Summary of Partnership Comments and Panel Responses to Draft Report of Recommendations from the Best Management Practice (BMP) Expert Panel for Manure Treatment Technologies

The Manure Treatment Technologies (MTT) panel's report was first released for review and comment by the Chesapeake Bay Program (CBP) partnership on March 31, 2016. This document is provided in accordance with the BMP Protocol, which instructs the Panel Chair and Panel Coordinator to develop a "response to comments" document that provides a response to comments received.

Comments were submitted to the Panel Coordinator by over a dozen entities between March 31 and May 3. These comments ranged from one or two sentences, to multiple pages of written comments. Comments or suggested edits that pertain to grammar, spelling or formatting of the report are not included or addressed here, but the Coordinator has noted those comments for direct revisions to the report.

A separate table is provided with a complete list of comments and responses from the Panel Chair and Coordinator. This document summarizes the major or recurring comments of interest to the partnership and is divided into three sections. The first section discusses recurring issues or themes in the comments received during the initial 30-day comment period and describes the proposed path forward for these issues. The second section recounts other miscellaneous comments or questions raised and responses or proposed clarifications to the report.

The order of comments or responses in this document is neither a reflection of their importance or impact in any way, nor is their order necessarily chronological. They are arranged in a way that is intended to be more convenient to the reader, i.e. according to their relation or overlap to one another or their general frequency in received comments. Additional comments received following the initial May 3rd comment deadline will be appended to the third section of this document as needed.

An updated draft of the report will be provided that includes revisions to the text in "track changes" format. Further feedback or requests for revisions within the report documentation are encouraged to include specific suggested edits or text going forward.

1. Recurring issues or themes in comments received during initial 30-day comment period

Comments within the initial 30-day comment period primarily focused around two broader issues: the panel's recommended nitrogen reductions for TCC and Composting technologies based on volatilization, and how the panel's recommendations fit with water quality trading programs in the Bay states.

Nitrogen volatilization, air pollution and deposition

General issue: Thermochemical and Composting manure treatment systems reduce the land application of nitrogen by volatilizing a portion of the N into the atmosphere. Some of this will be volatilized as ammonia (NH3), some as NOX, and some as elemental nitrogen N2. The latter is inert and an important component of the air we breathe; the former two are air pollutants with undesirable environmental impacts and may be redeposited within the watershed.

Raised by: VA DEQ, PA DEP, MDA, MDE, Chesapeake Bay Commission, Chesapeake Bay Foundation, Aqua Terra, Sustainable Chesapeake, CleanBay.

General Response: The panel is not suggesting that emissions of reactive nitrogen are desirable, but the transfer of nitrogen from treated manure into the atmosphere does represent a change in the amount of nitrogen that is assumed to be land applied or transported in the modeling tools. The potential for redeposition of this nitrogen is a concern that falls outside the scope of this panel. This issue also applies to other BMPs in the agricultural sector.

Proposed path forward: Given the panel's limited role it is recommended that the CBPO Modeling Team and Modeling Workgroup work to provide recommended methods or adjustments in the Airshed Model to the Agriculture Workgroup. It is understood that the CBPO Modeling Team is looking into this issue and that it will be discussed at the Modeling Workgroup's August 2016 Quarterly meeting, which will include a set of options for how to account for potential redeposition of reactive nitrogen. The panel supports this work that can readily be combined with the panel's technical recommendations for manure treatment. The panel has provided some revised text in the Thermochemical and Composting chapters to reflect information that is available in the literature regarding the composition of nitrogen species within the panel's recommended NVE values. Following a decision from the Modeling Workgroup adjustments can easily be made to Table ES.1 in the Executive Summary and Table A.2 in Appendix A consistent with the adjustments that will be made for similar BMPs in Phase 6. Considering the additional information that the panel has added in response to comments the expected adjustment will be smaller for thermochemical systems than it will be for composting systems, since the latter releases a higher proportion of reactive nitrogen in the form of ammonia.

See attached table for specific comments and responses.

