Economic Impact Analysis
Virginia Department of Planning and Budget

9 VAC 25-720 – Water Quality Management Planning Regulation
Department of Environmental Quality
January 24, 2008

Summary of the Proposed Amendments to Regulation

The State Water Control Board (Board) proposes to amend the nutrient waste load allocations in the Water Quality Management Planning Regulation to provide increases for total nitrogen and total phosphorous for the Frederick-Winchester Service Authority-Opequon Water Reclamation Facility and the Merck Wastewater Treatment Plant.

Result of Analysis

The benefits likely exceed the costs for all proposed changes.

Estimated Economic Impact

Background

In late 2005, the State Water Control Board adopted amendments to the Water Quality Management Planning Regulation (9 VAC25-720) that added nutrient waste load allocations (WLAs) for significant dischargers in the Chesapeake Bay watershed. (A WLA is a type of water quality-based effluent limitation. It is the portion of a receiving water's loading or assimilative capacity allocated to one of its existing or future point source discharges.) WLAs were determined by the Department of Environmental Quality (Department) based on each discharger's full design capacity and annual average nutrient concentrations associated with nutrient reduction treatment. According to the Department, the intent of the regulation was to limit nutrient discharge but, in the process, ensure that each facility *could* meet its assigned discharge limit through control measures taken at their own facility, without needing to use the Nutrient Credit Exchange program. The facilities were granted a compliance period until January

1, 2011, after which each facility must be in compliance with their assigned waste load allocation.

Frederick-Winchester Service Authority (FWSA)-Opequon Water Reclamation Facility (WRF)

Under current regulation, the Opequon WRF has waste load allocations (WLAs) of 102,336 lbs/year of total nitrogen (TN) and 7,675 lbs/year of total phosphorous (TP). Under the proposed amendment, the Opequon WRF would have a TN WLA of 115,122 lbs/year and a TP WLA of 11,506 lbs/year. In sum, this amendment will increase the allowable TN discharge of the Opequon WRF by 12,786 lbs/year and allowable TP discharge by 3,831 lbs/year. The amendment also includes language stating that the (amended) WLAs for Opequon WRF are based on a design flow of 12.6 million gallons per day (MGD) and if the plant is not certified to operate at 12.6 MGD design flow by December 31, 2010, then the discharge limit will revert to the current WLAs of 102,331 lbs/year TN and 7,675 lbs/year TP that are based on a design flow of 8.4 MGD.

The nutrient allocations for the Opequon WRF, like those for other wastewater treatment facilities, are based on the design capacity of the plant and annual average nutrient concentrations associated with nutrient reduction treatment. The current nutrient allocations are based on a permitted design flow of 8.4 MGD and an annual average TN concentration of 4.0 mg/L.[1] In October 2006, FWSA wrote a petition claiming that the existing infrastructure for biological treatment is more appropriately classified as 12.6 MGD, meriting higher waste load allocations. The Opequon WRF had previously operated under a discharge permit containing a dry water flow rating of 8.4 MGD, but in the winter or during peak flows, the facility treated almost 16 MGD. The discharge permit was reissued on July 7, 2006, stating the design flow of the existing facility as 8.4 MGD. Although it is true that certain units in the facility could handle 12.6 MGD, unless all of the units can handle that amount, the Department will not certify the facility for 12.6 MGD design flow. At a meeting in February 2007, FWSA proposed a revision to their original request; they would hydraulically expand all bottlenecks and be certified to operate at 12.6 MGD by December 31, 2010. FWSA felt so strongly about the higher design flow that

[1] The equation is WLA=Design Flow*concentration*8.344*365, where the design flow is measured in MGD, concentration is measured in mg/L, 8.344 is the conversion for mg/L into lbs/day, and 365 is the number of days in a year. So, the current nitrogen WLA for Opequon WRF is: 8.4*4.0*8.344*365 = 102,331 lbs/year

they were willing to commit to a lower total nitrogen concentration of 3.0 mg/L, rather than the standard of 4.0 mg/L for municipal treatment plants in the Shenandoah Basin. (The current total phosphorous allocation is already based on state-of-the-art treatment at 0.30 mg/L annual average.)

Merck Wastewater Treatment Plant (WWTP)

Under current regulation, the Merck WWTP has WLAs of 14,619 lbs/year for TN and 1,096 lbs/year for TP. Under the proposed amendment, the Merck WWTP would have a TN WLA of 43,835 lbs/year and a TP WLA of 4,384 lbs/year. In sum, this amendment will increase the allowable TN discharge of the Merck WWTP by 29,216 lbs/year and allowable TP discharge by 3,288 lbs/year. The amendment also includes language stating that the (amended) WLAs will be reviewed and possibly modified based on "full-scale" results showing the treatment capability of the four-stage Bardenpho technology being installed at this facility.

