APPENDIX A
West Virginia Potomac River Basin
Water Quality Nutrient Trading Program

Purpose: The purpose of Appendix A is to provide program-specific guidance regarding water quality trading of nutrients in the West Virginia portion of the Potomac River Basin.

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Definitions

Cap Load Allocation – *The total allowable load of nutrients that can flow from a basin within the Chesapeake Bay watershed that is based on protection of downstream water quality.*

Chesapeake Bay Watershed – *The area of land defined by the aerial extent of surface water which drains to the Chesapeake Bay and its tributaries.*

Chesapeake Bay Watershed Model (CBM) – *The Hydrologic Simulation Program in FORTRAN (HSPF), used to simulate the surface water runoff, groundwater flow and the transport of nutrients and sediments within the Chesapeake Bay watershed.*

Delivery Factor (DF) – *A factor that is applied to determine the portion of the nutrient load that is expected to be delivered from the watershed segment to the fall line of the Chesapeake Bay.*

Edge of Segment Factor (EOS) – *A factor that represents the fraction of the nutrient load originating from a given land use type that is delivered from the field (via runoff, groundwater and atmospheric deposition) to the edge of the corresponding watershed segment. Segment soil types, topography, hydrological, and land use characteristics of each WV Chesapeake Bay Model watershed segment are considered.*

Edge of Segment Baseline – *The average 2005 Edge of Segment nutrient load calculated by the Chesapeake Bay Watershed Model. This is the performance level that must be achieved in each agricultural land use category before nutrient credits can be generated.*

Edge of Field Baseline – *The Edge of Field target load from the Chesapeake Bay Watershed Model calculated by dividing the EOS baseline by the Edge of Segment Factor.*

West Virginia Potomac Basin – *The area of land within West Virginia that drains to the Potomac River and its tributaries.*

West Virginia Potomac Tributary Strategy ("the Strategy") – *The basin-specific framework developed by the West Virginia Tributary Strategy Stakeholders Working Group that seeks to reduce nutrient and sediment loads in the WV portion of the Potomac basin while minimizing economic and social burdens.*

West Virginia Potomac Tributary Strategy Implementation Plan ("the Plan") – *The Plan written by the WV Department of Environmental Protection and stakeholders to help define and address nutrient and sediment loadings in the WV portion of the Potomac Basin.*

I. Background

The Chesapeake Bay and its tidal tributaries have been determined by Maryland and Virginia to be impaired under Section 303 (d) of the Clean Water Act (CWA). As nutrient sources in West Virginia contribute to this impairment, West Virginia ("the State") became a partner in the Chesapeake Bay Water Quality Initiative (CBWQI) in 2002 by signing a document committing cooperation and efforts to protect and restore the Bay and its tributaries - joining a multi-jurisdictional effort to restore ecological functions within the Bay watershed which have been degraded by excess nutrients and sediment loads. In accordance with the 2002 CBWQI, each jurisdiction within the Chesapeake Bay watershed (WV, VA, PA, DE, Washington DC, MD, and NY) was to develop its own Tributary Strategy ("the Strategy") and Implementation Plan ("the Plan") (http://www.wvnet.org/) that would outline steps and goals for achieving agreed-upon cap load allocations (CLAs) for nutrient and sediment loads by 2010. This was done as an effort to avoid a mandated EPA TMDL for the Chesapeake Bay watershed.

Implementation of these strategies supports commitments associated with the CBWQI as well as compliance with Clean Water Act requirements, which mandate that states assure the attainment and maintenance of downstream water quality standards. Consequently, these requirements oblige WV to regulate permitted nutrient dischargers in the Potomac Drains in order to protect Maryland's water quality standards, including those applicable to the Chesapeake Bay.

West Virginia voluntarily committed to reducing nitrogen, phosphorus and sediment loadings to the Potomac River by 33, 35, and 6 percent respectively over 1985 loading rates. The Strategy and Plan further include specific initiatives to address loading reductions from both point and non-point sources. Reductions are needed in the Potomac Basin in the regulated point source sector (e.g., sewage treatment plants, industrial dischargers, regulated MS4s) and in the non-point source sector (e.g., farms, forestry, and unregulated urban stormwater runoff) to achieve EPA-allocated levels.

The Strategy describes how the State can achieve its nutrient and sediment load allocation through a combination of actions, including changes to NPDES permits and other activities such as installation of best management practices.

