UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

DEC 18 2012

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Ms. Melanie D. Davenport, Director
Water Division
Virginia Department of Environmental Quality
629 East Main Street
Richmond, Virginia 23219

Re: Technical Standards for Concentrated Animal Feeding Operations

Dear ~~Ms. Davenport~~ Melanie:

The United States Environmental Protection Agency (EPA) has completed its review of Virginia's state technical standards for concentrated animal feeding operations (CAFOs) as documented in the enclosed draft report. State Water Directors are required to establish a technical standard for nutrient management in accordance with 40 CFR § 123.36 and 40 CFR § 412.4(c)(2). EPA's review consisted of analyzing the documents your office provided in response to our letter of June 22, 2010 requesting submission of your technical standards, and additional follow-up. We recognize that states have taken or are currently taking steps to review and revise, as necessary, their state NRCS Natural Resource Conservation Service's Nutrient Management Conservation Standard 590 to ensure consistency with the revised national 590 Standard, and/or taken other actions to address the water quality concerns in their state. These actions may impact the state technical standards that will be applied to CAFOs. Our review may not reflect all revisions, so this review document serves as a place to begin discussions.

The documents that were identified as being part of the state technical standards, and thus reviewed, are listed in the draft report. It also includes an evaluation checklist (updated from our last communication) which provides detailed information relating to the relevant portions of the regulations and reference documents for each review criterion. Based on our review, EPA finds most aspects of the technical standards are consistent with EPA's effluent limitation (technology based) guidelines, but that some portions are inconsistent. Virginia's standards lack a field-specific nitrogen assessment to evaluate the potential for nitrogen transport from the field to surface waters (see Item 4). We understand that this is a requirement of the revised 590 Standard, and may soon be addressed. We have included recommendations for enhancing the state's P-Index to be consistent with NRCS standards, if not already addressed. These assessment tools are vital to ensuring that nutrient transport to our nation's waterways is minimized. Additionally, the technical standards criteria for Items 26 and 35 need your special attention for enhancement. Enhancement may be necessary because the criterion was not addressed, did not fully conform to the review criterion, or clarification is needed to fully meet the federal requirements.

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We ask that the Water Division, in coordination with the Virginia Department of Natural Resources (DCR), to carefully review the findings in the draft report and consider how the state can fully meet each criterion. EPA looks forward to working with you on refinement of the technical standards needed to ensure full implementation of the National Pollutant Discharge Elimination System (NPDES) program requirements for CAFOs, and that NPDES permits are consistent with applicable TMDLs. This review document helps serve as a starting point to discuss the sufficiency of the technical standards for protecting water quality in the context of the Chesapeake Bay TMDL and your state Watershed Implementation Plan. We will be contacting your staff to arrange conference calls to discuss this matter further.

The technical standards need to be clearly identifiable and accessible to the public for meaningful public participation during the NPDES permitting process. Technical standards will be made publically available on EPA's website http://cfpub.epa.gov/npdes/afo/techstandards.cfm. Should you have any questions, please contact me or your staff may contact Ashley Toy at (215) 814-2774.

Sincerely,

Jon M. Capacasa, Director
Water Protection Division

Enclosure

DRAFT REPORT

Review of Virginia's CAFO State Technical Standards
December 14, 2012

Prepared By:
U.S. Environmental Protection Agency, Region 3
1650 Arch Street (3WP42)
Philadelphia, Pennsylvania 19103-2029

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DRAFT

Introduction

The U.S. Environmental Protection Agency, Region 3 (EPA) has requested each Mid-Atlantic state to provide the technical standards used as the basis for developing nutrient management plans (NMPs) required by each state's National Pollutant Discharge Elimination System (NPDES) program. Overall, EPA expects the state's concentrated animal feeding operation (CAFO) program to achieve three primary goals.

- Meet the minimum requirements of the federal CAFO regulations for nutrient management.
- Conform to the January 2012 Natural Resources Conservation Service's (NRCS') Conservation Practice Standard Code 590 for Nutrient Management (revised CPS 590).
- Ensure implementation of the nutrient management practices identified in Virginia's Phase 1 and 2 Watershed Implementation Plans (WIPs).

The intent of this report, however, is limited to EPA's expectations for Virginia's technical standards for nutrient management (technical standards) and state conformance with NRCS' revised CPS 590. The *Virginia Technical Standards* section presents recommendations from EPA's review of the state's technical standards. The subsequent section evaluates how Virginia's CAFO program conforms to NRCS' revised national policies for nutrient management, particularly the state's P-Index and NRCS, Virginia's CPS 590 (590 standard). EPA will use the document as a basis for discussions with the state in a cooperative effort to improve water quality in the Chesapeake Bay.

EPA requests clarification from Virginia with regards to any of the following findings or recommendations that may have already been addressed or will be addressed in forthcoming revisions to the state's CAFO program, technical standards, and nutrient management tools.

Virginia Technical Standards

Finding #1. EPA determined the Virginia technical standards to be incomplete or not addressed.

Federal regulations specify that CAFO land application rates must minimize phosphorus (P) and nitrogen (N) transport to surface waters from fields used for land application of manure, litter, and process wastewater in compliance with technical standards established by the director at 40 CFR 412.4(c)(2). The federal Effluent Limitations Guidelines (ELG) also specify minimum requirements for state technical standards, including

- Field specific assessments of N and P transport from the field to surface waters;
- Address the form, source, amount, timing, and method of application of nutrients to achieve realistic production goals while minimizing N and P movement to surface waters; and
- Appropriate flexibilities such as consideration of multi-year P applications on fields that do not have high potential for P runoff, phased implementation of P-based nutrient management, and other components.

EPA identified the criteria that state technical standards for nutrient management must address to meet the minimum requirements outlined in the ELG. In December 2010 EPA requested each state identify the documents that constitute its technical standards for nutrient management. EPA then evaluated these documents to determine whether they adequately address the criteria identified in the checklist.

Virginia identified the following documents comprising the state's technical standards for nutrient management. EPA reviewed these documents to complete the technical standards checklist.

- Nutrient Management Training and Certification Regulations 4 VAC 5-15. http://www.dcr.virginia.gov/documents/nmtraincertregs.pdf.
- Virginia Nutrient Management Standards and Criteria, Revised October 2005. http://www.dcr.virginia.gov/documents/StandardsandCriteria.pdf.
- Virginia P-Index Version 2.0 Technical Guide, Revised October 2005. http://p-index.agecon.vt.edu/Virginia%20P-Index%20V%202.0%20Technical%20Guide.pdf.
- Recommended Methods of Manure Analysis, A3769. http://learningstore.uwex.edu/assets/pdfs/A3769.pdf.
- VPDES Permit Regulation 9 VAC 25-31, http://lis.virginia.gov/cgi-bin/legp604.exe?000+reg+9VAC25-31-200.
- Nutrient Management Plan Special Conditions for Virginia Pollution Abatement (VPA) and Virginia Pollutant Discharge Elimination System (VPDES) Permits, September 2011
    - Dairy and beef operations - http://www.dcr.virginia.gov/stormwater_management/documents/nmspcodairybeefperm.pdf
    - Poultry operations - http://www.dcr.virginia.gov/stormwater_management/documents/nmspcopoultryltrtranperm.pdf
    - Swine operations - http://www.dcr.virginia.gov/stormwater_management/documents/nmspcoswineperm.pdf

The following publication also contains portions of the technical standard, but was not readily available for review:

- Methods of Soil Analysis. Part 3. Chemical Methods (Soil Science Society of America Book Series, No. 5).

