



Chesapeake Bay Watershed, Virginia

Watershed-Based General Permit for Nutrient Discharges and Nutrient Trading

Permitting Authority Contact:

Kyle Winter
 Virginia Department of Environmental Quality (DEQ)
 Manager, Office of Water Permit Programs
 629 East Main Street, P.O. Box 1105,
 Richmond VA, 23218
 (804) 698-4182
kiwinter@deq.virginia.gov

Virginia Nutrient Credit Exchange Association Contact:

Mark Haley
 President
 (804) 541-2210
mhaley@hrwtf.org
www.theexchangeassociation.org

Permit Type:

General permit for total phosphorus and total nitrogen that overlays existing individual permits

Information:

Permit: www.deq.state.va.us/vpdes/pdf/9VAC25-820-NutrientDischargesGP-09-06-06.pdf
Fact Sheet: www.deq.state.va.us/vpdes/pdf/9VAC25-820-FactSheet.pdf

Pollutants Addressed in General Permit:

Nutrients (phosphorus and nitrogen)

Pollutants of Concern in Watershed:

Excessive nutrients (phosphorus and nitrogen), algae blooms, low dissolved oxygen (DO), decline in habitat availability

Permit Effective Date: January 1, 2007

Watershed: <i>Chesapeake Bay Watershed, Virginia</i>		
Key Water Quality Concerns: <i>Excessive nutrients (nitrogen and phosphorus) leading to algae blooms and low dissolved oxygen levels</i>		
Stakeholder Involvement Techniques:		
<ul style="list-style-type: none"> <i>Numerous statewide public meetings and several regulatory public hearings</i> <i>Voluntary Advisory Committee with issue-focused work groups</i> <i>Meeting minutes posted on Virginia's Regulatory Town Hall Web site (http://townhall.state.va.us)</i> 		
Case Study Issues of Interest		
Type of Point Sources	POTW Discharges	✓
	Industrial Process/Nonprocess Wastewater Discharges	✓
	Concentrated Animal Feeding Operations	
	Municipal Separate Storm Sewer System Discharges	
	Construction Site Stormwater Discharges	
	Industrial Facility Stormwater Discharges	
	Combined Sewer Overflows	
Highlighted Approach(es)	Statewide Watershed Approach	
	Implementation of Water Quality Standards	
	Implementation of Total Maximum Daily Loads or Other Watershed Pollutant Reduction Goals	✓
	Permit Coordination/Synchronization	
	Integrated Municipal Requirements	
	Point Source – Point Source Water Quality Trading	✓
	Point Source – Nonpoint Source Water Quality Trading	✓
	Discharger Association	✓
Coordinated Watershed Monitoring		

Overview

In March 2003, the Chesapeake Bay Program (CBP) adopted new nutrient reduction goals as part of the Chesapeake 2000 Agreement. This Agreement was established to protect and restore water quality in the Chesapeake Bay by a January 1, 2011 deadline. The nutrient reduction goals established in this Agreement aim to decrease the amount of total nitrogen (TN) and total phosphorus (TP) entering the Bay by 110 million and 6.3 million pounds per year, respectively. Based on these target reductions for the Chesapeake Bay watershed, the CBP established nutrient load allocations for each of the eight tributary basins (i.e., subwatersheds). Each state within the Chesapeake Bay drainage area then developed tributary strategies to achieve the nutrient reduction goals for each subwatershed.

The Virginia Department of Environmental Quality (DEQ), in conjunction with the Virginia Department of Conservation and Recreation (DCR) and the U.S. Environmental Protection Agency (EPA), developed tributary strategies for the Virginia tributaries to the Chesapeake Bay. Each tributary strategy establishes total nutrient loading allocations for both point and nonpoint sources within each subwatershed and outlines implementation plans to meet these allocations.

Legislation signed by the Governor in 2005 created the Chesapeake Bay Watershed Nutrient Credit Exchange Program (Exchange Program) and required new and expanding Virginia Pollutant Discharge Elimination System (VPDES) facilities and existing VPDES facilities on the CBP Significant Discharger List (significant dischargers) to register for coverage under a general permit designed to meet the nutrient load allocations for the Chesapeake Bay watershed.