Panel recommendations and water quality trading programs in Chesapeake Bay states

General issue: To fully incorporate the panel's recommendations into water quality trading programs, the jurisdictions need further information beyond the effect of treatment alone. Specifically, they need information on:

- Replacement nutrients.
- The fate and redeposition of reactive nitrogen air emissions (NOx, ammonia).

- Differences in runoff or loss of nitrogen or phosphorus between treated and untreated manure. These differences can result from field application to crops, runoff from crop application, crop uptake, or storage/handling losses.

Raised by: PA DEP, MDA, VA DEQ

General Response: The panel acknowledges the importance of these issues as they relate to the overall mass balance for nitrogen and phosphorus in manure. However, it is not the treatment panel's role to describe these pathways.

Proposed path forward: Given the range of issues it is recommended that the WQGIT and AgWG form a policy group under the procedures that the Management Board considered this at its June 16th meeting. This group will be charged with providing the answers and guidance that the MTT panel is unable to provide under its more limited technical scope. It is expected that the policy group's recommendations will not have an impact on the panel's technical recommendations. In other words, the "black box" and the treatment effects described by the panel will not be effected by any partnership decisions regarding assumptions, methods, or adjustments that will occur following treatment of the manure as described by the panel. It is expected that the policy group will consider a range of issues to determine the net "cradle to grave" effect of a treatment system for purposes of clarifying and documenting what other methods or assumptions can be applied regarding pre- and post-MTT factors that are outside the scope of this panel. For instance, the group would discuss how to account for replacement nutrients or demonstrate baseline for trading purposes, among other issues. In this manner the panel's recommendations are simply one piece of a larger puzzle and the policy group itself will not require changes to the substance of the panel's recommendations.

As this "policy group" process is new and outside the panel's purview, a specific timeline is unknown at this time, but the panel requests that the partnership consider and approve the panel's technical recommendations at the earliest possible date even though the policy group will likely continue its work beyond that same timeframe. If the panel's recommendations are approved by the WQGIT prior to completion of the policy group there is a possibility that some clarifying language would be desirable to reference the policy group's documentation. Such language would have no effect would be neutral to the panel's recommendations and could be amended to the executive summary or Appendix A, or somewhere else that is deemed appropriate. This revision would be communicated to the WQGIT, WTWG and AgWG at that time.

See attached table for specific comments and responses.

II. Other issues or comments received during initial 30-day comment period

The attached table includes responses for all comments that were received. To avoid duplication of effort this section only describes revisions that will be made to the report based on the feedback from the partnership.

Executive Summary

Comment: Nitrogen volatilization and redeposition. See page 2 of this memo.

Expected edit to the report: The values in Table ES.1 will be adjusted to reflect the partnership's decision of how to account for reactive nitrogen emissions and redeposition associated with BMPs.

Comment: VA DEQ pointed out some confusing text on pages 3 and 4.

Proposed edit to report: The end of the executive summary (pages 3 and 4) will be edited as follows:

While the panel provides values about the NVE, NSE and PSE wherever possible, only technologies that remove nutrients from the primary manure stream can receive a reduction efficiency in the Phase 6.0 Chesapeake Bay Watershed Model. Only those technologies with a NVE value (i.e., volatilization) remove nitrogen from the manure via the treatment technology. "Removal" in this case means that the nitrogen is no longer present in the treated manure that is available for field application or transport according to model procedures that occur post-treatment. The following manure treatment practices may be reported to the National Environmental Information Exchange Network (NEIEN) for credit in a Phase 6 progress scenario or ~~reported to the CBPO for credit~~used in a planning scenario:

[Table ES.1 will remain here in the report but is excluded from this memo for space]

Although manure treatment technologies without a NVE value do not remove nutrients from the overall manure stream that is land applied or transported, they create numerous environmental benefits. By stabilizing and reducing organic matter, they reduce nuisance conditions and make plant nutrients more marketable for off-farm use. Manure treatment technologies also transform nutrients, which, in most cases, enhance plant nutrient uptake.