The complete EPA technical standards checklist for Virginia is provided as Appendix A. The checklist identifies the EPA technical standards criteria, the state's comparable technical standard, references, EPA's expectations for each criterion, and a comparison of the state's technical standard and EPA expectations. EPA previously provided the state with a completed copy of the checklist. For this report, EPA reviewed Virginia's technical standards and updated any references revised since the checklist was last updated in August 2011. The *Nutrient Management Plan Special Conditions for Virginia Pollution Abatement (VPA) and Virginia Pollutant Discharge Elimination System (VPDES) Permits* appeared to be the only technical standard documents updated since August 2011.

Recommendation – (1) Virginia should revise the technical standards to ensure that the finalized version includes:

- A field-specific assessment tool for nitrogen (Appendix A, Item 4).

- Conditions when manure application should be delayed (Appendix A, Item 26).
- During multi-year P application, a restriction on the application of additional P to fields until the amount applied in the single year has been removed through plant harvest (Appendix A, Item 35).

Does Virginia's CAFO Program conform to the NRCS' Revised National Policies for Nutrient Management?

Finding #2. Virginia's CAFO program does not conform to the NRCS' revised national policies for nutrient management.

Conservation Practice Standard (CPS) 590 Revisions

NRCS' CPS 590 (Nutrient Management) establishes acceptable criteria and documentation requirements to manage the amount (rate), source, placement (method of application), form, and timing of the application of nutrients and soil amendments. CPS 590 applies to all lands where plant nutrients and soil amendments are applied, including land application areas at CAFOs. CPS 590 promotes a comprehensive nutrient management system designed to *avoid* application of excess nutrients, *control* nutrients at the site of application, and *trap* nutrients and sediment to prevent them being transported from agricultural fields to surface waters (ACT). Avoiding and controlling nutrients are accomplished according to the "4Rs" principle of applying the *right amount* of nutrients from the *right source* in the *right place* at the *right time*. This is in line with the nutrient management principles of the CAFO regulations, which require NMPs that address the form, source, amount, timing, and method of application to minimize nutrient transport to surface waters. The alignment of CPS 590 and CAFO nutrient management regulations is evidenced by the fact that many state regulatory agencies include a state-specific CPS 590 in their technical standards.

NRCS revised the national CPS 590 in January 2012 (revised CPS 590; NRCS, NHCP 2012) to help producers better manage the application of nutrients to agricultural land. The revised CPS 590 underscores and strengthens several aspects of the ACT and 4R concepts relevant to land application of manure. Key revisions include

- Increased emphasis on risk assessments, including use of the P-Index to assess the risk of P transport from a field to surface water and the N leaching tool to evaluate the risk of N movement to subsurface hydrology.
- Revised standards regarding surface application of nutrients to frozen, snow-covered, and saturated ground.

To support the revised CPS 590, NRCS released concurrent revisions to the nutrient management requirements of its National Instruction (190-Ecological Sciences, Part 302-A) and General Manual (190-Ecological Sciences, Part 402.1-402.7) in December 2011. Title 190, Part 302.2 outlines the technical criteria for risk assessments used in nutrient planning, including minimum criteria for state P-Index tools [Title 190, Part 302.2(D)]. NRCS expects that each state-specific 590 standard will be revised by December 2012 to be consistent with the national CPS 590.

The revised CPS 590 requires completion of an NRCS-approved nutrient risk assessment for N on all sites except when the state NRCS has determined specific conditions where nitrogen leaching is not a risk to water quality, including drinking water. The revised CPS 590 requires operators to conduct an NRCS-approved P risk assessment when:

- The P application rate exceeds land grant university fertility rate guidelines for the planned crop(s), or
- The nutrient application area is within a P impaired watershed, or
- NRCS and the state have not determined specific conditions where the risk of P loss is low.

Further, NRCS' Title 190 Part 302.2.D (NRCS 2012) establishes the following minimum criteria for all state P-Index tools.

- Consider nutrient losses caused by water and wind erosion.
- Consider soil test P (STP); time, rate, and method of P application; erosion; runoff; and leaching.
- Demonstrate that risk increases with increasing runoff, erosion, STP, application rate and depends on method of application and leaching factors.
- Include the risk categories: Low, Medium, and High.
- When manure is applied, the erosion component of the P-Index must be based on the annual soil-loss rate for the year when manure is applied.
- The P-Risk Assessment must *zero-out* when the environmental risk is too great to allow the application of P in any form.

In regards to nutrient application timing and placement, the revised CPS 590 prohibits surface application of nutrients when offsite losses are likely. The revised CPS 590 specifically prohibits spreading nutrients on:

- Frozen and/or snow-covered soils, and
- When the top 2 inches of soil are saturated from rainfall or snowmelt.

The following sections compare Virginia's policies regarding nutrient application to frozen, snow-covered, and saturated soil, and N and P field risk assessments with the revised CPS 590.

Nutrient Application to Frozen, Snow-Covered, and Saturated Ground

Virginia regulations at 4 VAC 5-15-150.A.4.f require NMPs to include a statement that applications of inorganic nutrient sources, liquid manure, liquid sewage sludge, or liquid industrial waste are not to occur on frozen or snow-covered ground. Dry or semi-solid manures, dewatered sludges, or dewatered industrial wastes may be applied to ground if the field has:

1) Slopes less than 6.0%;
2) 60% uniform ground cover from crop residue or an existing actively growing crop such as a small grain or fescue with exposed plant height of three inches or more;
3) A minimum of a 200-foot vegetated or adequate crop residue buffer between the application area and all surface water courses; and
4) Soils characterized by USDA as *well-drained*.

Virginia's 590 standard (NRCS, Virginia 2012) includes similar language and also references 4 VAC 5-15-150.A.4.f.

In addition, *Nutrient Management Plan Special Conditions for Virginia Pollution Abatement (VPA) and Virginia Pollutant Discharge Elimination System (VPDES) Permits* contain manure spreading schedules for beef, dairy, swine, and poultry manures. VPA and VPDES permit holders are prohibited from spreading liquid manure and dry or semi-solid manure during specific months for specific crops,

identified on the manure spreading schedule. Typically the spreading schedule prohibits manure application from at least September through February, depending on the crop. For cool season grasses and small grains, winter manure applications are not recommended but also not prohibited.

Recommendation – (2) Virginia's nutrient management regulation [4 VAC 5-15-150.A.4.f.] and the state's 590 standard do not directly address manure application to saturated ground. Virginia is recommended to update their nutrient application requirements to prohibit surface application of nutrients to saturated soils (e.g., when the top 2 inches of soil are saturated from rainfall or snowmelt); this additional language will make the Virginia CAFO program consistent with the revised CPS 590 in prohibiting nutrient application to frozen, snow-covered, and saturated ground.

