Appendix E. Compilation of partnership feedback on draft report and responses

Version: October 14, 2021 for posting to AgWG October 21 calendar page.

[Editor's note: Some text from commenters, including greetings and email signatures, have been left out, but the comments are verbatim unless stated otherwise in cases where summarized/abridged feedback is presented. Responses from the Panel Coordinator and Panel Chair are in blue. Please note that page number references in this section are not updated and therefore may not reflect page numbers in revised or final versions of the report.]

> We want to thank everyone who took time to read the draft report, especially those readers who took the time to offer written feedback compiled in this appendix.

Comments entered into chat during August 13 webinar:
Frank Schneider, PA SCC :
just note in Pa, burial is not used often except for large animals

Dave Montali, Tetra Tech:
Are there any concerns regarding the animal weights considered by the panel not matching the weights in place in the CBP manure generation protocols? Any remaining concerns that nutrients from mortalities are double counted in the manure nutrients (poultry)

Chris Brosch, DE Dept. of Ag:
Excellent and comprehensive discussion. I am interested in diving into a few assumptions and generally about considerations for Ches Bay regional issues compared to national average conditions or areas where animal production is centered outside Mid-Atlantic.

What sources were used for the characteristic animal data based? This was a part of some of the animal manure panels, poultry, turkeys and pigs done in the latest version of the Model by expert groups engaged with by the Ag Workgroup.

What is the justification for the 70% figure used as a basis for weight of a carcass?

Are the TN and TP values elemental or NO3/P2O5 equivalent?

For broiler sizes how were the flocks/yr calculated or gathered from production data? Integrated poultry are more market driven than capacity.

How relevant is the cow/calf operation relevant to cattle production systems across the Ches Bay region? Were local considerations made?

> Panelists responded to the above questions during the August 13 webinar, which can be viewed here, with the responses beginning at approximately 1:49:30: https://www.chesapeakebay.net/what/event/animal_mortality_management_bmp_expert_panel_recommendations_roll_out_webin

Victor Clark, Farm Freezers & Greener Solutions
Part 1 of feedback
[*From email*]
I would be happy to help with it in any way I can. If you give me specific examples of data that you need or references to source material I will do my best to find them for you. Some I already have. For example, I attached the AgWG presentation again because it contains a lot of information regarding how the model reflects manure (and mortality) transport. I even have references in there to sections of Model documents I think, so you can cross reference the docs – instead of citing the presentation. It had to be cut down to be short for the presentation, but I can find the source material for each point and forward if helpful?

In a similar vein, I added the last three sentences to the report's text (first sentence) on page 129. Not sure the panel will include it but the text seemed to be begging for a real world example. Maybe it would help you, even if they don't use it?

> If a jurisdiction has the ability to track and report the number of animals or tonnage of animal mortalities – and ideally, animal type – transferred from watershed farmers to rendering facilities, that may be the most effective method for tracking and reporting the animal rendering BMP. For example, Delaware's Nutrient Management Commission expanded its manure transport program to include mortality transport a few years ago. The program incentivizes the adoption of both practices by providing funds to offset the cost of transportation for individual growers. The invoices submitted for reimbursement contain the total tonnage [and type] of mortality diverted from land application, allowing the state to track and report the associated reduction in nutrients that would otherwise be assigned to Delaware's ag load.

I also attached practice code 316 so you have that as a reference too, if helpful?

> The panel combed through many sources of data using the Chesapeake Bay Program's protocol for BMP evaluation. The panel already possessed and considered the NRCS 316 practice standard as part of their deliberations.

There are some big issues that take time to first understand – and then explain. For example, I don't think the panel realized that the poultry mortality load is already in the model as part of the manure/litter load. That has big implications.

> The panel was fully aware poultry mortality load is counted as part of the manure in poultry operations. This is not the case for other types of animal farms, however. The panel went through the process of comparing manure nutrient loads to mortalities nutrients to provide information for decision makers to split the mortality nutrients out of manure for poultry or include mortalities with manure in other species. A point that was brought out in the comments we received appended to the draft of the report stated that the panel should consider other Chesapeake Bay sponsored data when comparing manure nutrients to mortality nutrients. Both the AGWG poultry litter subgroup data (PLS report, 2015, Chapter 3, Appendix A of P6 Watershed Model documentation) and turkey litter report (Ogejo et al., 2016) provide nutrient values for collected litter – after bedding has been added, many flocks have been added to the manure, and the excreted manure had been stored for a considerable period of time. The only way to compare the amount of nutrients contained in mortalities at the time of death to manure is to use freshly excreted manure – before losses and dilution take effect. This point

was made in each section of the report in which manure and mortality nutrients were compared.