In support of the State's voluntary commitments and in anticipation of an impending Bay-wide TMDL, the West Virginia Department of Environmental Protection (WVDEP) or, "the Department") is providing guidance for this water quality-related nutrient trading program. The trading program was one of the innovative measures outlined as a part of the CBWQI and recommended by WV's Point Source Innovation Work Group, a group formed by the Department for initiating the permitting framework. This measure is just one part of a larger program to help sources in all sectors take preventative and proactive measures to achieve cost effective reductions in nutrient loadings that will improve and protect local water quality and help meet WV's commitment to reduce nutrient loads to the Potomac Basin. *Most importantly, the water quality trading guidance outlined here is designed to ensure that WV's local goals for economic development, environmental and public health protection, and soil conservation are advanced through efforts to also restore and protect the Bay.*

II. Fundamentals

A. General

The Environmental Protection Agency (EPA) advocates water quality trading as a cost effective approach to achieve water quality goals that will increase overall environmental and economic benefits. Among Bay states, watershed nutrient trading programs have been adopted by Pennsylvania and Virginia, and Maryland's program is currently being finalized. Although the specific criteria of these programs differ, all programs, including the WV program rely on trading to benefit the states in two principal ways. The first addresses the expected cost differential between upgrading treatment technology of point sources versus other approaches for reducing non-point source discharges. The second benefit arises from the flexibility of trading policy to allow for future economic development and growth to take place without sacrificing water quality.

B. Nutrients Traded

Trading may occur for nutrient (total phosphorous, total nitrogen, and sediment) credits.

Credits are the units of compliance that correspond with a Department-recognized nutrient load reduction, instream nutrient load removal, and/or unused nutrient permit allocation which, when registered by the Department, may be used in a trade to offset a permittee's increase in a nutrient load beyond its permitted allocation.

C. Trading Guidelines

Credits must be expressed in units of measurement conforming to applicable permit compliance requirements. Nutrient credits will be expressed as delivered pounds per year, and will be valid for one year for trading in the context of the WV Potomac Basin. Credits must be measured, verified, and accounted for consistent with that time period.

Credits must be verified each year. If a credit-generating project has a longer life span than a year, then credits can be generated for the life of a project but they must be verified each year. Credits cannot be banked for future years but rather must be applied in the year that they are generated. For example, if an agricultural BMP generates an average of 10 credits per year and has a life span of five years, 50 credits cannot be applied in the fifth year. Projects with variable credit production capacity over time, however, can generate credits that reflect average performance over the life of the BMP (e.g. forested riparian buffer strips).

Credit trading may occur anywhere within the West Virginia portion of the Potomac Basin, but no trade may cause an impairment of any local water quality.

Trades must be of comparable parameters (e.g. nitrogen must be traded for nitrogen) and can occur amongst:

- Point sources;
- Non-point sources;
- Aggregators/Brokers;
- Any combination of the above.

D. Eligibility

1. Sector Trading Caps & Baselines

In the WV Potomac Tributary Strategy, a number of nutrient-contributing sectors are estimated to deliver respective nutrient loads to the Potomac Basin. Based on these initial estimated loads, the Strategy describes specific load reduction goals for each sector. The post-reduction loading levels are the nutrient loading caps that each sector/the State is responsible for obtaining and maintaining.

These load reduction goals are intended to be implemented across all sources. For point sources, regulatory efforts initially address point source sector permittees with design discharge flows of 50,000 gallons per day or greater. Other sector strategies are being implemented through different types of programs. For the purposes of the trading program, a party without permitted nutrient load restrictions that is interested in credit generation must demonstrate that it is also contributing to sector reductions and cap maintenance efforts as defined below. It is important to the integrity of the trading program that ***efforts intended to advance water quality goals not become credits that simply increase nutrient loadings elsewhere without resulting in a net load reduction***. It is also important to the integrity of the trading program that efforts to reduce nutrient loads to achieve water quality goals not violate water criteria locally.

The point at which an entity can begin to generate credits is its ***baseline***. The baseline for all sectors is defined in the sections below.

a) Point Source Sector Baselines

- **Regulated facilities** in the municipal point source sector have or will receive annual nutrient allocations in their NPDES permits based on Department-selected effluent concentrations for the facility, multiplied by the facility's permitted design flow as of November 2005. New facilities or expansions permitted after November 2005 are required to *offset all new nutrient loads*.

Targeted industrial and mining operations receive similar limits based on equivalent levels of nutrients as facility permits are reissued.

To be eligible to trade, a facility must have an NPDES permitted nutrient allocation for nitrogen and/or phosphorus, and must not cause or contribute to a localized water quality problem.

- **Facilities with design flow < 50,000 gal/day – *Reserved***

- **Other Point Sources** - Where a permittee does not have a nutrient /sediment allocation, such as in the general MS4 permit, the permittee is obligated to meet the applicable monitoring, reporting, and management requirements to the maximum extent practicable. Dischargers must be in compliance with the

expressed monitoring, reporting, and/or management requirements before the permittee is eligible to generate tradable credits from nutrient reductions.

b) Non-Point Source Sector Baselines

Non-point sources are not currently regulated by the Department and therefore do not have a regulatory nutrient allocation. The non-point source sector reductions set forth by the Tributary Strategy are to be achieved through the application of voluntary conservation practices by individual landowners, many of which can be funded by state or federal cost share or grant programs. The Department has decided, however, that a baseline performance must be achieved by these sectors before credits can be generated, certified, and registered by the Department for sale or exchange to help meet another entity's regulatory obligations. This requirement is intended to ensure the credit supplier's contribution toward meeting nutrient reduction goals in accordance with the Strategy.