The discharge control for companies like Merck are usually set not on design flow capacity, but on production values. However, because Merck does operate a biological treatment process, the Department initially set the discharge levels based on a design flow of 1.2 MGD and an annual average concentration of 4.0 mg/L of nitrogen and 3.0 mg/L of phosphorous. In a January 2007 petition, Merck stated that the WLAs are not technically feasible to achieve with available technology and requested that the WLAs be revised. Based on the results of a pilot study conducted by Merck, the Department felt it was apparent that available technology could not treat Merck's unique wastewater to the same concentration levels applied to the municipal plants in the Shenandoah basin. (One exception was that their total phosphorous removal pilot study did not consider the addition of tertiary filtration—another available treatment step—that Merck said they would evaluate in the full-scale study mentioned in the amendment and discussed below.)

Merck's process wastewater has an organic content that is about ten times higher than domestic wastewater[2] and the TN and TP concentrations are 2-3 times higher than a municipal plant would receive for treatment. If you consider the equivalent nutrient reduction treatment levels required at the municipal plants, which is about 85 percent removal, the removal rates of

[2] Domestic wastewater is wastewater from residential connections to the sewer system and is usually sent to a publicly owned treatment works to be treated.

Merck's proposed effluent levels are comparable. However, although Merck made progress in 2007 on a pilot study to test nutrient removal capabilities, their technical staff felt that the study period was too short and did not consider all of the possible variables to make a firm decision on what the feasible nutrient effluent levels should be. This is why the proposed amendment includes a footnote that Merck's WLAs be reviewed and possibly modified based on the full-scale results showing the treatment capability of the nutrient removal system being installed at the facility. The three-phase installation project is scheduled to be completed by the third quarter of 2010.

Costs and Benefits

The costs of both of these amendments are in higher levels of nitrogen and phosphorous discharge into the Potomac/Shenandoah River Basin than would be discharged under the current regulation. (It should be noted, however, that even with these proposed amendments, the discharged nutrient loads from the affected facilities will be lower than either current discharges or future loads at full design capacity.) Too much phosphorous or nitrogen can cause excessive growth of algae and rooted aquatic plants, as well as increased turbidity. Phosphorus is usually the primary concern in fresh water areas, but high nitrogen levels can also be a problem; for example, high nitrate levels can impact drinking water sources. The total delivered nitrogen load (from point and nonpoint sources) under the Shenandoah-Potomac's Tributary Strategy is already estimated to exceed the State's allocation commitment by about 300,000 pounds per year, and any further increase to individual facility allocations will add to this surplus unless an offset is identified. The Bay-wide Total Maximum Daily Load (TMDL) process beginning next year will use an updated, enhanced modeling framework to test compliance with water quality standards under the expected nutrient loadings (the point source loads will be the approved WLAs). Nutrient allocations to be established in the Bay-wide TMDL (scheduled for development and EPA approval by 2011) must achieve water quality standards and include loadings for point and non-point sources. In other words, the Department is concerned about the nutrient loading in the Potomac/Shenandoah River Basin and is taking steps to address that concern.

There are a number of benefits to these amendments. First, the Department feels that if they had the information in 2005 that they have now about the Opequon WRF and the Merck

WWTP, these requested WLAs would likely have been approved. (And, of course, should Opeqon WRF not complete its upgrades as planned or should the final Merck study show that the lower discharge limits are feasible, then the amendments allow the Board to revert to the current WLAs.) The Department feels that the proposed amendments offer both regulatory consistency across facilities and feasibility for the regulated community. The Department believes that if regulations are fair and feasible, compliance will be considerably better. If it is infeasible for Opequon WRF and Merck WWTP to meet the discharge limits in the current regulation, then changing the limits will improve compliance. This is particularly true for Opequon WRF, which does not have the option of moving out of Virginia.

If the discharge limits are infeasible and the Merck facility is forced to be non-compliant, then it is possible that Merck will choose to set up a plant elsewhere. A plant closing could cost Virginians jobs and negatively affect economic activity in the region. The long-run economic benefit of this amendment, then, is in creating discharge limits that are environmentally protective, yet reasonable for facilities to achieve. This will help ensure the long-run economic and environmental viability of Virginia's communities.

If non-compliance or moving are not options for Merck or Opequon WRF, their other option is to buy nutrient credits using the Nutrient Credit Exchange Program. (There is no system, technologically, that Merck can install to meet the current total nitrogen and total phosphorous allocations at its design flow, and Opequon is agreeing to install state-of-the-art treatment in a larger plant, so if the amendment is not accepted, both facilities would have to rely on the Nutrient Credit Exchange program.) Since the nutrient credits run about $2/lb for nitrogen and $4/lb for phosphorous, Merck would have to spend about $58,432[3] on nitrogen credits and $13,152[4] on phosphorous credits per year, for a total annual cost of $71,584. FWSA would have to spend about $25,572[5] on nitrogen credits and $15,324[6] on phosphorous credits per year, for a total annual cost of $40,896. According to the Department, however, the intent behind this regulation was to assign waste load allocations that a facility can meet without relying on the Nutrient Credit Exchange program. Then, if the facility chooses to expand and discharge more, they will have to rely on the Exchange program.