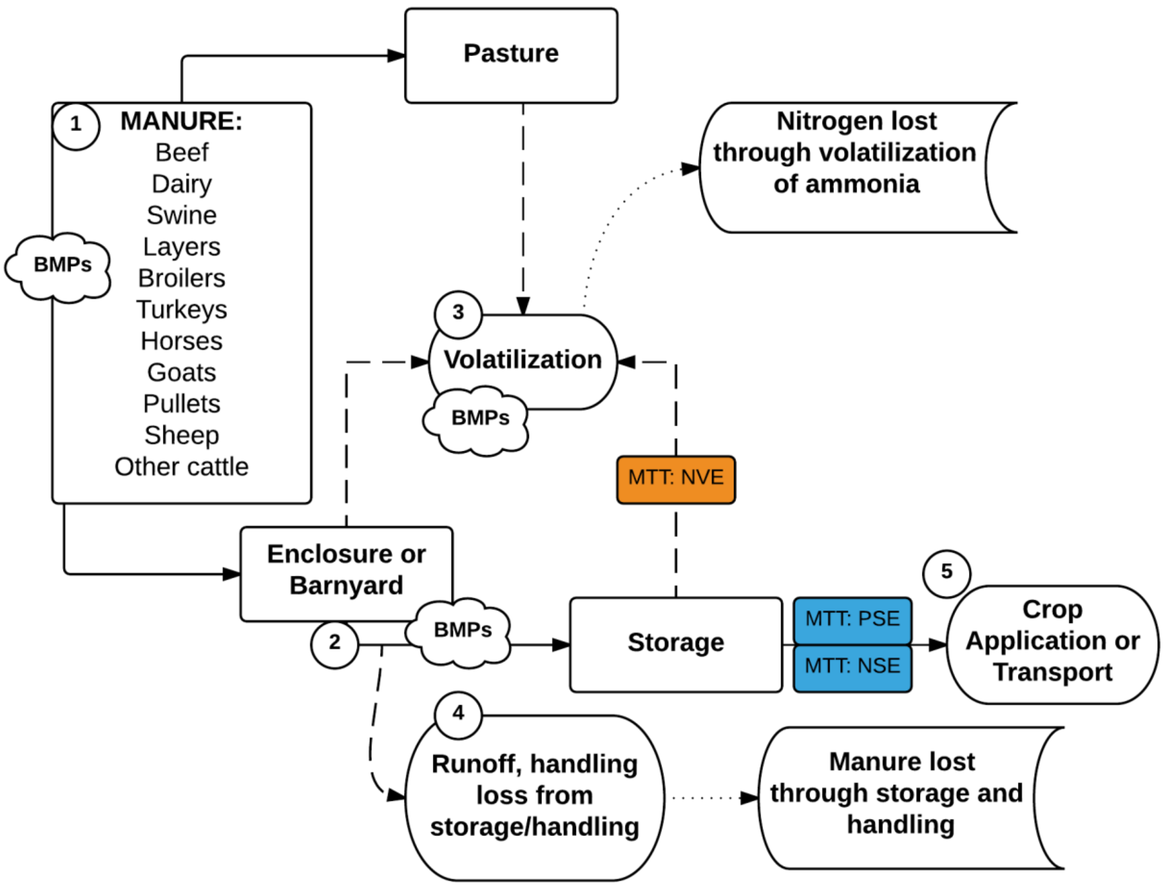
Section 2: Background and Modeling

Editorial or other changes: VA DCR and others provided several edits and corrections that will be incorporated in final report, but are not restated here since they are grammatical or editorial in nature. These changes to the paragraph at the top of page 8 is the biggest edit that was requested:

> Manure from animal agriculture is the largest source of phosphorus (P) loads to the Chesapeake Bay and the second largest source of nitrogen (N). Traditionally, the manure from livestock and poultry has been a valuable resource for farmers as a cost-effective fertilizer. When used appropriately, manure adds nutrients and organic matter that improves soil quality. However, manure's ratio of P to N is often higher than a crop's agronomic need, so application of manure at agronomic N rates frequently contributes to excess P in the soil. Manure is also a bulky material that is costly and

energy intensive to transport long distances to areas where it is needed. ~~Excess nutrients in some areas of watershed make nutrients in the soil more susceptible to runoff.". ~~Nutrients are often applied at excessive rates in areas of the watershed where excess manure exist. Resulting excess nutrient levels in soils in these areas increase susceptibility to nutrient loss via runoff.