This case study focuses on the tributary strategy components of the General Permit issued to significant and new and expanding dischargers as part of Virginia’s Exchange Program.

Permitting Background

To meet the water quality improvement goals set forth by the Chesapeake 2000 Agreement, the Virginia DEQ developed tributary strategies for the Rappahannock, York, James, Shenandoah-Potomac, and the Eastern Shore watersheds in Virginia. The tributary strategies define the needed reduction of TP and TN for each watershed to achieve compliance with the nutrient load allocations.

On March 24, 2005, the Governor of Virginia signed legislation authorizing the creation of the nutrient Exchange Program and requiring significant dischargers (based on the CBP Significant Discharger List), as well as new and expanding facilities, to register for coverage under a new General Permit. The permit, to be developed by DEQ, would require these facilities to collectively meet annual nutrient load allocations established for the Chesapeake Bay subwatersheds. The legislation was codified in Article 4.02 of the Code of Virginia.

In Virginia, general permits must be written as permits and adopted as regulations. The Virginia State Water Control Board approved the final regulation establishing the Exchange Program and the General VPDES Watershed Permit Regulation for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Bay Watershed in Virginia (General Permit—VAN000000) at its September 6, 2006 meeting. The permit became effective on January 1, 2007 and will expire on December 31, 2011.

The General Permit establishes annual effluent loading limits for nitrogen and phosphorus for all dischargers and addresses compliance schedules, compliance plans, and monitoring and reporting requirements for all significant and new or expanding dischargers in the Chesapeake Bay. It also establishes the conditions by which credits (the difference in pounds between the facility’s limit and the mass actually discharged) may be exchanged. Nutrient credits may also be purchased by existing facilities whose proposed expansion would otherwise cause the facilities to exceed their allocation or by new and expanded facilities that do not have an assigned a wasteload allocation. Facilities can make these nutrient credit transactions through the Nutrient Credit

Exchange Association (the Exchange Association) or independently with facilities located in the same subwatershed.

Permit Strategy

Virginia’s tributary strategies define the needed reduction of TP and TN for each of its Chesapeake Bay watersheds to achieve compliance with the nutrient load allocations (Tributary Strategies are available for download at: www.naturalresources.virginia.gov/Initiatives/WaterQuality/). The nutrient load allocations for each tributary strategy were determined by the CBP watershed model. This model divides the 64,000 square mile Chesapeake Bay watershed into 94 modeling segments. The segments are analyzed using rainfall, evaporation, and meteorological data in combination with a hydrologic submodel to simulate soil erosion and pollutant loads for the Bay’s rivers and reservoirs.

Loading reductions needed to meet the TN and TP allocations for each major watershed of the Chesapeake Bay in Virginia¹

Watershed	Mass Reduction ²		Percent Reduction	
	TN	TP	TN	TP
Rappahannock	2.66	0.33	34%	35%
York ³	2.00	0.27	26%	36%
James ³	10.86	2.54	29%	43%
Shenandoah-Potomac	9.96	0.56	44%	29%
Eastern Shore	0.94	0.15	45%	64%

¹ Reductions are from the individual tributary strategies and are based on the 2002 values from each watershed.

² In millions of pounds.

³ Allocations considered interim until further water quality standards adopted.

The Virginia DEQ developed the General Permit using this watershed-based approach. The General Permit describes the sources of nutrients in each of the major subwatersheds, their contributions to the water quality issues in the Chesapeake Bay main stem, and the nutrient load allocations derived for each subwatershed.

By affording covered facilities of each watershed multiple ways to achieve water quality goals, the General Permit offers a much more flexible and economically feasible approach than other possible permit options. Covered dischargers have the option of complying with their existing load limits through:

- ◆ Treatment technology upgrades;
- ◆ Trading among permitted facilities through the Exchange Association;
- ◆ Purchase of nutrient credits directly from compliant facilities within their watershed;
- ◆ Joining multiple facilities to create an aggregate nutrient cap (see Permit Highlights below for more information); and
- ◆ Purchasing nutrient reductions generated by nonpoint source best management practices (to offset new or expanded discharges);
- ◆ Payment into the Water Quality Improvement Fund (WQIF) where no other options are available.

