TMDL development. It is estimated that a TMDL development for pH would cost the agency about $25,000.

Water Quality Criteria

The proposed changes will also establish 33 new water quality criteria and revise 30 existing criteria for surface waters including freshwater, saltwater, public water supplies, and all other surface waters. The department indicates that all of these changes are made based on the recommendations from the Environmental Protection Agency (EPA) that developed the proposed standards and that the EPA will likely promulgate these criteria if the state does not follow the EPA recommendations. All of the proposed additional criteria are human health criteria and has the potential to reduce many types of sicknesses including cancer. However, none of these pollutants were found in a search of pollutants being used in the Commonwealth during the last triennial review. 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 routes may be reduced and the source may have to incur some additional compliance costs.

The revisions of 30 existing criteria are for both human health and aquatic life. Some of the proposed revisions are more or less stringent than the current standards by one or more order of magnitude.[7] However, the department indicates that, except for the metal criteria, there are no

[6] Report to the Honorable James S. Gilmore, III, Governor and Chairs of the House Committees on Appropriations and Conservation and Natural Resources and the Senate Committees on Finance and Agriculture, Conservation and Natural Resources, November 1, 2000.

[7] *Existing criteria proposed as significantly more stringent:* Chlordibromomethane for all waters not designated as water supply, Chromium III for freshwater, Dichloroethylene for all waters not designated as water supply, Dieldren

permits containing any of these significantly less or more stringent standards currently. Thus, no significant economic impact is expected from adopting these revised criteria at this time, but there may be additional compliance costs for new industrial sources in the future to protect aquatic life.

The main effect of these revised criteria is expected to be on permits containing metal standards. The proposed aquatic life criteria for metals are more stringent, except for copper in saltwater, than existing criteria, but for most metals the changes are small. A survey of industrial and municipal permit limits indicates that most of the effects on permit limits for metals are for chromium and copper. The proposed more stringent standards for freshwater copper and chromium may affect a small number of permittees when the permits are renewed within five years as well as the new sources that may come online. These sources may incur some additional treatment costs to comply with proposed more stringent chromium and copper standards. The department is unable to determine the number of permits that may be affected due to lack of monitoring data, but does not expect more than a few permits to be affected by the changes in the metal criteria.

Also, the saltwater criteria for copper are proposed as less stringent criteria. Both industry and the department believe that the proposed standard is a more accurate assessment of what level of copper is toxic to marine life. It is indicated that the current standard does not consider the chemistry of the salt water that binds and renders the copper non-toxic. The proposed criteria are based on new toxicity data provided by the Navy for two species (the blue mussel and the juvenile summer flounder), additional toxicity data on two species (the eastern oyster and Acartia tonsa), and data that indicate that four species (embryonic summer flounder, Pacific mussels, the Pacific oyster, and Tigriopus californica) are not present in state waters. Due to anti-backsliding rules, existing permit limits cannot be made less stringent. Thus, less stringent copper standard is unlikely to have an effect on current permit limits. However, potential new sources discharging copper into saltwater will be subject to less stringent limits

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for freshwater acute criteria, Endrin for freshwater acute criteria, Hexachlorocyclohexane for freshwater acute criteria, Isophorone for all waters not designated as water supply, Tetrachloroethylene for all waters not designated as water supply, Vinyl chloride for all waters not designated as water supply.
Existing criteria proposed as significantly less stringent: Chloroform for all waters not designated as water supply, Chlorodane for all waters not designated as water supply, Dieldren for freshwater chronic criteria, Endrin for freshwater chronic criteria, Hexachlorocyclohexane for freshwater chronic criteria, Hexachlorocylcohexane for saltwater chronic criteria, Mercury for freshwater and saltwater chronic criteria.

and may avoid installing treatment systems. Thus, the new sources may realize some cost savings in potential treatment costs.

Taste and Odor Criteria

It is proposed that the existing taste and odor criteria apply at the drinking water intake. Currently, they apply throughout the entire public water supply, including tributaries to water bodies on which drinking water intakes are located. Thus, effluent from upstream facilities may be restricted even though they have little affect on water quality at the water intake. The taste and odor compounds include manganese, chloride, foaming agents, iron, sulfide, and total dissolved solids. Effective effluent limitations based on taste and odor standards cannot be removed from the current permits for discharge into the public water supply because of anti-backsliding rules.