The baselines below may change based on future requirements set forth in any applicable TMDL or state nutrient criteria.

(1) **Agricultural Sources Baseline Requirements -** The baseline eligibility requirement for agricultural sources is the *more restrictive of*:

- any existing regulatory requirements or effluent limits related to nutrient management; or
- implementation of a whole-farm Nutrient Management Plan <u>and</u> an average per-acre nutrient load for the field or livestock production area where credits are being generated based on the 2005 average Edge of Segment (EOS) nutrient load for the specific agricultural land use (cropland, hay, pasture and manure).

Non-point sources entering the trading program who have implemented management practices that exceed the baseline are eligible to receive credits for their prior commitment to land stewardship. The per-acre nutrient load is calculated by NutrientNet based on-farm specific inputs such as current land use, fertilizer application rates and existing conservation practices, etc. that have been approved by the CBP and/or the WVDEP.

The table below specifies the nitrogen, phosphorous and sediment performance level (EOS baseline in lbs/ac) that must be achieved in the four agricultural land use categories (cropland, pasture, hay and manure) before credits can be generated. These numerical baselines are based on a weighted average of estimated Chesapeake Bay Model EOS nutrient and sediment loadings across all WV Potomac basin watershed segments representing existing land use and practices as of 2005.

Table 1. Agriculture Land Use Baselines

Land Use	*Total Nitrogen(lb/ac)*	*Total Phosphorus(lb/ac)*	*Sediment (ton/ac)*
Hay	7.7	0.7	0.2
Cropland	22.9	2.9	0.9
Manure	323	39	N/A
Pasture	7.0	0.8	0.2

Compliance with the baseline requirement may be determined and verified with the use of Department-approved calculation methodologies available via NutrientNet – an online tool – and through a site visit by Department staff or a Department–approved certified nutrient or conservation planning specialist.

(2) **Urban/Mixed Open**- For this category the trading baseline is the *more restrictive of*:

- loadings associated with existing land uses as of 2005; or
- management practices needed to comply with applicable state or local regulations.

2. Farmland & Open Space Concerns

The Trading Program is not intended to accelerate industrial, commercial or residential development of productive farmland or open space. Therefore, credits cannot be generated for converting farmland into commercial, industrial or residential developments even though the conversion may result in a reduced nutrient load.

However, the Department may allow the generation of credits when sustainable development practices are applied to the same land use. For example, a municipality can generate credits for retrofitting an existing development with innovative stormwater practices that reduce nutrient loading. Similarly, a developer can generate credits by employing sustainable development practices (green infrastructure, low impact development, and smart growth practices above and beyond federal, state, county or local development requirements) that can be demonstrated to reduce nutrient runoff beyond what would occur under traditional development practices. Credit generation proposals for these types of activities should be developed on a case-by-case basis with the Department.

Additionally, if a portion of farm land is retired and/or converted through programs such as USDA's Farm Services Agency Conservation Reserve Program (CRP) and Conservation Reserve Enhanced Program (CREP) and the USDA's Natural Resources and Conservation Service's Environmental Quality Incentives Program (EQIP), those actions may be eligible for nutrient credit approval. Farmland retired under conservation easements obtained through other entities (e.g., state/local programs, land trusts, non-profit conservation groups, etc.) may

also be eligible for credit generation; proposals for these lands should also be developed on a case-by-case basis with the Department.

III. Generating Tradable Credits

A. Eligible Activities for Generating Credits

Nutrient reduction activities beyond those meeting baseline requirements are eligible for credit generation.

1. Point Sources

a) **Regulated Point Sources** - For a permitted source with a nutrient allocation to generate nutrient credits, it must discharge at levels below the nutrient allocation stated in its NPDES permit. Credits are based on the difference between the permitted limit and the discharge level (reported in the Discharge Monitoring Reports or DMRs) deemed by WVDEP to be representative of average discharge loads, and adjusted with relevant factors in section [IV.B.] below.

b) Existing nutrient related facilities *with design flow less than 50,000 gallons per day* – These facilities represent a nutrient load which may be used for offset and/or trading purposes. On a case-by-case basis, these facilities will be assigned an average annual nutrient load which would provide opportunities for new and expanded non-significant and/or significant facilities to use as offsets for increased nutrient loads**.**

Note: Once the Chesapeake Bay Total Maximum Daily Load (TMDL) is developed, all facilities including those with design flows less than 50,000 GPD may be assigned nutrient loading limits commensurate with the TMDL and may be required to obtain offsets.

c) For MS4s, the six Minimum Control Measures in the MS4 general permit must be attained before other activities are eligible to generate credits (e.g. increasing nutrient assimilative capacity or using wetland treatment at outfalls, investing in nutrient removal efforts on public lands, etc.). Such activities must be proposed and will be reviewed on a case-by-case basis by the Department.