I point this out because I will try to submit all of my comments by the end of the day today, but Is anyone really going to read my comments over the holiday weekend? Many of my comments are accurate I believe, but I need time to double-check or find citations so it's not just me saying it. Has anyone else asked for a little more time? Or has everyone already gotten their comments in?

Let me know if there's wiggle room.

I also have comments on the report from a hog farmer in Delaware (who uses freezers) – very positive about the report – and I think it helps broaden the scope beyond chickens. Can I just forward the email to you – he gave me permission to share it with you.

The panel did not limit the use of freezers for storage to any particular animal type or disposal method.

[*the following portion of comments is copied from a provided attachment to the above email]*

Feedback from Farm Freezers and Greener Solutions on Expert Panel Report Titled Estimates of Nutrient Loads from Animal Mortalities and Reductions Associated with Mortality Disposal Methods and Best Management Practices (BMPs) in the Chesapeake Bay Watershed

Who We Are

I write on behalf of Farm Freezers and Greener Solutions, local companies that provide equipment and hauling services in connection with routine mortality management on farms in the watershed. My partner also operates a poultry farm in Millsboro, DE, so our comments set forth below are not only informed by our knowledge of freezer equipment and the rendering industry, but by his knowledge of on-the-ground daily operations of farming – including routine mortality management. In fact, it was his realization, shortly after buying the farm – that there was a better use for routine mortality than composting and land application – that started us down this path a decade ago.

Others saw the beneficial aspects of this management method too, and, therefore, in 2016, Delaware and Maryland jointly petitioned the Bay Program to grant poultry mortality freezers interim status pending an expert panel. This is important to note because (i) data about poultry growth rates, poultry mortality rates and nutrient content was readily available –and, in fact, had been adopted by prior panels, (ii) poultry mortality was already reflected in the model as part of an existing load (manure/litter), thanks to one of those prior panels, and (iii) the use of freezers (with transport to rendering) was identical to manure transport out of the watershed vis-à-vis how this new BMP would be reflected in the model.

The scope of the original petition was later expanded to include many more animal types and four other management methods. A comprehensive review of mortality management made sense, however, data for those other animal types and data reflecting how those other management methods would be reflected in the model was severely limited – making the task extremely difficult, but also making the panel's achievement all the greater.

Why This Panel's Work Is So Important

The panel's work has brought this previously unseen aspect of both agriculture and nutrient generation out into the light.

Though the panel modestly downplayed the importance of its work – "The nutrients contained in mortalities are a minor component of the water pollution potential of animal production." -- the reality is that conservation solutions rarely come in the form of a silver bullet. Reducing a load by 5% or 10% is actually a big deal.

But more importantly, as the panel would no doubt agree, a great majority of the litter that is generated in the watershed is actually needed for land application as a soil amendment.

So, our task as supporters of both agriculture and the watershed, is not to figure out how to zero out 80% or 90% of the manure/litter load; our task is finding a way to zero out the nutrients from that portion of the manure/litter load that mass balance studies say we have in excess.

It is for that reason, that while mortality may be an insignificant part of the manure/litter load, zeroing out the nutrients from mortality could be a significant part of the solution.

We appreciate the panel's work and respectfully ask that the comments we are submitting (below and attached) be fairly considered and hopefully adopted where appropriate. We have done our best to be clear and thorough, but welcome questions when we have fallen short of that goal.

> Mortality nutrients were compared to manure nutrients so that modelers and CBP partners have a sense of the relative contribution of mortalities and decide how best to add mortality nutrients to the watershed model, if so desired in a future update. The fact is mortality nutrients are a minor component of the pollution potential of animal agriculture. Totally eliminating mortalities from the waste stream, would at best, reduce nutrient load by 4% (farrow-to-finish swine farms), based on available data.