Proposed edit to Figure B.2 and associated description in the text: Figure B.2 will be replaced with this modified version:



Additionally, the following sentence will be added to the end of the first paragraph at the top of page 11 that follows and describes Figure B.2 (ends with "…in Figure B.2 above"):

> The orange MTT: NVE box in Figure B.2 illustrates the nitrogen that is extracted by certain treatment technologies (e.g., thermochemical or composting) from the primary manure stream that is subsequently available for land application or transport. The total overall nutrients remaining in that primary manure stream are not changed as a result of the PSE or NSE values since those nutrients still remain to be land applied or transported according to model procedures. Other assumptions and procedures in the modeling tools (e.g., field application, runoff, losses from storage/handling) are outside the scope of this Manure Treatment Technologies expert panel report and will apply to treated manure streams the same as untreated manure streams since the overall

nutrients are part of the same overall “bucket” of manure nutrients at the county scale in the modeling tools.

Section 4: Thermochemical

Comment: Why are there two types of gasification systems listed under defined technologies based on whether the gasifier is operated above or below 1,500 °F? There is nothing particularly special about 1,500 °F that changes the composition of syngas or char.

Response: Even though there is not a drastic change in operation at 1,500 °F, gasification systems run at cooler temperatures take on more of the characteristics of pyrolysis. Using a breakpoint of 1,500 °F, provides a more defined transfer efficiency for systems without testing or monitoring data.

Proposed edit to report: The process factors section (page 28) will be modified to read:

> **Operating Temperature** plays a major large role in the removal of N from manure handling systems. Combustion systems typically operate at high temperatures (>1500 F) and with excess oxygen associated with the process, much of the nitrogen is converted to various gaseous forms. Gasification processes cover a wide range of temperatures. Generally as the operating temperature is reduced for gasification systems, the amount of nitrogen retained in the ash/char increases. Below 1,500° F, 75% of manure N is retained in char. Above 1,500° F, as much as 85% of manure N is lost in gaseous emissions. The 1,500 F temperature was chosen as a breakpoint for gasification processes. Even though nitrogen retention in ash/char does not have the drastic change at a given temperature, using 1,500 F provides a guide to use for systems without monitoring or testing data. This temperature could also vary depending on the system and operational performance.

Comment: Many comments were received on the forms of gaseous nitrogen emitted by thermochemical conversion processes.

Response: Additional references were used to augment the nutrient transformation subsection of the literature review.

Proposed edit to report: The final paragraph under the nutrient transformations subsection (page 31) will be replaced with the following text:

> The typical gaseous nitrogen emissions from thermochemical processes include: ammonia (NH_3), nitrogen oxides (NO_X), nitrous oxide (N_2O), and nitrogen gas (N_2). Losses of nitrogen from the solid phase as ammonia emissions are generally less than 2% of total losses (Caron-Lassiter 2014). Additionally, based on reported air permits (Energy Works Biopower, 2014) and available EPA air emission data

(www.epa.gov/air/emissions) NO_X-N emissions can be estimated as 10% of feed N. The Farm Manure-to-Energy Initiative (2015) reported on a limited number of air emission tests which were conducted on gasification and combustion systems for litter from small poultry operations. Results show that ammonia emissions were less than 0.05% for all operations. Nitrogen oxides varied from 2.5 to 5.2% for the combustion systems and 0.6% from gasification. (A portion of the NO_X, especially for the higher operating temperatures of the combustion systems, likely resulted from thermal NO_X, but was not considered for this work.) Nitrous oxide (NO) was estimated at 2.65% of the NO_X (EPA AP-52, Chapter 1.6, 2003) which accounted for 0.1% or less of the nitrogen being emitted. Comparing these emitted values with the nitrogen retained in the ash/char (Farm Manure-to-Energy, 2015) showed that for these combustion systems, the emissions associated with N_2 was approximately 90% and for gasification at greater than 96% of the total nitrogen emissions. Similar data was not published for pyrolysis systems, but given the operating temperature and lack of oxygen it would be expected that a pyrolysis system would release more of its nitrogen in the form of N_2 than a gasification system. However, to be conservative the gasification N_2 rate of 96% could be used. The remainder of emitted nitrogen (10% for combustion; 4% for gasification and pyrolysis) would be assumed to be in reactive forms as NO_X or NH_3. The deposition fate of ammonia and NO_X may be of interest to other technical groups (e.g., the Modeling Workgroup) for adjustments in the modeling tools if desired by the partnership. These percentages only apply to emitted nitrogen and do not change the panel's analysis of the N that remains in the ash/char (Table TCC.4) that would be available for application or transport. It should be noted that these percentages are based on a very limited number of systems and are not representative of all combustion or gasification systems.