Virginia's Nitrogen Field Risk Assessment

Virginia's 590 standard requires NMP writers to evaluate every field in the NMP to identify environmentally sensitive sites. The NMP must identify and address prevention of nutrient pollution from these environmentally sensitive sites. The state's 590 standard defines an environmentally sensitive site as any field which is particularly susceptible to nutrient loss to groundwater or surface water since it contains, or drains to areas which contain sinkholes, or where at least 33% of the area in a specific field contains one or any combination of the following features:

1. Soils with high potential for leaching based on soil texture or excessive drainage;
2. Shallow soils less than 41 inches deep likely to be located over fractured or limestone bedrock;
3. Subsurface tile drains;
4. Soils with high potential for subsurface lateral flow based on soil texture and poor drainage;
5. Floodplains as identified by soils prone to frequent flooding in county soil surveys; or
6. Lands with slopes greater than 15%.

Virginia Nutrient Management Standards and Criteria, Tables 1 through 4 (DCR 2005) are used to determine if a particular site meets criteria 1, 2, or 4. Evaluations of criteria 3, 5, and 6 rely on information from the county soil survey and the operator's knowledge of the site. Criteria 4, 5, and 6 are related directly to nutrient transport to surface water and criteria 1, 2, and 3 appear to largely address leaching to groundwater or indirect connections to surface water. Thus, Virginia's screening criteria for environmentally sensitive sites appears protective of surface and groundwater.

The revised CPS 590 requires the completion of the NRCS-approved nutrient risk assessment for N on all sites unless the state NRCS, with concurrence of state water quality authorities, has determined specific conditions where N leaching is not a risk to water quality or drinking water (NRCS, NHCP 2012). NRCS' Title 190, Section 302.2.B(1) identifies the Leaching Index (LI) as the current NRCS-approved tool for assessing N leaching potential (NRCS 2012). The LI is a quantitative index of N leaching potential based on average annual precipitation and seasonal rainfall distribution. The LI returns a result expressing the "ability of soluble nitrogen to move below the root zone and into groundwater" (EPA 2004).

Recommendation – (3) The Virginia 590 standard states that the screening procedure for environmentally sensitive sites, described above, constitutes the approved site-specific N loss risk assessment procedure under the Virginia 590 standard. Virginia should confirm with NRCS that the screening procedure for environmentally sensitive sites is an acceptable alternative to the LI. EPA expects the state's N loss risk assessment procedure to be included or referenced in the technical standards.

Virginia's P-Index

Virginia Nutrient Management Standards and Criteria, Section IV. Phosphorus Management describes the process used to manage P application rates to minimize adverse water quality impacts.

- P applications from inorganic nutrient sources must not exceed crop nutrient needs over the crop rotation based on a soil test.
- NMPs will prohibit P application when soils exceed 65% P saturation levels.
- A single application of P may be recommended to address multiple crops in the crop rotation identified within the NMP if the single application does not exceed the sum of the appropriate application rates for individual crops.

When the P saturation level is less than 20%, N-based nutrient management is acceptable. For fields with P saturation between 20% and 65%, nutrient management planners can use either the Environmental Threshold Method or the Virginia P-Index to determine allowable P application rates for organic materials. Note that NRCS, Virginia does not accept use of the Environmental Threshold Method to determine P application rates in NMPs (NRCS, Virginia 2012).

The Virginia P-Index (Wolfe et al. 2005) evaluates a field's potential for P loss through surface runoff and subsurface transport to water bodies through assessment of P transport, source, and management factors. Transport factors include: edge of field soil loss; sediment P delivery factor; runoff from field; runoff P delivery factor; percolation; and soil texture/drainage factor. Source factors include: sediment total P factor; runoff dissolved reactive orthophosphate (DRP) factor; applied fertilizer DRP factor; and subsurface DRP factor. Phosphorus management factors (annual application and method of application) are included in the applied fertilizer DRP calculation.

Transport, source, and management factors are grouped into erosion risks, runoff risks and subsurface risks for calculation of the P-Index.

- Erosion Risk Factor = [edge of field soil loss (tons/acre)] X [sediment P delivery ratio] X [sediment total P factor (ppm)] X 0.002 (units conversion factor)
- Runoff Risk Factor = [runoff from field (inches)] X [runoff P delivery factor] X [runoff DRP factor (ppm)] X 0.22651 (units conversion factor) + applied fertilizer DRP factor (lb/ac)
- Subsurface Risk Factor = [percolation (inches)] X [soil texture/drainage factor] X [subsurface DRP factor (ppm)] X 0.22651 (units conversion factor)

To calculate the final P-Index for a field, the three risk factor group scores (erosion, runoff and subsurface) are multiplied by 8.5 and added together. For a detailed description of the P-Index, its factors, as well as an interpretation of the calculated P Index values, please consult the *Virginia P Index Version 2.0 Technical Guide* (Wolfe et al. 2005) and *Virginia Nutrient Management Standards and Criteria* (2005). Table 1 presents potential water quality impacts and P-based management guidance according to the P-Index.

Table 1. Summary Interpretation of Phosphorus Index (Wolfe et al. 2005)

P Index Value	Potential Water Quality Impact	Phosphorus Management Guidance Based on Proposed Management Practices
0 – 30	Low	Phosphorus applications according to N-based nutrient management are acceptable.
31 – 60	Medium	Phosphorus applications should not be greater than 1.5 times crop removal.

P Index Value	Potential Water Quality Impact	Phosphorus Management Guidance Based on Proposed Management Practices
61 – 100	High	Phosphorus applications should not be greater than crop removal.
> 100	Very High	No phosphorus should be applied.

Recommendation – (4) Virginia should eliminate the Environmental Threshold Method as an acceptable method for determining P application rates for organic materials. The Virginia P-Index used in conjunction with RUSLE2 is the NRCS-approved nutrient risk assessment for P.

P-Index Scenario Modeling

EPA previously conducted a comparison of P-indices developed by each Chesapeake Bay watershed (CBW) state. The evaluation looked at the response of each state's P-Index to a common set of circumstances or scenarios (EPA 2011). State P-indexes were reviewed to identify a representative set of driving factors across the Chesapeake Bay states. Primary driving factors include soil loss, runoff class, leaching class, STP, commercial fertilizer phosphorus application rate and method, manure phosphorus application rate and method, distance to stream, and presence or absence of a buffer. Rather than attempt to define a specific set of virtual fields as was done by Osmond et al. (2006), values for these factors were varied across a range (e.g., fertilizer phosphorus application rate from 0 to 120 pounds P_2O_5/acre) that would encompass crops and management common within the Chesapeake Bay states.

Crops were selected to characterize factor values on the basis of an informal survey of crop acreage data reported in the USDA's 2007 Census of Agriculture. Five crops dominate agricultural production in the CBW: corn (grain); soybeans; wheat; hay/alfalfa; and pasture grasses. Again, while EPA did not use specific virtual fields to drive the comparisons, the scenarios considered crop type, typical nutrient application rates, and management practices based on values appropriate to those crops. While this limited list omits some crops grown in the CBW, EPA believes that the variation in P-Index input parameters encompasses a reasonable range in agricultural practices, even for crops not specifically included.