What is the Water Quality Improvement Fund (WQIF)?

The WQIF was created by the Virginia Water Quality Improvement Act of 1997 (Section 10.1-2128 of the Code of Virginia). The Fund provides water quality improvement grants to state and local pollution prevention, reduction, and control programs. It also supports nonpoint source pollution reductions identified by the Virginia tributary strategies. Payments to the WQIF for compliance credits are \$11.06 for each pound of nitrogen and \$5.04 for each pound of phosphorus. WQIF compliance credits are only available as an option of last resort if there are no credits available through the Exchange Association or nonpoint source offsets.

The Virginia DEQ took a unique approach with its strategy for developing the General Permit. As stated by Kyle Winter of the Virginia DEQ, “[The] DEQ developed one permit in 15 months with the assistance of a stakeholder group, as opposed to negotiating nutrient reduction conditions in 125 permits with individual facilities over a period of five years.” This strategy saved large amounts of time and resources for the Virginia DEQ while maintaining active stakeholder involvement throughout the General Permit development process.

Permit Highlights

As previously noted, to assist with meeting the new and more stringent nutrient reductions, several options, such as the Exchange Program, are provide flexibility for facilities under the General Permit. Upgrading existing treatment systems would be very expensive and potentially hinder growth within the Chesapeake Bay Watershed. The Exchange Program, on the other hand, offers a market-based and cost-effective method for meeting nutrient caps while accommodating continued

growth and development. It also allows for new upgrades to be phased-in, easing construction and resource demand, while expediting the process of meeting nutrient load allocations by the January 1, 2011 deadline. The Exchange Program and other options for meeting requirements under the General Permit are highlighted below.

The Virginia Nutrient Credit Exchange Association

Facilities may conduct trading on an individual basis, or they can elect voluntary participation with the Exchange Association. Those facilities choosing membership are offered a number of services aimed towards efficient and cost-effective compliance with the General Permit. Authorized by the General Assembly, the Exchange Association is funded through the WQIF. Membership in the Exchange is free and open to all significant dischargers, as well as new or expanding facilities, interested in participating. A \$1,000 membership fee for consultant affiliates applies.

The Exchange Association coordinates and facilitates nutrient credit trading among its members. After reviewing the participating dischargers’ compliance plans, treatment capabilities, control costs, and potential expansions, the Exchange Association develops compliance scenarios. This approach ensures that the individual facilities meet their permitted discharge limits while maintaining nutrient loads below that of the collective subwatershed allocation.

Independent Trading

Individual facilities choosing not to join the Exchange Association still have the option of trading, but must do so independently. Independent trading follows the same guidelines, but is done in the absence of the Exchange Association’s assistance and services. Trading partners and trading scenarios must be developed separately between facilities within the same subwatershed. Facilities also would individually submit Compliance Plans and annual updates, as opposed to doing so through the Exchange Association.

Nonpoint Source Trading

The permit establishes a framework for facilities seeking to offset proposed expansion or new construction by allowing the option of purchasing nutrient reductions generated by nonpoint source best management practices (BMPs). This trading alternative is still under development due to issues related to estimating nonpoint source loading and BMP load reductions, inspection and monitoring of BMP installation, and enforceability. As stated in the General Permit, if a point source acquires nonpoint offsets, a trading ratio requires the point source discharger to purchase two pounds of nonpoint source load reduction for every one pound needed at the facility’s end-of-pipe discharge. Nonpoint source trading adds another option for new and expanding facilities to achieve General Permit compliance.

Aggregate Loads

Owners of multiple facilities (within the same subwatershed) have the option of applying for an aggregated mass load limit for delivered TN and TP. Virginia DEQ would base compliance on the combined nutrient caps of those facilities, allowing the owner to meet the aggregate cap through collectively managing the nutrient loads of each individual facility. This approach essentially creates a small trading network under the management of the owner.