The performance and subsequently the air emissions of each thermochemical system will vary from other systems due to unique operational characteristics, e.g., the characteristics of the manure or litter fed to the system, the feed rate, the system itself, system maintenance, pre-treatment or other steps in the process, etc. The panel's recommended values represent their best attempt at a reasonable estimate for that type of technology's performance considering the potential variability. These generalized rates will serve for the CBP's purposes if the Modeling Workgroup and the CBP Partnership need to make adjustments to the Default and Defined TCC BMPs (MTT1-6) are made to account for redeposition within the watershed.

Section 5: Composting

Comment: The NVE and NSE values for in-vessel and rotating bin composters in Table C1 (page 42) do not add up to 100. (CBF and VA DCR)

Response: This is a typo.

Proposed edit to report: Table C1 will be corrected to give an NSE value for in-vessel and rotating bin composters of 90%.

Comment: Nitrogen volatilization (see page 2 of this memo and associated Table for details and responses)

Proposed edit to the report: The "Nutrient Transformations" section will be replaced with the following text:

Nutrient Transformations

Manure **Nitrogen** is transformed to microbial biomass (Org-N) during composting. Much of the remaining TN exists as NO_3-N in mature compost. Manure nitrogen is lost during the composting process by three pathways: 1) liquid transport as leachate (dissolved NO_3^-), 2) liquid transport in runoff (NH_4^+ bound to particles or Org-N contained in particles); and 3) emissions of gases such as NH_3 and NO_x. Eghball et al. (1997) found that 92% of manure TN lost from windrow composting of beef manure was through gaseous emissions, with the balance leaving in runoff and leachate.

Nitrogen lost through leaching can be recovered as compost tea. Most states in the Chesapeake Bay Watershed require runoff water to be contained either by covering the composting area or in a capture and reuse system.

Almost all of the volatilized nitrogen leaves the compost pile as NH_3. Less than 6% of nitrogen is volatilized as N_2O (Zeman et al., 2002). Ammonia emissions depend on both C:N of the pile and the concentration of easily decomposable forms of nitrogen in manure (Tiquia et al., 2000; Peigne and Biardin, 2004). Compost Piles with low initial C:N made from manure with high concentrations of Nitrate (NO_3^{-1}), urea, and ammoniacal nitrogen emit the most NH_3. Other important factors in NH_3 emission are pH and temperature. Basic compost piles with high temperatures emit more NH_3 than cool, acidic piles. Sommer (2001) found that most NH_3 losses occur during the initial 5 to 19 days of pile formation as the piles are heating. Exposure of pile surfaces to the atmosphere also increases NH_3 volatilization. Sommer (2001) found total nitrogen emissions losses were 28% for uncovered piles of deep bed dairy manure, and 12 to 18% for covered piles.

Nitrous oxide is formed during incomplete ammonia oxidation and incomplete denitrification, and high temperatures inhibit formation of N_2O (Rowan et al., 2009). Most authors found that the greatest emissions of N_2O occur in wet piles after the initial heating phase of composting, when much of the readily available carbon has been depleted. (He et al., 2001; Sommer, 2001; Amlinger et al., 2008; Brown and Subler, 2007). A few studies (Hellmann et al., 1995; Beck-Friis et al., 2000) recorded high N_2O emissions early in pile formation, but in these cases, N_2O was released by denitrification of NO_3^{-1} present in the raw materials added to the composting pile.