2. Non-point Sources

For non-point sources, nutrient reduction proposals must contain Department-recognized methods for demonstrating nutrient reductions occurring from activities that reduce nutrient application, increase nutrient uptake and retention, or result in net export of nutrients/sediments from the watershed. Currently, all approved Chesapeake Bay Program BMPs are eligible to generate credits. A current list of approved activities in West Virginia is available on the Department's trading program website.

Where Department-recognized methods for a nutrient reduction activity do not exist, methods may be proposed for Department review and approval.

BMPs or other credit-generating activities occurring after November 1, 2005 may be submitted for review to determine credit eligibility. Non-structural BMPs (e.g. no-till, cover crops, litter transport, etc) that were implemented prior to November 2005 and continue to be utilized and maintained on an annual basis are eligible to earn nutrient reduction credits.

Credits must be generated and verified on an annual basis for the duration of the contractual agreement between the credit supplier and buyer.

B. Calculation of Delivered Load

To calculate the number of credits that can be derived from nutrient reduction activities, the factors below are used. These factors serve to translate how various activities on a parcel of land result in a delivered load reduction and are automatically calculated in the Nutrient Net online forms (nutrient reduction activities not included in the Nutrient Net program may be approved subsequent to Departmental review).

1. **Edge of Segment Factor (EOS)**

The **Edge of Segment Factor** is a factor that represents the fraction of the nutrient or sediment load originating from a given land use type that is delivered (via runoff, groundwater and atmospheric deposition) to the edge of the corresponding watershed segment. This factor also accounts for average soil types, topography, hydrology, land use, and other factors within the segment. The EOS is derived from the Chesapeake Bay Watershed Model and included in the NutrientNet calculation tools. The WV Potomac River watershed segments used in the Chesapeake Bay Model are depicted in the map on the following page.