Risk assessment scenarios - For each driving factor, EPA selected a set of variables anticipated to represent varying risk levels from very low to very high risk. Table 2 presents the selected range of values for each input factor. Refer to EPA (2011) for a detailed discussion of these factors.

Table 2. Values used for each driving factor in P-Index computation scenarios

Factor	Scenario options
USLE soil loss (t/ac/yr)	2/4/8/12
Runoff/drainage class (qualitative)	low/medium/high/very high
Leaching potential (qualitative)	low/moderate/high
Soil test phosphorus(mg/kg Mehlich 3/Morgan)	Mehlich-3: 20/50/80/100/250 Morgan: 2/5/20/40/60
Phosphorus fertilizer appl. rate (lb P_2O_5/ac)	0/20/40/60/80/100/120
Phosphorus fertilizer appl. method (qualitative)	Injected, surface/ incorp <7 d, surface Apr-Nov /incorp >7 d, surface Nov-Mar, snow or frozen ground
Phosphorus fertilizer appl. timing (qualitative)	Will assume one application/yr

Factor	Scenario options
Manure phosphorus appl. rate (lb P_2O_5/ac)	0/20/40/60/80/100
Manure phosphorus appl. method (qualitative)	Injected, surface/ incorp <7 d, surface Apr-Nov /incorp >7 d, surface Nov-Mar, snow or frozen ground
Manure phosphorus appl. timing (qualitative)	Will assume one application/yr
Manure type (qualitative/coefficient)	Dairy
Distance to water (ft)	49/100/300/501
Buffer (qualitative)	Present/absent

Scenario sets were created using common primary driving factor values to cover all possible combinations of the different variables for each factor. A total of 1,238,400 scenarios were developed.

The scenarios were entered into Microsoft Excel spreadsheets with the driving factors in columns and the factor values in rows. Each factor value was represented to characterize all possible scenario combinations. Each state's P-Index result was calculated for each scenario. Output P-Index values were color-coded according to the risk category assigned by their respective states. Note that some scenarios based on all possible combinations of factors were deleted because they were nonsensical (e.g., manure application method/timing when manure application was zero).

Table 3 presents an overview of P-Index risk assessment by CBW state for the 1,238,400 scenarios modeled; each scenario was modeled once for each state. It is immediately apparent from Table 3 that assessment of an identical set of P-Index factor values yields very different assessment of risk—and phosphorus application recommendation—across the CBW states.

Table 3. Percent of scenarios ranked for each risk category by state P-Indices

P-Index Value	MD/DE	NY	PA	VA	WV
Low	8%	34%	15%	17%	3%
Medium	19%	20%	12%	41%	33%
High	22%	19%	13%	27%	54%
Very High	50%	31%	61%	15%	10%

Most major conflicts in state P-Index ratings for the same scenario occurred in the middle overall risk range. The most common situation was one where the Virginia P-Index was ranked Very High, while the Maryland/Delaware, Pennsylvania, or the New York P-Index ranked Low. That was generally the case when soil loss and STP were both high and distance to a stream was low with no buffer present, but P application rates were low to moderate. This is consistent with the observation that the Virginia P-Index is relatively sensitive to soil loss, especially greater than 8 tons/acre (EPA 2011). At higher P application rates (as fertilizer or manure or both) Virginia, Delaware/Maryland, and Pennsylvania P-Indexes tended to yield a Very High risk rating compared to a Low rating for the New York P-Index.

Conclusions:

- The Virginia P-Index restricts P application under 83 percent of the modeled scenarios[1] (P application prohibited on 15 percent).

[1] Includes a P application restriction to 1.5 times P removal rate under a Medium rating.

- The Virginia P-Index is sensitive to soil loss.
- Virginia's P-Index yield Very High risk ratings and allows no P application under high-risk conditions, regardless of the rate or method/timing of P application for fertilizer or manure, or both combined.
- Under lower risk conditions, Virginia's P-Index generally does not restrict P applications.

Recommendation - None

NRCS National Policies

As discussed above, NRCS' revised Title 190, Section 302 establishes criteria for administering a P risk assessment and items that must be considered in the P risk assessment. The following two sections compare Virginia's P-Index with requirements in the National Instruction.

Screening Criteria

NRCS developed a P-Index Scenario Matrix to determine when a P-Index is required, not required, or no P application is allowed (NRCS 2012). For comparison with Virginia's P-Index criteria, the three situations determined by NRCS to require a P-Index are

1. Phosphorus application rates exceed land-grant university fertility rate guidelines for the planned crop(s);
2. The planned application area is within a P-impaired watershed; or
3. The site-specific conditions equating to low risk of P loss have not been determined by the NRCS and state water quality authority.

<u>1. Phosphorus application rates exceed land-grant university fertility rate guidelines for the planned crop(s)</u> – When Virginia farmers plan to apply organic P sources at rates higher than crop nutrient needs, the application rate recommendations should be established using the P Index along with RUSLE2 (NRCS, Virginia 2012).

<u>2. The planned application area is within a P-impaired watershed</u> – The Virginia P-Index and screening criteria do not include a factor for sites located within a P-impaired watershed (Wolfe et al. 2005).

<u>3. The site-specific conditions equating to low risk of P loss have not been determined by the NRCS and state water quality authority</u> – Virginia's screening criteria allows P applications according to N-based nutrient management when a sites P saturation level is less than 20% (Wolfe et al. 2005).

Recommendation – (5) Virginia should incorporate NRCS P-Index screening criteria #2 to be consistent with NRCS' Title 190 - National Instruction.

P Risk Tool Minimum Criteria

The previous section compared Virginia's P-Index implementation requirements against NRCS P-Index Assessment Requirements. This section compares Virginia's P-Index with NRCS' six minimum criteria expected from state P-Index tools (NRCS 2012).

<u>1. Consider nutrient losses caused by water and wind erosion</u> – Virginia P-Index water erosion factors include edge of field soil loss, sediment P delivery factor, and sediment total P factor. Edge of field soil loss is calculated in tons per acre using RUSLE2. RUSLE2 is used to estimate rates of soil erosion caused by rainfall and resultant overland flow.

The Virginia P-Index does not evaluate nutrient losses from wind erosion.

2. Consider STP, time, rate and method of P application, erosion, runoff, and leaching
- The Virginia P-Index incorporates STP as a source factor (sediment total P factor).
- Phosphorus application rate and method of application are included in the Virginia P-Index as 'applied fertilizer DRP factor'.
- Soil erosion (edge of field soil loss) is a Virginia P-Index transport factor.
- Runoff is incorporated through 'Runoff from field', 'Runoff delivery factor' and 'Runoff DRP factor'.
- Leaching is considered by the 'Subsurface DRP factor' in the P-Index.

Timing of P application does not appear to be included in the Virginia P-Index.

3. Demonstrate that risk increases with increasing runoff, erosion, STP, application rate and also depends on method of application and leaching factors – Virginia's calculated P-Index value does increase with risk factors. Factors from each risk class (erosion, runoff, and subsurface) are first multiplied (except 'applied fertilizer DRP', which is added to the runoff risks) Second, each risk class is multiplied by 8.5. Then the three risk classes are added to determine the final P-Index value.