Table C.6 lists the expected base total nitrogen volatilization efficiency of different composting systems. This table takes into account the type of nitrogen compounds found in raw manure and the amount of exposure the compost pile experiences.

Table C.6. Base Total Nitrogen Volatilization Efficiencies (%) of Composting Systems.

Type of Composting System	Type of Manure Composted				
	Beef	Dairy	Poultry	Swine	Mixed
Turned Pile and Windrow	25	25	25	30	25
Static Pile and Windrow	28	28	26	40	26
In-Vessel and Rotating Bin	12	12	10	15	10
Forced Aeration	25	25	35	30	25

Low initial C:N is a critical factor affecting N loss in composting (Tiquia et al., 2000). If the bulking agent or the C:N ratio of the bulking agent is known, then the base total nitrogen volatilization efficiencies given in Table C.6 may be adjusted by the multiplicative factors listed in Table C.7. For example, if a turned windrow beef manure composter uses straw as a bulking agent; multiply the value in Table C.7 (base value of 25%) by 1.25 to give a nitrogen mass volatilization efficiency of 31.25%.

Table C.7. Factors for Modifying Base Total Nitrogen Volatilization Efficiencies based on Bulking Agents.

Bulking Agent	C:N Ratio	Multiplicative Factor
Wheat Straw	40-100:1	1.25
Cornstalk	30-80:1	1.1
Woodchips/Sawdust	100-500:1	1.1

Phosphorus in compost is mainly found in inorganic fractions. Dissolved inorganic phosphorus can be lost during composting primarily as runoff, and as leachate during and following rain events. Sharpley and Moyer (2000) suggest that water extractable phosphorus may be used to estimate the potential for land-applied manure or composts to enrich leachate and surface runoff.

Sections 7-9: Settling, Mechanical Solid-Liquid Separation, or Wet Chemical Treatment

Comment: The column headings above PSE and NSE in tables MSLS.8 through MSLS.11 contain removal efficiency, which has not been defined in the report.

Response: These are typos.

Proposed edit to report: Column headings in MSLS.8, MSLS.9, MSLS.10, and MSLS.11 have been changed from removal efficiency (%) to separation efficiency (%)

Section 10: Data collection and reporting for data driven (Level 3) transfer efficiencies

Multiple comments were made regarding this section (e.g., MDA, MDE, VA DEQ, PA DEP). The section is copied below with suggested edits in track changes:

> This section describes the general expectations and protocols that are proposed as a data-driven BMP category that can apply to a manure treatment system that has monitoring data to determine the nitrogen load that will be eliminated from the primary manure stream. This section does not apply to the Default (Level 1) and Defined (Level 2) categories described elsewhere in this report. **Data Driven (Level 3) Transfer Efficiency** can be applied to a treatment system that utilizes one or more manure treatment technologies described previously in this report. The technologies being used may be proprietary or non-proprietary and may be used in any sequence to produce one or more end products for subsequent transport or land application. On-farm or multi-farm, centralized manure ~~T~~treatment systems reported under this category will have unique transfer efficiencies that must be determined using monitoring data collected on site. The reported performance data will include the mass of N volatilized as gaseous emissions. If mass of N lost through emissions is not monitored, then a quantifiable mass balance of the system's N inputs and outputs is required. The calculated transfer efficiency will vary annually from system to system. Transportation or land applications of any end products from these types of systems should be reported via NEIEN under separate BMPs (e.g. Manure Transport, manure injection/incorporation). Manure treatment systems that lack adequate annual performance data to support a Data Driven Transfer Efficiency (i.e., Level 3) should be reported using the appropriate Level 1 or Level 2 Transfer Efficiency for that system's primary manure treatment technology.

Existing monitoring data collection and reporting requirements will vary by manure treatment system and jurisdiction and/or supplemental funding program(s), if any. Permit requirements may exist for some treatment systems, but will also vary based on a variety of factors, including whether the treatment system is associated with a permitted CAFO or AFO, the capacity and type of system, the system's air emissions, and applicable state and federal regulations that cover relevant areas such as air emissions or the handling/treatment/disposal of animal manure.