[3] Calculation: 29,216*$2
[4] Calculation: 3,288*$4
[5] Calculation: 12,786*$2

In sum, it will benefit Virginians to have discharge limits that are feasible (and fair). It is also important, however, to maintain the integrity of the Shenandoah River Basin and the tidal waters of the Bay and its tributaries. Although the costs and benefits are difficult to quantify, given the information that the Department has received about the feasibility of the current discharge limits, given its intent with the regulation, and given the TMDL process that will begin in the spring to ensure that the water body meets state and federal environmental standards, we can conclude that the benefits of these regulatory amendments outweigh the costs.

Businesses and Entities Affected

The businesses and entities that are affected most directly are Merck—a large pharmaceutical producer and industrial discharger—and the Frederick-Winchester Service Authority (FWSA). Merck plans to spend about $18 million to install a nutrient reduction system and about $1 million in additional annual operation and maintenance costs for their wastewater treatment facility due to the installation of nutrient reduction technology.[7] On the one hand, the proposed amendment should benefit Merck, since their discharge limits are being increased. On the other hand, if the existing waste load allocations are infeasible and the alternative to this amendment is non-compliance or a move of the facility out of state, it is difficult to assess the costs and benefits of this amendment to Merck. The construction project for upgrading and expanding the Opequon facility to meet the amended nutrient WLAs has had an apparent low bid of $50.7 million. With state cost share, the localities of Frederick County and the City of Winchester will have to pay $39.3 million for the upgrade.[8] Again, if the alternative to the amendment is non-compliance it is difficult to assess the costs and benefits arising from this specific amendment to FWSA.

In addition, all entities in the vicinity of these facilities will be affected by these amendments, both in terms of potential economic losses should the Merck facility leave the area, or in the economic fallout for business, tourism, and quality of life, should high nutrient concentration in the Potomac, Shenandoah River Basin not be addressed.

[6] Calculation: 3,831*$4
[7] Source: Department of Environmental Quality
[8] Source: Department of Environmental Quality

Localities Particularly Affected

Frederick County and the City of Winchester are particularly affected by this amendment. Secondarily, all Virginia counties and localities surrounding the Potomac-Shenandoah River Basin could be affected by this amendment, including Frederick, Rockingham, Shenandoah, and parts of Augusta, Page, and Warren Counties.

Projected Impact on Employment

Should this amendment avert the loss of jobs from the Merck facility, it would have a positive (or non-negative) impact on employment. In addition, should the amendment increase the likelihood of compliance with the regulation, it could improve water quality in the region, thereby potentially boosting recreational and tourist activities, fishing, and/or other economic activities that are positively affected by better water quality. On the other hand, should the amendment negatively impact water quality by increasing waste load allocations, the amendment could have a negative impact on employment in the region. The net impact is unknown.

Effects on the Use and Value of Private Property

The increase in discharge limits for the Merck facility will increase the value of that facility, thereby having a positive effect on the value of private property.

This amendment could increase the value of private property in the region if it averts the loss of jobs and if it increases regulatory compliance, thereby improving water quality. However, if the amendment results in a deterioration of water quality from what it would have been under the current regulation, then the effect on the value of private property could be negative.

Small Businesses: Costs and Other Effects

No small businesses are directly affected by these amendments. However, the amendment could help small business in the region if it increases Merck's regulatory compliance, thereby improving water quality and helping industry that relies on the water, such as fishing or tourism. However, if the amendment results in a deterioration of water quality from what it would have been under the current regulation, then it could have a negative effect on small business. The net impact is unknown.

Small Businesses: Alternative Method that Minimizes Adverse Impact

No alternative methods would reduce cost while still achieving the desired policy goals.

Real Estate Development Costs

This amendment could have an effect on real estate development costs by affecting the price of the land in the area surrounding the Shenandoah River Basin. If nutrient levels are higher than they would have been, the price of the land might be reduced due to the quality of the water for recreation or drinking. On the other hand, if this amendment keeps the Merck facility—and the economic activity that accompanies it—in the area, then the amendment might avert a future drop in the price of land. The net impact of the amendment is difficult to quantify.

Legal Mandate

The Department of Planning and Budget (DPB) has analyzed the economic impact of this proposed regulation in accordance with Section 2.2-4007.04 of the Administrative Process Act and Executive Order Number 36 (06). Section 2.2-4007.04 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. Further, if the proposed regulation has adverse effect on small businesses, Section 2.2-4007.04 requires that such economic impact analyses include (i) an identification and estimate of the number of small businesses subject to the regulation; (ii) the projected reporting, recordkeeping, and other administrative costs required for small businesses to comply with the regulation, including the type of professional skills necessary for preparing required reports and other documents; (iii) a statement of the probable effect of the regulation on affected small businesses; and (iv) a description of any less intrusive or less costly alternative methods of achieving the purpose of the regulation. The analysis presented above represents DPB's best estimate of these economic impacts.