4. Include the risk categories: Low, Medium, and High – The Virginia P-Index includes risk ratings of Low (phosphorus applications according to N-based nutrient management are acceptable), Medium (phosphorus applications should not be greater than 1.5 times crop removal), High (phosphorus applications should not be greater than crop removal), and Very High (No phosphorus should be applied).

5. When manure is applied, the erosion component of the P-Index must be based on the annual soil-loss rate for the year when manure is applied – The erosion value in Virginia's P-Index is calculated using RUSLE2. Average annual soil-loss rates from rill and inter rill erosion caused by rainfall and the resulting overland flow are automatically calculated by RUSLE2 as part of the erosion rate calculation (NRCS, nd).

6. The P-Risk Assessment must *zero-out* when the environmental risk is too great to allow the application of P in any form – States must establish an upper limit of STP above which manure cannot be applied regardless of the P-Index results. The following approaches may be used to set this threshold

- Draw down STP level (e.g., set a number of years to be drawn down to optimum nutrient levels under normal cropping conditions before additional nutrients can be added.)
- Where field-based research has been conducted to develop this upper limit, this state-specific information should be used to establish the zero-out limit.

Virginia prohibits P application to soils with greater than 65% P saturation, without requiring a P-Index. P application rates must be determined using either the P-Index or the Environmental Threshold Value (*see* **Recommendation 4**) when P saturation is between 20% and 65%. For these sites, P application is prohibited with the P-Index is greater than 100. The Virginia P-Index resulted in limited or no P application under 83 percent of the scenarios modeled by EPA (2011).

Recommendation – (6) Incorporate wind erosion into the Virginia P-Index.

Summary of Virginia Findings and Recommendations

In summary, EPA recommends that Virginia evaluate the following two major findings and implement associated recommendation to ensure that the state's technical standards meet EPA expectation and

the CAFO program conforms with NRCS national nutrient management policy. The recommendations are discussed at length in the sections above.

Finding #1. EPA determined the Virginia technical standards to be incomplete or not addressed.

1. Virginia should revise the technical standards to ensure that the finalized version includes:
   - A field-specific assessment tool for nitrogen (Appendix A, Item 4).
   - Conditions when manure application should be delayed (Appendix A, Item 26).
   - A restriction on the application of additional P to fields, during multi-year P application, until the amount applied in the single year has been removed through plant harvest (Appendix A, Item 35).

Finding #2. Virginia's CAFO program does not conform to the NRCS' revised national policies for nutrient management.

2. Virginia is recommended to update their nutrient application requirements to prohibit surface application of nutrients to saturated soils.
3. Virginia should confirm with NRCS that the screening procedure for environmentally sensitive sites is an acceptable alternative to the LI.
4. Virginia should eliminate the Environmental Threshold Method as an acceptable method for determining P application rates for organic materials.
5. Virginia should incorporate NRCS P-Index screening criteria #2 (the planned application area is within a P-impaired watershed) to be consistent with NRCS' Title – 190 National Instruction.
6. Incorporate wind erosion into the Virginia P-Index.

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Appendix A. Results from the EPA Region III review of Virginia's technical standards for nutrient management

ESTABLISHMENT and APPLICABILITY OF TECHNICAL STANDARDS (TS): Virginia		
1	Has the Director Verified what the technical standard is?	Yes, Virginia DEQ Manager of Land Application Programs, Neil Zahradka, sent a response letter identifying three documents as Virginia's technical standards: 1) Virginia Nutrient Management Training and Certification Regulations 4VAC-15-10 et seq, 2) Virginia Nutrient Management Standards and Criteria, Revised October 2005, 3) Virginia P-Index Version 2.0 Technical Guide, Revised October 2005. In July 2011, Virginia DEQ and DCR Responded to EPA Region 3's letter identifying deficiencies in the state's technical standards. The July 2011 responses included several additional documents (VPDES Permit Regulation 9 VAC 25-31; Recommended Methods of Manure Analysis, A3769; and sector-specific permit special conditions, September 2011) to be included as technical standards.
2	What mechanism was used by the State Director to establish the technical standard?	Standalone document
		Permit attachment: Sector-specific special conditions
		Permit referenced documents
		Written into the regulations: Virginia Nutrient Management Training and Certification Regulations 4 VAC 5-15 ; VPDES Permit Regulation 9 VAC 25-31
		Regulation reference documents: 4 VAC 15-10 refers to Virginia Nutrient Management Standards and Criteria, Revised October 2005; Virginia P-Index Version 2.0 Technical Guide, Revised October 2005; and Recommended Methods of Manure Analysis, A3769
		Other
3	How is the specific standard included as a requirement of the CAFO program?	Regulation 4 VAC 5-15-150 (Virginia Nutrient Management Training and Certification Regulations) and 9 VAC 25-31-200 (VPDES Permit Regulation) include regulatory NMP criteria. The Nutrient Management Training and Certification Regulations incorporate by reference the other documents listed in item 2 above. The Nutrient Management Plan Special Conditions are attached to VPA and VPDES permits issued to CAFOs in Virginia.

APPLICATION RATES					
Field Specific assessment					
	Criteria	**Specify**	**Reference**	**EPA Expectation for what will be reported**	**Comparison to EPA Expectation**
4	Does the TS contain a clearly outlined field-specific assessment tool for N and P transport from the field for surface waters?	**P Transport – Y.** If soil P saturation is > 65%, P application is not permitted. If soil P saturation is not greater than 65%, then the following methods may be used: • Soil Test Method for P recommendations OR • P - Environmental Thresholds, OR • P-Index.	• Virginia Nutrient Management Standards and Criteria Revised October 2005, Section IV, Page 47-50. • Virginia Phosphorus Index, Version 2.0, Technical Guide.	One of the following as defined by the NRCS 590 conservation standard: P-Index Soil test P method or Soil test threshold	Meets EPA's expectation.
		N Transport – N. A field-specific assessment tool for N transport is not addressed in any of the technical standard documents. VA Standards and Criteria recommends N	• Virginia Nutrient Management Standards and Criteria Revised October 2005, Section V, Page 64.	N leaching assessment tool as defined by the NRCS 590 conservation standard.	Does not meet EPA expectation. VA's Nutrient Management Standards and Criteria recommends N sidedress adjustments if high nitrogen leaching loss or low mineralization of organic nitrogen sources(s) are suspected. The state's Technical Standard should specify that a NRCS-approved nutrient risk assessment for nitrogen must be

		sidedress if N leaching is suspected, but it is not required for all sites.			completed on all sites. The results of the risk assessment must be used to establish an appropriate rate, form, timing and method of application that minimizes N transport to surface waters. Where appropriate rate, form, timing, and method of application are less than optimal conditions for minimization, BMPs should be required to achieve the reductions to a minimum to protect water quality. Certain types of BMPs could be targeted to critical areas.
5	Does the assessment identified by the TS (above) provide quantitative and/or qualitative criteria for determining whether the rate can be N-based, P-based, or prohibited?	Y. Virginia Tech Mehlich 1 P test level for 65% P-saturation is provided by Region. Phosphorus Environmental Thresholds are included by Region; for all P levels and regions, N cannot exceed crop N needs. P-Index quantitative and	Virginia Nutrient Management Standards and Criteria Revised October 2005, Table 4-1, Page 47; Table 4-2, Page 48; Table 4-3, Page 50.	Qualitative criteria could be reported as a risk rating (very low, low, medium, high, very high). Qualitative criteria may not always be applicable. Quantitative criteria should be provided. A rate application should always be associated with a criterion. *EPA may have concerns if there is no point at which manure application is prohibited.*	Meets EPA's expectation.