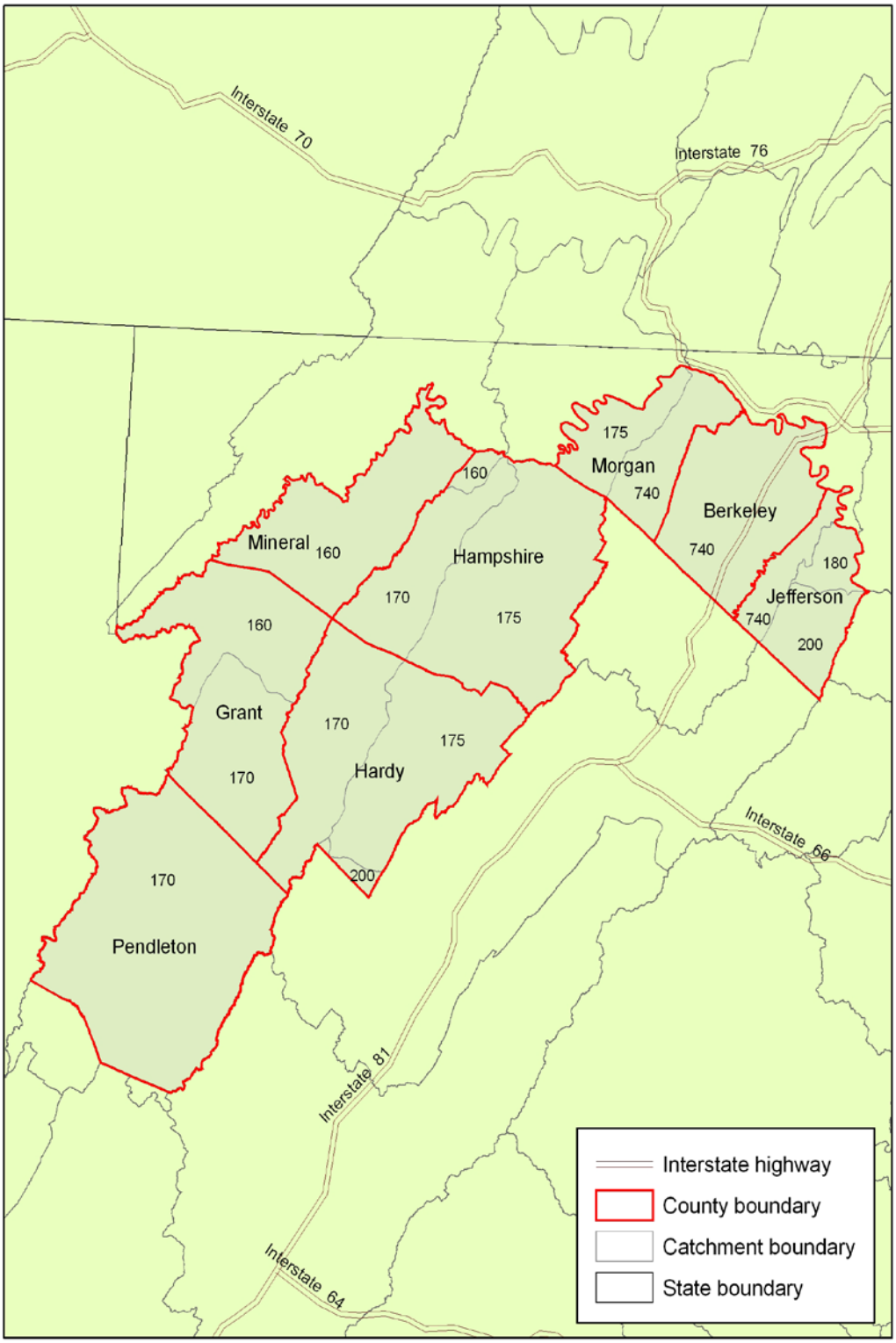
2. **Delivery Factor (DF)**

The **Delivery Factor** is a function of the distance from the edge of the watershed segment to the fall line of the Chesapeake Bay. It represents the effective delivery of the nutrient/sediment load to the Chesapeake Bay and the related estimated diminution of the effect of the nutrient reductions between upstream and downstream points. The delivery factor is derived from the Chesapeake Bay Watershed Model and included in the NutrientNet calculation tools. The delivery factors for the watershed segments within the WV Potomac River basin are shown below:

Table 2. Delivery factors for Potomac River Basin watershed segments.

	Delivery Factors		
Watershed Segment	*N*	*P*	*Sediment*
160	0.59	0.77	1
170	0.56	0.77	1
175	0.70	0.77	1
180	0.83	0.77	1
200	0.66	0.77	1
740	0.74	0.77	1

West Virginia Counties and Subwatershed Segments Within the Potomac Watershed



C. Calculation of Credits from Eligible Activities

1. Point Source

a) **Nutrient limited point sources -** For a point source to generate credits, it must discharge at levels below its nutrient allocation stated in the NPDES permit. Credits generated are based on the difference between the permitted allocation and discharge level monitored and reported in the DMR. Therefore, the number of credits that are either needed for purchase or available for sale is obtained by calculating the difference between the permit limit (lbs) and the discharge level (lbs). Point sources with available credits for sale will provide the quantity of their available credits to the Department, who will verify and list them on NutrientNet.

b) **Point Sources without nutrient limitations -** A point source without nutrient limits that voluntarily installs nutrient reduction treatment can also generate credits. Credits for such facilities can be calculated by the difference between the existing discharge level and the level achieved by upgrading treatment. Also, a nutrient limited point source may generate credits by absorbing a point source without nutrient limitations.

c) MS4's can generate credits by performing nutrient reduction activities beyond those required for compliance with the State's general MS4 permit.

All point sources generating credits must apply the delivery factor to nutrient reductions in order to equate reductions across segments.

2. Non-point Source

a) **Agriculture** – Agricultural sources can generate nutrient reduction credits by implementing activities on their fields or animal concentration areas that reduce nutrient loads to ground and surface water. In order to generate credits, these activities must result in an average per-acre load below the stipulated baseline. The Department's on-line automated calculation methodology, NutrientNet, will be available for use to calculate the initial nutrient loading rate for the acreage and apply the relevant segment factor, delivery factor and BMP effectiveness to establish credits resulting from proposed or on-going practice(s).

The following steps are used within NutrientNet to calculate agricultural credits:

Step 1: The farmer enters site-specific information about the farm (e.g. crop type, amount and type of manure/fertilizer applied, manure application method, current best management practices).

Step 2: NutrientNet automatically calculates a nutrient loading rate for the field depending on the information the farmer has entered in step 1. The nutrient loading rate subtracts the nitrogen and phosphorus outputs of the cropping system (i.e. crop uptake) from the nutrient inputs to the cropping

system (i.e. amount of fertilizer applied) and adjusts for current best management practices.

Step 3. The farmer selects one or more Best Management Practices (BMP's) that are to be implemented on the farm. NutrientNet calculates the estimated nutrient/sediment reductions using the Chesapeake Bay Model effectiveness estimates.

Step 4. The estimated nutrient reductions are multiplied by the Chesapeake Bay Model's Edge of Segment (EOS) factor to adjust for the amount of nutrients that are transported to the stream. The EOS factor is a ratio that estimates the amount of nutrients that travels from the edge of the farm field to the edge of the watershed segment.

Step 5. The EOS nutrient reductions calculated in step 4 are multiplied by a Chesapeake Bay Model Delivery Factor to adjust for the nutrient/sediment load delivered from the watershed segment to the Bay.