However, the anti-backsliding rules do not apply to new facilities. If new facilities come on line in existing public water supply watersheds, they are likely to benefit from the proposed change, as they will not be subject to taste and odor standards. This change may be most beneficial to dischargers to tributaries of water bodies on which public water supply intakes are located. The proposed changes may also benefit facilities with effluent limits that are tied to compliance schedule, and consequently, are not yet effective. These facilities are not subject to anti-backsliding rules. Similarly, if new public water supplies are designated, facilities on these waters will no longer be subject to taste and odor criteria unless they discharge in the proximity of the intake zone.

The department is aware of seven facilities that have either monitoring requirements or permit limits for the taste and odor compounds. One of these facilities has permit limits scheduled to go in effect, but the limits are not yet effective. With the proposed changes, these limitations will likely not be necessary for this source. The facility estimates that capital costs to install treatment technology to attain the existing limitations for these constituents are over $1 million with $54,000 to $240,000 per year in operating costs. Although the remaining six sources are not believed to have the same potential to incur similar cost savings, there is a chance that the proposed rule may allow them to continue discharging at existing levels and may provide some savings in potential treatment costs.

On the other hand, potential increases in discharges of the taste and odor compounds from new sources may slightly reduce the quality of the public water supply at or near their outfall. The discharges of these compounds from new or existing sources are not expected to have a significant effect on human health and aquatic life because they are not human health or aquatic life criteria and the number of sources is small.

Bacteria Criteria for Secondary Contact Waters

The proposed regulations will also add new bacteria criteria for secondary contact recreational waters. The two classifications that currently apply to all waters in the Commonwealth are primary and secondary contact designations. The primary contact waters are swimable waters with a high probability of total body immersion. The secondary contact waters are those with a low probability of immersion where humans are not likely to come in direct contact with, but may be exposed to it. For example, waters that are not used for swimming, but used for wading, boating, and fishing are examples of secondary recreation waters. However, no waters are currently designated for secondary contact recreation in the Commonwealth. Also, there are no bacteria criteria for secondary contact waters under the current regulations. The department believes that secondary recreation waters exist in the state and in order to protect these waters when designations are made, bacteria criteria are needed.

E. coli and enterococci concentrations are used as bacteria indicators to protect people from the risk of gastrointestinal illness contracted from waters. Pollution from both point and nonpoint sources can lead to fecal bacteria contamination of water bodies. Sources of fecal contamination to surface waters include wastewater treatment plants, on-site septic systems, domestic and wild animal manure, and storm runoff. The fecal coliform is found in the intestinal tract of warm-blooded animals; consequently, fecal waste of warm-blooded animals contains fecal coliform. Even though fecal coliform is not pathogenic, its presence in water indicates the potential for contamination by fecal material. Thus, recreational activities in contaminated waters might be a health risk. Since it is difficult, time-consuming, and expensive to test directly for the presence of a large variety of pathogens, water is usually tested for fecal coliforms instead. Potential health risks are lower for secondary contact recreational uses such as boating and fishing than for the primary contact recreational activities such as swimming.

Consistent with the proposed bacteria criteria for primary contact waters in a separate regulatory rule making, the proposed changes will adopt E. coli and enterococci bacteria standards for secondary contact fresh waters and enterococci standard for secondary contact marine waters. Both of these standards are currently proposed to apply to primary contact waters. However, the proposed bacteria standard for secondary waters is about five times less stringent than the bacteria criteria for the waters designated as primary contact waters because potential health risks are lower. Current point sources will likely be required to meet the bacteria standard for primary contact bacteria limits regardless of this proposed rule and will likely not be affected by this change. However, if less stringent proposed standard is appropriate for the secondary contact waters, there is likely to be some potential savings for nonpoint sources when secondary contact designations are made. It should be noted that the following potential effects are contingent upon designation of secondary contact waters.

Currently, about 102 TMDLs must be developed during the next ten years because of the bacteria criteria for primary contact waters. The proposed regulations will establish a less stringent value for the secondary contact waters and may reduce the number of TMDLs. If the number of TMDLs that must be developed decreases, significant fiscal impact on the state and nonpoint sources would result. 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 sources, and to construct a simulation model. According to the department, developing a fecal TMDL may require $33,000 to $76,000 depending on whether modeling is needed or not. The department usually incurs the development costs, but some funding is provided from the federal government. Currently, the federal government funds about forty percent of TMDL development costs. Thus, the proposed changes will make it possible to provide some savings to the department in TMDL development costs when the secondary contact water designations are made. However, the department does not know the number of waters that may be designated as secondary contact waters, or he number of TMDLs that may be avoided.