More information on the Virginia's Chesapeake Bay Watershed Nutrient Credit Exchange Program is available at:
www.chesapeakebay.net/trading.htm
www.theexchangeassociation.org

Permit Components

Permit Coverage

The General Permit requires that significant and new or expanding facilities in the Chesapeake Bay watershed register for coverage. The criteria for coverage under the permit are as follows:

- ◆ A significantly discharging facility:
 - ◆ An existing facility that discharges 100,000 gallons or more per day, or an equivalent load, directly into tidal waters;
 - ◆ An existing facility that discharges 500,000 gallons or more per day, or an equivalent load, directly into nontidal waters; or
- ◆ A new or expanding facility:
 - ◆ An facility that proposes to discharge 40,000 gallons or more per day, or an equivalent load, directly into tidal or nontidal waters as a result of that new construction.

There are 127 significant dischargers and about 12 new/expanding facilities eligible for participation in the Exchange Program. The Virginia DEQ maintains registration lists of these facilities covered by the General Permit. The lists contain the load limits for the facilities which are enforceable under the General Permit (www.deq.state.va.us/vpdes/).

Effluent Limits

The General Permit establishes annual, water quality-based effluent loading limits for TN and TP. Each covered facility is required to be in compliance with TN and TP final effluent limits as soon as possible, but no later than January 1, 2011. The dates will be subject to revision by the Virginia DEQ based on individual Compliance Plans. The General Permit supersedes the requirements of the facilities' individual VPDES permits pertaining to TN and TP, except where site-specific conditions necessitate more restrictive limits.

Monitoring and Reporting Requirements

General Permit holders are required to conduct nutrient discharge monitoring to determine compliance with effluent limitations. Monitoring frequency is based on design flow and is conducted as shown below.

Total monthly and year-to-date mass loads must be calculated as specified by the General Permit as follows:

$$ML = ML_{avg} * d$$

ML = total monthly load (lbs/mo)

ML_{avg} = monthly average load as reported on discharge monitoring report (lbs/day)

d = number of discharge days in sampling month

$$AL - YTD = \sum_{(January - current\ month)} ML$$

AL-YTD = calendar year-to-date annual load (lbs/yr)

ML = total monthly load (lbs/mo) as reported on discharge monitoring report

Monitoring requirements for facilities covered under the General Permit.

Parameter	Monitoring Sample Type/Frequency		
	Design Flow		
	≥ 20.00 MGD	1.00–19.99 MGD	0.04–0.99 MGD
Total Nitrogen	24 HC*/ 3 Days Per Week	24 HC/ 1 Day Per Week	8 HC/ 2 Per Month (>7 Days Apart)
Total Phosphorus	24 HC/ 3 Days Per Week	24 HC/ 1 Day Per Week	8 HC/ 2 Per Month (>7 Days Apart)

*HC = hour composite (e.g. 24 HC = 24 hour composite sample)

Reporting dates are determined for each facility and reports are due the same date each month. If the facilities are conducting trading through the Exchange Association, annual reports are due on or before February 1 of each year to the Exchange Association. If a facility opts out of Exchange Association membership, it must directly submit reports to the Virginia DEQ. These reports include the previous year's annual mass loads of TN and TP, the delivered loads of nitrogen and phosphorus (i.e., pounds of total nitrogen and total phosphorus delivered to tidal waters), and the number of nitrogen and phosphorus credits to be acquired or exchanged.

For more information on the VPDES General Permit program, Virginia nutrient trading program legislation and regulations visit the Virginia DEQ website (www.deq.state.va.us/vpdes/).

Special Conditions

Special conditions are included in Part I and Part II of the General Permit. Special conditions for all facilities under the General Permit are found in Part I and include the following sub-sections:

- ◆ Authorized activities under the General Permit
- ◆ Wasteload allocations and nutrient credit generation
- ◆ Compliance schedules
- ◆ Guidelines for annual compliance plan updates
- ◆ Monitoring and annual reporting requirements
- ◆ Registration statement and requirements
- ◆ Public notice requirements
- ◆ Methods for wasteload allocation compliance

All facilities must complete a registration statement (i.e., notice of intent) and submit the completed registration statement to the Virginia DEQ to obtain coverage under the General Permit. The registration statement form is available at (www.deq.state.va.us/vpdes/pdf/9VAC25-820-RegistrationStatement.pdf). The Virginia DEQ reviews and approves all registration statements, adding those facilities with approved registration statements to the registration list. Upon receiving approval from the Virginia DEQ, a facility is subject to the conditions of the General Permit.