		qualitative values are Low 0-30, Medium 31-60, High 61-100, and Very High > 100.			
6	Where the assessment requires a P-based application rate is it constrained to a 1-year P removal rate?	Y. <u>P Environmental Thresholds:</u> P application must not exceed crop P removal at specified soil P levels (*Eastern Shore and Lower Coastal Plain:* 55-135 ppm, *Middle and Upper Coastal Plain and Piedmont:* 55-136 ppm, *Ridge and Valley:* 55-162 ppm). <u>P-Index:</u> Medium risk rating - P applications are not to exceed 1.5 times crop removal High risk rating - P applications are not to exceed crop removal.	Virginia Nutrient Management Standards and Criteria Revised October 2005, Table 4-2, Page 48; Table 4-3, Page 50.	If No, EPA expects that all criteria under 'Appropriate Flexibilities' (items 33-36) will be followed	Meets EPA's expectation.

Amount					
	Criteria	**Specify**	**Reference**	**EPA Expectation for what will be reported**	**Comparison to EPA Expectation**
7	Does the TS provide the basis for determining expected crop yields?	Y. Several methods are described in the TS: 1) Average of the three highest yields over the last five crop years for the particular crop grown in the field, 2) Use the Virginia Agronomic Land Use Evaluation System (VALUES), Table 1-2, as follows: a) If a field is at least 67% a single soil productivity group, this predominant soil group may be used to establish the expected yield for the field, or b) Use a weighted average of all soil productivity groups to determine the expected yield.	Virginia Nutrient Management Standards and Criteria Revised October 2005, Page 1	Basis for yield should be provided. *EPA may have concerns if crop insurance factors are added to yield goals.*	Meets EPA's expectation.

		3)			
8	Does the TS provide crop recommendations that are to be used to base applications rates for crops?	Y.	Virginia Nutrient Management Standards and Criteria Revised October 2005, Section V. Crop Nutrient Needs, pp. 55-59 and 60 - 95	Recommendations with the source should be provided.	Meets EPA's expectation.
9	Does the TS define what a P-based application rate is? (e.g. crop removal rate, soil test, or the choice of either)?	Y. <u>Soil Test Method:</u> The TS crop nutrient recommendations in Section 5 of VA Nutrient Management Standards and Criteria are based on soil test P levels. <u>P Environmental Thresholds:</u> P application must not exceed crop P removal. <u>P-Index:</u> Medium risk rating - P applications are not to exceed 1.5 times crop removal	Virginia Nutrient Management Standards and Criteria Revised October 2005, Section IV. Phosphorus Management, pp. 47 - 50	The basis should be defined and clearly stated.	Meets EPA's expectation.

		High risk rating - P applications are not to exceed crop removal.			
10	Does the TS provide the actual removal rates, soil test recommendations or both for crops, depending on the answer to item 9?	Y. Values are provided to determine the pounds of P removed per unit of harvest for each crop.	Virginia Nutrient Management Standards and Criteria Revised October 2005, pages 55-59, Table 4-7.	The recommendation should be defined and clearly stated.	Meets EPA's expectation.
11	Does the TS provide a value for N credits to be given when legume crops are planted?	Y. N credits are provided for legumes.	Virginia Nutrient Management Standards and Criteria Revised October 2005, Section VII, Page 108, Table 7-1.	Appropriate credits to be applied should be included.	Meets EPAs expectation
12	Are N mineralization rates provided for each type (dairy, beef, poultry, swine, etc.) of manure?	TBD. Rates are provided for dairy, poultry, and swine manure, but not beef.	Virginia Nutrient Management Standards and Criteria Revised October 2005, Page 109, Table 8-2.	If rates are not provided then standard should state that all N is 100% available the year it is applied for all manure types.	Meets EPA's expectation. The July 2011 response indicates that the mineralization rates for dairy manure are used for beef manure. In the NutMan 3.0 software this is accounted for when the planner enters the "type of animal" in the program. Planners using other plan writing formats, select the dairy manure coefficient since they are similar species or ask program staff for clarification. DEQ and DCR should consider

					including in the standard the actual mineralization rate value for beef for those situations where the Nutman software is not used to develop the plan. This will help to ensure the correct value is used by all plan preparers.
13	Does the TS address the requirement for a manure† analysis?	Y. 4 VAC 5-15-150.A.2.g requires, for existing operations, the most recent organic nutrient source analysis results or an average of past nutrient analysis results for the specific operation within the last three-year period shall be used to determine the nutrient content of organic nutrient sources.. . . Plant available nutrient content shall be determined using the mineralization rates and availability coefficients found	Nutrient Management Training and Certification Regulations 4 VAC 5-15-150 (Required nutrient management plan procedures), part A.2.g, page 11	Required. A separate analysis must be provided for each form (solid, semi-solid, liquid) of manure contained in the NMP.	Meets EPA's expectation. The July 2011 response also refers to NMP Special Condition #3, which requires representative sampling and clarifies that DEQ interprets "representative" to mean that the manure analysis must quantify the nutrients in the manure being applied, thus unless the manure types are mixed, separate analyses would be required.

		in Virginia Nutrient Management Standards and Criteria, revised October 2005, for different forms and sources of organic nutrients." To meet this requirement a planner needs to have an analysis of each organic nutrient source.			
14	Does the TS address the frequency of a manure† analysis	Y. The VPDES permit regulation requires annual analysis.	9 VAC 25-31-200.E.5.a.(2) and E.5.b(4)(b)	At least once annually.	Meets EPA's expectation. Note, however, that the Nutrient Management Training and Certification Regulations 4 VAC 5-15-150 (Required nutrient management plan procedures), Part A.2.g, page 11 and Part D.5, page 14) allows manure analysis once every three years for solid and semi-solid manures after a baseline is established. DEQ and DCR should consider clarifying that these provisions do not apply to permitted CAFOs.
15	Does the TS address methods for collecting manure† samples?	N. The state's July 2011 response clarifies that the document	• Nutrient Management Training and Certification	Methods should be included. *EPA may have concern if methods deviate from land*	Meets EPA's expectation. However, the State should clarify the link between the reference

		referenced in Nutrient Management Training and Certification Regulations (4 VAC 5-15-150 A.2.g - Recommended Methods of Manure Analysis, Pub. A3769, Uni. of Wisconsin, 2003) outlines sampling procedures. However, the Nutrient Management Training and Certification Regulations refer to this document only for laboratory methods, not for sampling procedures.	Regulations 4 VAC 5-15-150 (Required nutrient management plan procedures), part A.2.g, page 11 • *Recommended Methods of Manure Analysis*, Pub. A3769, Uni. of Wisconsin, 2003	*grant university or extension recommendations.*	document and the methods required by the TS to ensure the proper method is utilized to support plan development and implementation. The State's response also indicates that planners are instructed in the Ag Nutrient Management Plan Writing School on proper manure sampling procedures.
16	Does the TS address which components to include in the manure† analysis?	Y. Percent moisture, total nitrogen or total Kjeldahl nitrogen, ammonium nitrogen, total phosphorus, and	Nutrient Management Training and Certification Regulations 4 VAC 5-15-150 (Required nutrient management	At least nitrogen and phosphorus	Meets EPA's expectation.