The Department may consider other calculation approaches for practices not included in the NutrientNet program.

b) **Urban/Mixed Open (U/MO)** – Reductions of nutrients from the land in this category can generate credits using calculations based on the Chesapeake Bay Model and applying relevant Segment and Delivery factors. Persons interested in developing U/MO credits must work with the Department on a case-by-case basis.

c) **Other** - Credit generation by other non-point sources and other innovative nutrient reduction projects to increase nutrient uptake/increase nutrient assimilation and retention (such as algal scrubbers and floating islands) will be evaluated on a case-by-case basis. If the Chesapeake Bay Program has already determined effectiveness estimates or methodologies for the practices in question, alternatives will only be considered with justification and upon approval of the Department. Relevant calculation factors will be determined on a case-by-case basis.

IV. Use of Credits in NPDES Permits and Trading Ratios

Department-approved and registered credits may be used by NPDES permittees to comply with permit requirements. For a nutrient regulated point source to apply available credits as offsets to plant loads in excess of permitted nutrient allocations, the facility must apply the appropriate ratios as described in this section.

A. Trading Ratios

Reserve Ratios set aside a percent of load reductions to be held in a "Credit Reserve." Similar to risk or crop insurance, this Reserve covers permittees' obligations in the event of natural or the otherwise uncontrollably-caused failure of credit generating activities. The reserve ratio applies to all credits generated. This ratio may be adjusted by the Department to ensure program integrity.

Uncertainty Ratios are an allowance for the relative uncertainty in the relationship between credit generation efforts and actual resulting nutrient and sediment reductions in local waters and ultimately the Bay – this accounts for uncertainties related to the absence of monitoring data and the challenge of estimating how individual actions affect stream loads over time and space. For example, there is uncertainty in estimation of initial loadings, the load reduction effectiveness of various BMPs, the delivery of the nutrients to the nearest stream and across watersheds.

Uncertainty ratios *will not* be applied when:
1. The performance of BMPs are directly monitored to quantify resulting nutrient reductions; or
2. Chesapeake Bay Program-approved BMPs with well established and conservative nutrient reduction efficiencies are implemented. These practices have been rigorously peer reviewed by the Bay Program and have uncertainty incorporated into their reduction effectiveness.

Uncertainty ratios *will* be applied on a case-by-case basis by the Department to agricultural and urban and mixed open stormwater BMPs that have not been approved by the Chesapeake Bay Program and are not in widespread use and do not have accepted scientific peer reviewed reduction efficiencies. The Department reserves the right to conduct a technical review of these practices and apply an appropriate uncertainty ratio.

Special Concerns Ratio – Additional incentives or ratios may be applied to credits generated in watersheds which the Department deems to be of special water quality concern such as those located on impaired or high quality streams and/or their tributaries.

B. Application of Ratios

1. Credits generated by non-point sources that either measure reductions or implement Chesapeake Bay Program peer-reviewed practices will be used by NPDES permittees at a ratio of 1.2:1 – that is, for each pound of nutrient discharged above permit levels, the permittee must purchase 1.2 credits of non-point source reductions. This accounts for the risk reserve factor (0.2). An additional uncertainty factor may be applied on a case-by-case basis to non-point nutrient reduction practices that are not measured or have not been peer reviewed and approved by the Chesapeake Bay Program.

2 Credits generated by *nutrient-limited point sources* must be purchased or secured by other NPDES point sources at a ratio of 1.1:1 – for each pound of nutrient discharged above permit levels, the permittee will be required to purchase 1.1 credit pounds of point source reductions. This accounts for the risk reserve (0.1).

3. Credits available from regulated point sources without nutrient limitations can be secured by other NPDES point sources at a ratio of 1.1:1 – for each pound of nutrient discharged above permit levels, the permittee is required to purchase 1.1 credits of point source reductions to account for risk (0.1 risk reserve factor).

   An example of the latter is that a nutrient limited point source may take measures to reduce or eliminate discharge from an unregulated wastewater point source in order to increase its own nutrient allocation. A PSD may choose to control the discharge from an existing package treatment plant or on-lot sewage disposal system. The PSD could claim credits from absorbing an unregulated point source or on-lot system at a ratio of 1 pound credit to every1.1 pound load eliminated.

Table 3. Credit calculation factors and ratios applied to point and non-point sources.