The wasteload allocations assigned to all facilities are considered total loads; facilities must maintain and monitor wasteload allocations to ensure compliance. Monthly and annual monitoring reports will be used to calculate monthly and total year-to-date mass loads. A facility shall be in com-

pliance in one of three ways: 1) if their annual mass load is below the applicable wasteload allocation; 2) if the facility acquires sufficient TN and TP credit; or 3) if payment is made to the WQIF to purchase sufficient TN and TP credits. Any proposed modification or incorporation of a new wasteload allocation to offset new or expanded discharges must be incorporated into a public notice for a 30-day comment period.

The conditions of Part I also apply to the new and expanding facilities, but additional conditions for these new sources of TN and TP are addressed in Part II. This section includes information spelling out how these facilities must offset their new or increased loads, methods for acquiring wasteload allocations, and the conditions for acquiring allocations.

Compliance Plans and Schedules

Each facility must complete a compliance plan (individually or through the Exchange Association) by July 2007 that explicitly details how each facility will meet nutrient standards by the compliance date of January 1, 2011, as directed by the Chesapeake 2000 Agreement. If the facility wishes to use nutrient credit trading to meet nutrient reductions, the compliance plan will specify how this trading will be accomplished. Any planned capital projects and implementation schedules for achieving nutrient reductions must also be included. General Permit compliance schedules override any duplicate or conflicting schedules from a facility's individual VPDES permit.

Each individual facility is required to be in compliance with TN and TP final effluent limits; compliance dates, based on individual Compliance Plans, will be subject to revisions by the Virginia DEQ. Compliance with the overall subwatershed TN and TP loads are to be achieved as soon as possible, but no later than January 1, 2011, as set forth by the Chesapeake 2000 Agreement. Facilities must submit mandatory annual updates for compliance plans to the Virginia DEQ no later than February 1 of each year.

Trading and Other Special Conditions

As part of Compliance Plan development, a facility may request to have its annual load cap activated early and be entitled to trade and acquire nutrient credits, if approved by the Virginia DEQ (9 VAC 25-820-40 A.1-2). The earliest that the caps can be activated is January 1, 2007, which corresponds to the effective date of the General Permit. As stated by the General Permit, these facilities may trade independently or through the Exchange Association. Trading partners are then established (by the Exchange or individually) based on credits generated and trades required. Each facility is required to generate annual reports, also due by February 1 of each year, that specify the number of TN and TP credits the facility will acquire or exchange.

When a facility discharges less than its annual TP or TN limit, the difference (in pounds) between the limit and actual discharge will result in excess pounds available for conversion to saleable nutrient exchange credits using an applicable delivery factor (see text box below). Credits are expressed as pounds per year of delivered TN or TP load. If a facility exceeds its TN or TP limit and chooses to exchange credits, it can purchase nutrient reduction credits from a more efficient point source facility.

What is a delivery factor?

A delivery factor is simply an estimate of the number of pounds of TN or TP delivered to the Chesapeake Bay that is calculated from the actual number of pounds discharged from a facility multiplied by a factor based on the geographic location of the facility. The delivery factor accounts for the attenuation of TN and TP during riverine transport from the facility's discharge to the Chesapeake Bay.

For all facilities, credits may only be exchanged if they are (9 VAC 25-820-70 Part I.J.2-3):

- ◆ Generated in the same subwatershed
- ◆ Generated and applied towards compliance in the same calendar year
- ◆ Exchanged without conflicting with local water-quality based limitations
- ◆ Acquired no later than June 1 of the year following calendar year to which the credits will be applied
- ◆ Generated by a facility whose wasteload allocations are based on design flow or industrial activity
- ◆ Recorded in a credit exchange notification form and submitted to the Virginia DEQ

To offset new or increased delivered TN and TP loads, Part II of the General Permit lists several options available for new or expanding facilities to acquire wasteload allocations (9 VAC 25-820-70 Part II.B.1-2). In addition to the option of trading, new/expanding facilities may also use one or any combination of the following to acquire allocations:

- ◆ Acquisition of nonpoint source load allocations
- ◆ Acquisition of allocations through other means approved by the Virginia DEQ on a case-by-case basis.