This chapter provides some basic guidance for the partnership with the understanding that any specific regulatory and programmatic requirements for the monitoring, sampling or reporting of data for a manure treatment system is determined by the jurisdiction. Given the panel's scope, and due to the potentially complex nature of federal and state regulations, program requirements and guidance, the panel understood early on that it would only be able provide general reporting and monitoring guidance ~~to be used~~ for the partnership when seeking to establish a category for Level 3 transfer efficienciesy in the modeling tools. By not prescribing specific methods the panel does not inhibit the ability of state and federal partners to work with each other, producers and third parties to determine effective monitoring and verification protocols that can simultaneously ensure rigorous data collection and reporting while not being overly burdensome or costly to implement.

The panel acknowledges that some states have existing programmatic and regulatory structures that will guide ~~and inform~~ the necessary data ~~collection~~ tracking ~~and reporting~~ to report~~establish~~ Level 3 transfer efficiencies for eligible manure treatment systems. Other states may not have such programmatic structures at this time because these treatment technologies may only be in pilot stages or are not common enough in their state to warrant more explicit regulations or guidance. For the CBP partnership's reference, the panel coordinator solicited preliminary information from the jurisdictions in order to summarize information for states that have some existing programs or funding-mechanisms that would be the basis for their data collection, reporting and verification protocols for potentially reporting Level 3 transfer efficiencies. Maryland, Pennsylvania and Virginia fall under this category and are summarized in Table DD.1. The other jurisdictions did not provide additional information at this time, which, in no way, affects their ability to report treatment practices with Level 3 transfer efficiencies in the future.

[Table DD.1 will remain but is not copied here to save space; no edits to the table itself are being made]

Table DD.1 summarizes applicable data collection or reporting requirements as described by Maryland, Pennsylvania and Virginia when contacted by the Panel Coordinator in the course of developing this report. The table is not intended to be a comprehensive description of applicable programs in the three states, as other programs may apply or be created in the future. The table is provided to serve as a basic reference and starting point for future discussions by the partnership as these systems start to be reported for annual progress runs. The information may be less useful to the jurisdictions who already have a deeper understanding of these programs and associated data, but others may benefit from the basic overview provided in the table. Other jurisdictions not shown in Table DD.I may also have their own programs or may create ones in the future. The table is provided as an informational guide to illustrate how, or if, a Level 3 transfer efficiency could be reported for a manure treatment system covered under the programs shown in Table DD.I.

Systems could be covered under one or more programs based on its source funding or regulatory requirements, so each system ~~will~~may need to be described in the jurisdiction's QAPP in order for the jurisdiction and EPA to determine its eligibility, on a case-by-case basis, for a Level 3 mass transfer efficiency. For these reasons it is likely that initially only a handful of systems will report Level 3 transfer efficiencies, but that number will likely grow if implementation incentives are accelerated. If the cumulative reductions for manure treatment systems reporting Level 3 treatment efficiencies becomes > 1% of a state's net nutrient reductions for one or more progress runs, the partnership should evaluate the reporting requirements for these systems and discuss whether improvements to the data collection, reporting and verification system are warranted.

Any jurisdiction reporting a manure treatment system with a Level 3 transfer efficiency must document its data collection and reporting requirements for the associated system in its Quality Assurance Project Plan (QAPP) submitted to and reviewed by EPA. If there are variations in requirements or data collection between individual systems, the jurisdiction will need to clarify those differences in its QAPP.

Specific data collection and reporting requirements will be determined by the applicable state agency, in coordination with any appropriate federal agencies who have oversight or implementation roles (e.g., EPA or USDA-NRCS). State-federal coordination may be required in certain cases and may already occur in most instances, but, if not, it should be strongly encouraged for purposes of effective management. **In all cases, the collected and reported data will need to meet the expectations described in the CBP partnership's BMP Verification Framework.** Such a determination will be made by EPA and state partners during the submission and review of annual BMP progress data.