Implementation of a TMDL represents 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, 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. The department's total cost estimate for implementing a fecal TMDL in a typical watershed is about $1.4 million. There are also various cost share and incentive programs for TMDL implementation. Since the number of TMDLs that may not be required due to less stringent standards is not known, the size of the potential cost savings to non-point sources, cost share and incentive programs, and the state is also not known.

Site Specific Copper Criterion

A site-specific copper standard will be adopted for Little Creek Harbor, Hampton Roads Harbor, and Elizabeth River. The proposed site-specific copper standard is slightly less stringent than the proposed statewide water quality standard. One of the permittees in this region, the U.S. Navy, conducted a site-specific study and demonstrated that the receiving stream naturally reduces the bio-availability of copper and therefore able to assimilate more copper without adversely affecting aquatic life. The proposed criteria reflect the outcome of this study. The department and the Navy believe that the site-specific copper criteria are more technically correct and better represent the actual toxicity of copper in these areas. Currently, only one Navy permit contains effluent limits for copper. In addition, there are several other permits issued to other facilities in this area containing effluent limits or monitoring requirements for copper. The department indicates that the difference between this site-specific standard and the proposed statewide standard is negligible and does not believe that this proposed standard will significantly affect any of the existing permittees at this time. If this is the case, the proposed change is not expected to provide significant savings in compliance costs to existing permit holders in this area.

However, if any of the permittees in this region have actual copper concentrations in their discharge that exceeds the existing copper criteria, or new sources come on line in this area, or become subject to the proposed standards due to change in department's policy, then they may be able to avoid some treatment costs if the proposed standard is adopted. The Navy pointed out the possibility that about 300 storm water discharges that are currently monitored may be required to comply with the proposed copper standard in the future if the department's policy changes. About 200 of these storm discharges would not meet the current criteria, but would be able to comply with the proposed standard. In this case, the proposed change would eliminate compliance costs associated with 200 storm discharges. There is a similar possibility for the

local governments as well for hundreds of other storm discharges. The compliance costs for these outfalls could be significant and include treatment costs, costs associated with disposal of residuals, and infrastructure costs to establish piping systems. Thus, the proposed less stringent standard has the potential to reduce the number of such outfalls that may be found out of compliance, and consequently, reduce the compliance costs. For example, these sources may avoid purchasing of a chemical precipitation processor or an infiltrating system and may avoid application of best management practices that may otherwise be required.

Businesses and Entities Affected

The proposed regulations are expected to affect about 60 ammonia sources over a five year period due to mixing zone rule, about seven facilities due to taste and odor criteria, and several copper sources discharging into Little Creek Harbor, Hampton Roads Harbor, and Elizabeth River. The proposed changes may also affect new and expanded point sources as well as nonpoint sources in the future.

Localities Particularly Affected

The proposed regulations apply throughout the Commonwealth except the site-specific copper standard. This standard will apply only to copper sources discharging into Little Creek Harbor, Hampton Roads Harbor, and Elizabeth River.

Projected Impact on Employment

While some of the proposed changes are likely to increase the demand for labor, some others are likely to decrease it. For example, the proposed taste and odor criteria are expected to reduce the demand for labor because some treatment projects will be cancelled. On the other hand, mixing zone requirement is expected to increase demand for labor because the level of treatment will likely be higher. Thus, the net impact on the employment is not known.

Effects on the Use and Value of Private Property

The net effect of the proposed changes on private property is unclear. However, if expected increase in compliance costs of about 60 ammonia sources is significant this may hurt the firm value over a five year period due to mixing zone rule. On the other hand , about seven facilities that are subject to taste and odor criteria may be able to avoid some of their compliance costs and contribute to firm value. Similarly, privately owned copper sources discharging into

Little Creek Harbor, Hampton Roads Harbor, and Elizabeth River may also increase in value due to less stringent copper standards. All other potential effects are expected to take place in the future, but there is not enough information at this time to determine what the net impact, if any, on firm values will be.

The proposed changes also have the potential to affect the private property prices through improvements in environmental quality. However, such effect is 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.