Details of the nonpoint source trading approach are still under development, but these two additional options are offered as a means of offsetting the additional TN and TP loads generated by the new or expanding facilities.

Permit Effectiveness

Environmental Benefits

Though the permit has been issued, nutrient credit trading has yet to begin. Therefore, there have been no measurable environmental benefits. The flexibility, cost-effectiveness, and collaboration-oriented approach of the program are anticipated to result in much quicker nutrient reductions than solely relying on technology upgrades. Once the details of the non-point source trading are worked out, there are many possible environmental benefits as new or expanding facilities acquire credits through BMPs in the watershed.

Benefits to the Permittee

Despite the new and more stringent reductions in nutrient loads required by the Chesapeake 2000 Agreement, the General Permit provides the permittees with several different tools for achieving compliance. This provides facilities with a much more flexible approach as opposed to solely employing costly treatment upgrades. This flexibility not only assists existing facilities with meeting their load reductions, but it also allows for future economic growth in the region as it eases costs and resource demands.

Benefits to the Permitting Authority

The development and implementation of the General Permit has allowed for a much more streamlined and efficient permitting process for the Virginia DEQ. Kyle Winter, Manager of the Office of Water Permit Programs in the Virginia DEQ, stated that the General Permit has been most beneficial because the process only used a few staff members to negotiate a single consolidated permit with 125 load limits and ten schedules of compliance over 15 months. This approach is compared that with using twelve or more permit writers to negotiate 125 individual permits with 125 load limits and 125 compliance schedules over five years.

Lessons Learned

Kyle Winter was also asked to comment on the questions listed below and he provided the following answers:

- ◆ What have been the most challenging parts of the project?

The most challenging part of the project was developing consensus among a broad stakeholder group while holding firm to the intent of the enabling legislation and existing state and federal [statutes and] regulations, some of which were under development at the time this regulation was initiated. A lot of good ideas weren't possible because they were either outside the intent of the enabling legislation, would have conflicted with concurrent regulatory initiatives, or would have cost the support of one or more critical stakeholders.

- ◆ Would this approach be applicable to other watersheds? What characteristics would define other candidate watersheds?

The applicability would be dependent on the intent. As Virginia is developing nutrient criteria for reservoirs and free-flowing streams throughout the Commonwealth (not just the Chesapeake watershed), I would expect the nutrient trading regulation to eventually be applicable state-wide; however, I couldn't speculate whether we'd consider watershed-based permits for other parameters.

Resources

9 VAC 25-820-10 et seq.—General Virginia Pollutant Discharge Elimination System (VPDES) Watershed Permit Regulation for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Bay Watershed in Virginia. Adopted September 6, 2006.

www.deq.state.va.us/vpdes/pdf/9VAC25-820-NutrientDischargesGP-09-06-06.pdf

The Chesapeake Bay Program. Water Quality Protection and Restoration Web Site.

Data Viewer: <http://maps2.chesapeakebay.net/website/modeling/viewer.htm>

Nutrient Trading Web Site: www.chesapeakebay.net/trading.htm

Modeling Website: www.chesapeakebay.net/model.htm

Monitoring Programs Web Site: www.chesapeakebay.net/monprgms.htm

Water Quality Web Site: www.chesapeakebay.net/wquality.htm

The Commonwealth of Virginia- Secretary of Natural Resources. 2006. Statewide Tributary Strategies. Official Web Site.

www.naturalresources.virginia.gov/Initiatives/WaterQuality

Gilinsky, Ellen. 2007. Guidance Memo No. 07-2008: Permitting Considerations for Facilities in the Chesapeake Bay Watershed. Department of Environmental Quality, Division of Water Quality Programs Memorandum. May 16, 2007. Richmond, Virginia.

www.deq.state.va.us/vpdes/pdf/GM07-2008.CB_Watershed_Facilities_Permit_Considerations.pdf

The Virginia Nutrient Credit Exchange Association. Official Web Site.

www.theexchangeassociation.org/Default.htm

Note: All Web references current as of July 6, 2007.