While specific requirements or decisions will be made by state and federal partners, the panel suggests the following for their consideration when constructing or evaluating an appropriate sampling, reporting and verification protocol for determining manure treatment system Level 3 transfer efficiencies:

- **There is no one-size-fits-all protocol for monitoring or sampling**. Sampling and testing of the influent (manure) and effluent (treated end products) should be conducted at a frequency appropriate to the size, scale, type(s) of treatment(s) and technologies being used.
- Sampling or monitoring data should be reported to the appropriate state/federal agency at least twice per year, preferably on a quarterly basis, even if only reported through NEIEN to the CBP once per year for annual progress runs.

Calculating the Level 3 Transfer Efficiencies

Lbs Removed/Year = Mass of N lost as gaseous emissions = NVE (see equation TT.2)

Note: if the system incorporates other feedstock(s) that represent 5% or more of the total mass of N in the system, then the reported transfer efficiency should be adjusted accordingly.

If the operator does not directly measure the amount of N removed from the treated manure in the form of gaseous emissions, then the operator can alternatively calculate a mass balance to determine their transfer efficiency.

N lost as gaseous emissions = (lbs-N of all inputs) – (sum of lbs-N remaining in all solid and liquid outputs)

The jurisdiction should use new or existing programs in order to maintain accurate records that may serve to enhance their reporting, tracking or verification efforts. This may include, but is not restricted to the following:

- The amount (in tons or lbs) of manure that is treated by the system.
- The type of livestock manure (or litter) being treated.
- Source location of the manure. If the treated manure is from another site (i.e. the system is not associated with one livestock operation), then the source county of the manure should also be recorded.
- End-use or fate of treated manure or other end-products. If the treated effluent or the end-product from the treatment process is transported to another county or outside the watershed, this information should also be recorded and could potentially be reported through other BMPs such as Manure Transport.

- An annual summary of the manure input and the fate/transport of the treated manure or any end products should be provided to the jurisdiction if the jurisdiction does not already collect or require this information.
- The dominant type of treatment technology or technologies utilized in the system, e.g. anaerobic digestion, pyrolysis, gasification, combustion, etc.

While the BMP could still be credited and simulated in the modeling tools without all of the above information, it will improve the accuracy of the simulation if the full set of information is available. Some information (amount of manure treated and location) is required for any system reported under the transfer efficiencies for Levels 1, 2 or 3 as described in Appendix A. If data elements are not ~~reported~~ available for Level 3 then the system will be simulated under the appropriate Level 2 or Level 1 BMP based on the ~~provided~~ available information~~data~~.

~~Note: The estimated nitrogen reductions associated with a given manure treatment system reported under Level 3 and calculated in the Chesapeake Bay Program Partnership environmental modeling tools will not necessarily be equal to credits generated (in pounds of TN) for water quality trading purposes. Water quality trading programs, whether intrastate or interstate, may have different calculation steps, retirement ratios, additionality requirements, or other factors that are not considered for this panel's purposes. This may be a source of confusion if attempts are made to compare the reductions credited for a treatment system in the CBP partnership modeling tools with any water quality trading credits associated with that same manure treatment system under a state's water quality trading program.~~

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~~Systems could be covered under one or more programs based on its source funding or regulatory requirements, so each system will need to be described in the jurisdiction's QAPP in order for the jurisdiction and EPA to determine its eligibility, on a case-by-case basis, for a Level 3 mass transfer efficiency. For these reasons it is likely that initially only a handful of systems will report Level 3 transfer efficiencies, but that number will likely grow if implementation incentives are accelerated. If the cumulative reductions for~~

~~manure treatment systems reporting Level 3 treatment efficiencies becomes > 1% of a state's net nutrient reductions for one or more progress runs, the partnership should evaluate the reporting requirements for these systems and discuss whether improvements to the data collection, reporting and verification system are warranted.~~

Tracking and reporting (Appendix A)
Comments: See VA DEQ, MDA, MDE, CBF

Response: See attached table for specific responses.

Proposed edits to report: The panel coordinator will work with the WTWG to make edits to Appendix A related to reporting through NEIEN. Edits are also expected to Table A.2 following a decision from the Modeling Workgroup on how to account for emissions and potential redeposition within the watershed of reactive nitrogen associated with BMPs.