		total potassium.	plan procedures), part A.2.g, page 11		
17	Does the TS address acceptable method(s) for conducting the manure† analysis?	Y. The Nutrient Management Training and Certification regulations state that the laboratory methods should be consistent with U. of Wisconsin's Recommended Methods of Manure Analysis, publication A3769, or other methods approved by the department. The referenced publication A3769 includes methods of analysis.	• Nutrient Management Training and Certification Regulations 4 VAC 5-15-150 (Required nutrient management plan procedures), part A.2.g, page 11 • Recommended Methods of Manure Analysis, publication A3769, University of Wisconsin, 2003, Unit III (Laboratory Procedures), pp. 12 - 51	Methods should be included unless specific appropriate labs are provided. *EPA may have concern if methods prescribed by the land grant university or extension are not used or if methods used by the Manure Testing Laboratory Certification Program (MTLCP) are not used where applicable.*	Meets EPA's expectation.
18	Does the TS address which laboratories are acceptable for performing the manure† analysis?	N		Labs should be included unless specific appropriate methods to be followed by a lab are provided. *EPA may have concern if the land grant university or extension labs are not used or where it is applicable the lab is not listed with the Manure*	Meets EPA's expectation. Does not recommend laboratories but does include specific lab methods (see Item 17).

				Testing Laboratory Certification Program (MTLCP) http://www.mda.state.mn.us/licensing/pestfert/manurelabs.htm under the auspices of the Minnesota Department of Agriculture.	
19	Does the TS address the requirement for a soil test?	Y	Nutrient Management Training and Certification Regulations 4 VAC 5-15-150 (Required nutrient management plan procedures), part A.2.f, page 11	Soil testing requirement must be included.	Meets EPA's expectation.
20	Do the TS address the frequency of the soil test?	Y. Plans must be based on a soil analysis no more than three years old.	Nutrient Management Training and Certification Regulations 4 VAC 5-15-150 (Required nutrient management plan procedures), part A.2.f, page 11	At least once every permit cycle.	Meets EPA's expectation.
21	Does the TS address the methods for collecting soil samples?	Y. The Nutrient Management Training and Certification Regs include basic soil sampling methods, and also	Nutrient Management Training and Certification Regulations 4 VAC 5-15-150 (Required nutrient management	Methods should be included. *EPA may have concern if methods deviate from land grant university or extension recommendations.*	Meets EPA's expectation.

		refer to standard sampling methods in *Methods of Soil Analysis, part 3, Chemical Methods, 1996.*	plan procedures), part A.2.f, page 11		
22	Does the TS address which components to include in the soil analysis?	Y. Crop nutrient needs shall be consistent with recommendations in the TS and shall be based on soil test results for P2O5 and K2O.	Nutrient Management Training and Certification Regulations 4 VAC 5-15-150 (Required nutrient management plan procedures), part A.2.a Page 10	At least phosphorus.	Meets EPA's expectation.
23	Does the TS address acceptable method(s) for conducting the soil analysis?	Y. The Nutrient Management Training and Certification Regs refer to standard methods in *Methods of Soil Analysis, part 3, Chemical Methods, 1996.*	Nutrient Management Training and Certification Regulations 4 VAC 5-15-150 (Required nutrient management plan procedures), part A.2.f, page 11	Methods should be included unless specific appropriate labs are provided. *EPA may have concern if methods prescribed by the land grant university or extension are not used or if methods that meet or exceed the requirements and performance standards of the North American Proficiency Testing Program (NAPT) Proficiency Assessment Program (PAP) http://www.naptprogram.org /pap/ under the auspices of the Soil Science Society of America are not used.*	Meets EPA's expectation.

24	Does the TS address which laboratories are acceptable for performing soil analysis?	Y. Approved soil test labs correlated to the VA Tech soil test lab using the Mehlich III procedure for phosphorus analysis are A & L Agricultural Laboratories, Brookside Laboratories, and Spectrum Analytical Laboratories Waters Agricultural Laboratories uses the Mehlich I procedure therefore the phosphorus soil test results can be interpreted the same as VA Tech phosphorus soil test results.	Virginia Nutrient Management Standards and Criteria Revised October 2005, page 40	Labs should be included unless specific appropriate methods to be followed by a lab are provided. *EPA may have concern if the land grant university or extension labs are not used or if laboratories that do not meet or exceed the* requirements *and performance standards of the North American Proficiency Testing Program (NAPT) Proficiency Assessment Program (PAP) http://www.naptprogram.org /pap/ under the auspices of the Soil Science Society of America are not used.*	Meets EPA's expectation.
Form					
	Criteria	**Specify**	**Reference**	**EPA Expectation for what will be reported**	**Comparison to EPA Expectation**
25	Does the amount, source, timing and form address how it is to be applied to	*Form is addressed separately under the amount, source, timing and method of land application as it applies. Form applies to the criteria amount as it is captured by the manure analysis requirement.*			

	each form of manure? (solid, semi-solid, or liquid)?				
Source					
	Criteria	**Specify**	**Reference**	**EPA Expectation for what will be reported**	**Comparison to EPA Expectation**
Timing – The Virginia TS addresses timing of manure application through restrictions and recommendations regarding application of manure under specified field and weather conditions and through use of mineralization rates specific to the season of application.					
	Criteria	**Specify**	**Reference**	**EPA Expectation for what will be reported**	**Comparison to EPA Expectation**
26	Does the TS address when manure application should be delayed?	N. However, the Nutrient Management Training and Certification Regs include detailed instructions for timing of nitrogen application as close to plant nutrient uptake periods as reasonably possible, based on timing of crop establishment and the environmental sensitivity of the site.	Nutrient Management Training and Certification Regulations 4 VAC 5-15-150, part A.4.f (Nutrient application timing), page 13. NMP Special Conditions: #5 states that the spreading schedule #21 (poultry)#23 (dairy/beef), #26 (swine) and the NMP should be utilized to determine appropriate manure application rates and times.	*EPA may have concern if not addressed.*	The criterion is not addressed. The Manure Spreading Schedules #21, #23, #26, and 4 VAC 5-15-150.A.4.a do not appear to address conditions under which application should be *delayed*. Rather, the special conditions and supporting regulatory language address when no waste application should be made and timing considerations for certain forms of manure and, therefore, have been included under Items 27 and 29.
27	Does the TS address when no waste application should be made?	Y. NMP Special Conditions #21 (poultry)#23 (dairy/beef), #26 (swine) prohibit	NMP Special Conditions: *Manure Spreading Schedules: #21, #23, #26*	*EPA may have concern if not addressed.*	The criterion is addressed.