		Credit calculation factors			Trading ratios		
Source		***Baseline***	***Edge-of-Segment Factor (calculated by CBM)***	***Delivery Factor(calculated by CBM)***	***Uncertainty***	***Reserve***	***Total***
Point Source	**≥ 50,000 gpd**	Permitted load	N/A	Yes	N/A	0.1	1.1:1
	< 50,000 gpd	Existing load	N/A	Yes	N/A	0.1	1.1:1
	MS4	Permit requirements	N/A	Yes	N/A	0.2	1.2:1
	Nutrient assimilation projects designed for nutrient removal (e.g. algal scrubbers, floating islands, etc.)	- 0 -	Project-by-project	Yes	Project-by-project	Project-by-project	Project-dependent
Non-Point Source	**NPS Agriculture**	Farm-wide Nut. Mgt Plan & attainment of average field or practice area load in accordance with EOS Baseline.	Yes	Yes	N/A for measured reductions or CBP approved practices: case-by-case for others.	0.2	1.2:1
	NPS Urban/Mixed	Legal compliance with any federal, state, and/or local codes and an average per acre load.	Yes	Yes	N/A for measured reductions or CBP approved practices: case-by-case for others.	0.2	1.2:1
	Septic	9.5 lbs/N/capita/yr for failed systems; 5.7 lbs N/capita/yr for functioning systems minus the discharge level of the receiving system, i.e. actual N reduced.	Yes	Yes	N/A	0.2	1.2:1

V. Monitoring and Evaluation / Risk Allocation and Reduction

The Department (and approved aggregators/brokers) will ensure the effectiveness, validity and availability of the credits used in NPDES permits by using: (1) scientifically proven methodologies to calculate credits before approval; (2) credit certification, verification and registration processes, and (3) a credit reserve.

Permittees voluntarily participating in the trading program are obligated to ensure: (1) credits satisfy their permit conditions; (2) the credits they obtain and apply to their permits for compliance purposes are certified and registered by the Department; and (3) that the terms of their credit purchase agreements are met, when needed, to ensure compliance with their permit.

In the event that nutrient reduction activities fail due to uncontrollable or unforeseeable circumstances such as extreme weather conditions or credit supplier default, timely notice must be provided to the Department and Reserve Credits may be applied for the purposes of permit compliance. The purpose of the credit reserve is to reduce permittee risk in participating in the trading program by providing access to a credit pool that can be applied, if necessary and warranted, to meet permit obligations. The Department plans to exercise enforcement discretion with respect to permittees for the year in which credits are determined to be invalid, as long as (1) the credit failure is not due to negligence or willfulness on the part of the permittee or credit supplier, and (2) the permittee replaces the credits for future compliance periods.

Additionally the Department provides permittees a “true up” period at the end of each accounting year to generate or purchase credits needed to meet their compliance obligation due to credit failures not related to natural disaster or risk or due to unexpectedly higher discharge annual average discharge volumes or effluent levels. Application timeframe for this period extends for two months from the end of the credit accounting year.

Furthermore, nothing in this guidance prohibits permittees from purchasing additional credits above and beyond their compliance requirements in order to ensure an adequate credit supply. In the event these excess credits are not needed by the purchaser they can be sold or transferred to another entity to be used in the year in which they are generated.

VI. Documenting Credits and Trades

The Department, using approved methodologies, must approve all credit calculations, credit and trade registries, and credit tracking activities. This information is public and current information will be available on the Department's Nutrient Trading website and the on-line marketplace (NutrientNet). All credits must be registered before they can be used to meet permit limits.

The marketplace tool may also be used by buyers and sellers to verify that their trades have been approved by the Department.

The Department may provide guidelines for acceptable contract terms and a model trading contract, purchase agreement or a list of certain essential elements of a trading contract in the future if deemed necessary.

VII. Ensuring Program Integrity and Managing for Success

The Department recognizes that there is some level of uncertainty in the ultimate success of nutrient and sediment reductions that serve as the basis for tradable credits.

The Department will evaluate the program at least every five years or more frequently if deemed appropriate. Based on these reviews, the Department may determine program enhancements are needed and the appropriate changes will be made. These will be shown on the Department's Nutrient Trading website. Stakeholder input will be obtained prior to the changes, as appropriate.

VIII. Examples of Credit Calculation and Trades

The following examples are based on hypothetical situations and are intended to demonstrate how credits are calculated and trades are carried out in the marketplace. Information required for the calculations is either predetermined through established models and policies, or calculated by NutrientNet based on site-specific input provided by non-point sources. The following table lists required information and sources.

Table 4. Information required to calculate credits for this trading program.

Input	Source of Information
Current TN and TP loading (point source)	Monitoring data from point source
Permitted TN and TP loading (point source)	Discharge permit
Land area	Non-point source – i.e., farmer
Current nitrogen (N) and phosphorus (P) loading rate	NutrientNet, based on non-point source data
BMP effectiveness	Chesapeake Bay Program
Edge-of-Segment Factor (EOS)	Chesapeake Bay Watershed Model
Delivery Factor (DF)	Chesapeake Bay Watershed Model
Risk Reserve Factor	WV Potomac Water Quality Trading Program

Example 1: Non-point Source Credit Calculation

A farmer located in Chesapeake Bay Watershed Model Segment 740 currently plants 100 acres of corn using conventional till (high-till). (S)He decides to implement a cover crop on this field to generate nutrient credits. How many credits can (s)he generate with this BMP?