		spreading liquid manure, dry or semi-solid manure, or parlor effluent on soils that are saturated and during certain months based on the crop grown. In addition, manure applications may not be made earlier than 30 days prior to planting on environmentally sensitive sites. Late fall/winter manure and poultry litter applications are not recommended for certain crops; the special condition includes rate limitations for such applications if they are necessary. Operators must avoid spreading on windy days to avoid drift.			
28	Does the TS address	Y. Rates are	Virginia Nutrient	If rates are not provided	The criterion is addressed.

	mineralization rates for applications made at different times during the year?	provided for Spring/early Fall, winter topdress/ spring residual, and perennial grasses.	Management Standards and Criteria Revised October 2005, Page 109, Table 8-2.	than standard should state that all N is 100% available at the time that it is applied.	
29	Are there any timing considerations that apply to certain forms (solid, semi-solid, or liquid) of manure when land applied?	Y. Liquid manure may not be applied on frozen or snow-covered ground. When ground is frozen, dry or semi-solid manure and poultry litter may be applied if the field has: (i) slopes ≤6.0%; (ii) ≥60% uniform ground cover; (iii) ≥200' vegetated or adequate crop residue buffer between the application area and all surface water courses; and (iv) has "well drained" soils (per USDA) NMP Special Conditions #9 prohibit spreading	• Nutrient Management Training and Certification Regulations 4 VAC 5-15-150, part A.4.f (Nutrient application timing), page 13 • NMP Special Conditions: #9 and #21 (poultry), #23 (dairy/beef), and #26 (swine)	Timing considerations with different forms of manure should be included. *EPA may be concerned if liquid manure application is allowed to frozen or saturated fields.*	The criterion is addressed.

		liquid manure/ effluent to frozen, ice or snow covered ground. In addition, application of dry or semi-solid manure and poultry litter should be avoided on frozen, ice or snow covered ground. If necessary applications may be made to fields that have: (i) slopes ≤6.0%, (ii) minimum of a 200 foot vegetative or adequate crop residue buffer is maintained between the application area and all surface water courses, (iii) only on soils characterized by USDA as "well drained" with good infiltration are used, AND (iv) at least 60%			

		uniform cover by vegetation or crop residue is present. On fields not listed as environmentally sensitive, no liquid manure or poultry litter applications more than 60 days prior to spring planting. No applications of semi-solid beef manure or semi-solid dairy manure dairy manure for operations using straw or sawdust bedding more than 90 days prior to spring planting on fields having (i) slopes < 7% or (ii) having at least 60% uniform ground cover from crop residue.			
Method of Application – The Virginia TS addresses method of application through use of volatilization rates specific to different application methods and time to incorporation as well as rate limitations for certain application methods or manure types.					
	Criteria	**Specify**	**Reference**	**EPA Expectation for what will be reported**	**Comparison to EPA Expectation**
30	Does the TS provide	Y. Rates for	Virginia Nutrient	If rates are not provided	The criterion is addressed.

	volatilization rates to apply to different types of land application methods?	injection, broadcast with incorporation, and irrigation without incorporation are provided.	Management Standards and Criteria Revised October 2005, Page 109, Table 8-1.	than standard should indicate that there is no N lost via volatilization.	
31	Does this include accounting for any timing delays for when manure is incorporated?	Y. Rates are provided for semi-solid manure, liquid slurry, lagoon liquid and dry litter for immediate incorporation, incorporation after 2, 4, and 7 days, and no incorporation.	Virginia Nutrient Management Standards and Criteria Revised October 2005, Page 109, Table 8-1.		The criterion is addressed.
32	Are there any specifications provided for applying different forms (solid, semi-solid, or liquid) of manure?	Y. Application of liquid manures via irrigation may not exceed hydraulic rates contained in Virginia Nutrient management Standards and Criteria. Plans should not recommend liquid manure application rates utilizing nonirrigation	• Nutrient Management Training and Certification Regulations 4 VAC 5-15-150, part A.5 (Application method for nutrients), page 13 • Virginia Nutrient Management Standards and Criteria Revised October 2005, Page 116, Table 8-8 (Maximum Wastewater Irrigation Application Rates for Different Soil Types).		The criterion is addressed.

		liquid spreading equipment > 14,000 gal/acre per application and application should not exceed the soil's hydraulic loading capacity. Manures are recommended to be incorporated or injected in the crop root zone to reduce loss of nitrogen.			
Appropriate Flexibilities					
	Criteria	**Specify**	**Reference**	**EPA Expectation for what will be reported**	**Comparison to EPA Expectation**
33	Does the TS allow multi-year P application	Y. A single phosphorus application may be recommended to address multiple crops in the crop rotation if the single application does not exceed the sum of the appropriate application rates for individual crops.	• Virginia Nutrient Management Standards and Criteria Revised October 2005, pp. 47, 48, and 50 • Nutrient Management Training and Certification Regulations 4 VAC 5-15-150, part A.2.c(5), page 11	TS does not have to include this, however if it is included items 34 – 36 are expected to be followed	Meets EPA's expectation.

34	If yes, does it provide restrictions on when and/or where this can occur?	Y. The single application may not exceed the sum of the appropriate application rates for individual crops as determined by subdivisions 2 c (1) through (3), which include a prohibition on phosphorus applications for soils exceeding 65% phosphorus saturation levels.	Nutrient Management Training and Certification Regulations 4 VAC 5-15, 150.A.2.c Pages 10 and 11.	Multi-year P application should not occur on sites with an elevated potential for P runoff to waters of the United States (as determined by the State)	Meets EPA's expectation. The State's July 2011 response clarifies that where the soil test is above the 65% saturation level, no phosphorus could be applied throughout the life of the plan, even as part of a multi-year P application, until the soil test level is below 65% saturation, at which point one of the procedures defined in Standards and Criteria would have to be used to re-evaluate the field to determine if phosphorus could be applied.
35	If yes, is there a restriction that additional P to these fields may not be applied until the amount applied in the single year has been removed through plant uptake and harvest?	N		If multi-year P is allowed by the standard this restriction would be included	May not meet EPA's expectation. The State's July 2011 response indicates that the required nutrient management planning procedures would ensure that no additional P is applied until appropriate. However, the standard does not include an explicit prohibition on application of P in subsequent years after a multi-year P application. It is recommended that the TS include a specific restriction with respect to future P applications in those cases where a multi-year P approach has been

					implemented (e.g., if a multi-year P application supplies the recommended P applications for 3 years of the crop rotation, then no additional P may be applied for 3 years, unless a management change or other [defined or documented] circumstance necessitates application of P.]
36	If yes, does the standard set N limits that must be met?	Y. Plant available N is not to exceed nutrients needs for individual crops.	Virginia Nutrient Management Standards and Criteria Revised October 2005, page 47.	If multi-year P application is used, the manure application shall not exceed the annual nitrogen recommendation of the current year of application.	Meets EPA's expectation.

† "Manure" refers to manure, litter, and/or process wastewater.

DRAFT