Given:

Land area:	100 acres
Current Nitrogen (N) Loading Rate:	30 lbs/acre/yr
Cover Crop Nutrient Reduction Effectiveness:	45%
Edge-of-Segment Factor (EOS):	0.21
Delivery Factor (DF):	0.74

Nitrogen Credit Calculation:

1) Current N load = land area × current N loading rate
   = 100 ac × 30 lbs/ac/yr = 3,000 lbs/yr
2) BMP implementation reduction = BMP effectiveness × current N load
   = 0.45 × 3,000 lbs/yr = 1,350 lbs/yr
3) Delivered N loading reduction =
   BMP implementation reduction × EOS × DF
   = 1,350 lbs/yr × 0.74 × 0.21 = 210 lbs/year

Number of credits generated = 210 lbs/yr

Example 2: Point Source-to-Point Source Trade

Two point sources in the Potomac basin would like to benefit by participating in the trading program. Point source A is currently exceeding its nutrient allocation; Point source B is discharging below its nutrient allocation either because it has installed nutrient removal technology, modified its treatment process to enhance efficiency, or because it is discharging below its design flow. How many credits are needed by Source A to achieve compliance; and how many credits can Source B provide?

Given:

Source A

Bay Watershed Model Segment Location:	740
Delivery Factor (DF):	0.74
Current TN Loading:	50,000 lbs/yr
Permitted Loading (5mg/l @ design flow):	25,000 lbs/yr

Source B

Bay Watershed Model Segment Location:	180
Delivery Factor (DF):	0.83
Current TN Loading:	100,000 lb/yr
Permitted Loading (5mg/l @ design Flow):	150,000 lbs/yr
Risk Reserve Factor:	10%

Nitrogen Credit Calculation:

Source A

1) Excess N loading = Current TN loading – permitted loading
   = 50,000 lbs/yr – 25,000 lbs/yr = 25,000 lbs/yr
2) Delivered N loading reduction needed = Excess N load × DF
   = 25,000 lbs/yr × 0.74 = 18,500 lbs/yr
3) Number of credits needed = Delivered N loading reduction needed + (Delivered N loading reduction needed × risk reserve factor)
   = 18,500 lbs/yr + (18,500 lbs/yr × 0.1) = 20,350 lbs/yr

Number of credits needed = 20,350 lbs/yr

Source B

1) Unused N allocation = Permitted loading – current TN loading
   = 150,000 lbs/yr – 100,000 lbs/yr = 50,000 lbs/yr
2) Delivered N loading reduction = Unused N allocation × DF
   = 50,000 lbs/yr × 0.83 = 41,500 lbs/yr

Number of credits available = 41,500 lbs/yr

Sources A and B would work out a trade agreement and then register the trade on the Department's website.

Example 3: Point Source-to-Non-point Source Trade

Point source B in watershed segment 740 is exceeding its nutrient allocation and would like to purchase credits from local farms to achieve compliance in lieu of installing technology. Farmers located in segment 740 choose to form Co-op A and plant cover crops on 1000 acres of fields currently under conventional tillage, in the hopes of generating income from the sale of nutrient reduction credits. How many credits can Co-op A generate; and how many credits are needed by Source B to achieve compliance?

Given:

Source A: Farm co-op

Land area:	1000 acres
Edge-of-Segment Factor (EOS):	0.21
Delivery Factor (DF):	0.74
Current N Loading Rate:	30 lbs/ac/yr
Cover Crop Nutrient Reduction Effectiveness:	45%

Source B - Point source

Delivery Factor (DF):	0.74
Current N Loading:	10,000 lb/yr
Permitted Loading:	5,000 lb/yr
Risk Reserve Factor:	20%

Nitrogen Credit Calculation:

Source A

1) Current N load = land area × current N loading rate
   = 1000 ac × 30 lb/ac/yr = 30,000 lb/yr
2) BMP implementation reduction = BMP effectiveness × current N load
   = 0.45 × 30,000 lbs/yr = 13,500 lbs/yr
3) Delivered N loading reduction =
   BMP implementation reduction × EOS × DF
   = 13,500 lbs/yr × 0.74 × 0.21 = 2,098 lbs/year

Number of credits generated = 2,098 lbs/yr

Source B

1) Excess N loading = Current TN loading – permitted loading
   = 10,000 lbs/yr – 5,000 lbs/yr = 5,000 lbs/yr
2) Delivered N loading reduction needed = Excess N loading × DF
   = 5,000 lbs/yr × 0.74 = 3,700 lbs/yr
3) Number of credits needed = Delivered N loading reduction needed + (Delivered N reduction needed × risk reserve factor)
   = 3,700 lbs/yr + (3,700 lbs/yr × 0.2) = 4,440 lbs/yr

Number of credits needed = 4,440 lbs/yr

Point source B would work on a trade agreement either directly with Co-op A or with a third party aggregator, and then register the trade on the Department's website. Point source B must acquire the remainder of its needed credits from an additional source.