More Context for Each Method Will Increase the Value of the Report

Though the panel's charge discussed reviewing various mortality management methods that have historically been employed in the watershed, not all methods discussed deserve equal billing.

First, some methods have fallen out of favor or have been outright banned since their introduction. For example, pit burial was commonly used for routine poultry mortality on Delmarva, until it was deemed to be a hazard to ground water and surface water resources about three decades ago. In fact, composting owes its creation in part to pit burial's demise on the Peninsula.

Second, some methods discussed in the report are viable options for catastrophic losses, but are never used for routine mortality. For example, windrowing inside a chicken house is used only in mass mortality disease situations because it takes the chicken house out of production for a long time.

Thorough discussion of each method is understandable from an academic perspective; however, giving each method equal billing – with occasional caveats about limitations embedded here and there -- does not reflect the reality on the ground. For example, a new poultry operation in Delaware is in essence limited to either freezing/rendering or composting, and even within the category of composting, only

bins, channels and rotary drums are used for routine mortality. But those limitations are not apparent from the report.

Pit burial, landfilling and incineration may be options in other states for routine poultry mortality, but setting forth which states and under what circumstances, would increase the value of the report.

The confusion is compounded when some aspects of mortality management are discussed watershed-wide (e.g., Table I.2.1. sets forth broiler production in the Chesapeake Bay Region). It's hard for the reader to remember that the management methods cannot be deployed watershed-wide when those methods are set out as equals. For example, that same table says the largest producer of chicken is Delaware, however, producers in Delaware are essentially limited to two options for mortality management, rendering discussion about the other three poultry mortality management options moot for the most relevant group.

Our suggestion is the inclusion of a chart or table that sets out each method and identifies each state in which its use is allowed and for which animal types. This would allow the reader to cross reference the panel's findings to put into perspective the potential impact on nutrient reduction each method is capable of achieving for each state. This would make the panel's work even more valuable. For example, while landfilling routine poultry mortality may, in theory, zero out the associated nutrients, if landfilling routine poultry mortality is banned in most poultry producing states – then its impact is not accurately reflected in the report.

As for practices that are limited to catastrophic losses, those should be removed as outside the scope of the charge for the same reason – the impact of those practices on the routine mortality load is not accurately reflected in the report. If discussion of those practices is preserved, maybe drop those comments into footnotes so it's obvious to the reader that the topic is not about routine mortality.

> The purpose of Part II of the report is to provide estimates for potential nutrient transfer to water bodies given a particular standard of practice. Attempting to determine losses for every non-standard or historic practice is beyond the scope of this panel's charge. If a producer, modeler, or jurisdiction wants to compare potential nutrient transfers between disposal methods (broilers in Delaware or instance), they can use the mortality and nutrient production information in Part I combined with the potential movement fractions in Part II. This information is universal and is transferable to all parts of the watershed. Implementation or use of these practices will naturally vary by state or local conditions and programs, and the priorities or policies are determined by the jurisdictions and are outside the scope of this panel. Additionally, the standard for burial provided in the burial chapter states that the method is not feasible in sandy soils with a high-water table.

Final Disposition Is Critical to the Value of the Panel's Work

The primary goal of the Bay Program is nutrient reduction in the watershed. So, while it's important to understand intermediate steps in the nutrient's life cycle, the actual impact on the watershed – the end result – is why BMPs are created, vetted and incorporated into the model.

The panel has focused on the final disposition of the nutrients attributable to routine mortality. For example, the panel determined – rightly so – that the freezer shed was an interim step on the way to final disposition at a rendering plant, and renamed the BMP accordingly.

But the composting shed is an interim step too. Composted mortality does not stay in the shed, it is ultimately land applied. (We're not asking that the composting BMP be renamed "land application," though to be fair, that would be analogous to renaming freezers as the rendering BMP.)

What we are suggesting is that the composting process reflect the reality on the ground – that we follow the nutrients in composted mortality (along with its co-composting material) to their final disposition, for the following reasons:

First, the process simply cannot happen without co-composting material, as explained in the report at page 107: "For proper composting to occur, dry carbon-rich material must be added to mortalities to control moisture released from the carcasses and supply a carbon source for the microbes."

Second, the full process is necessary to have a true apples-to-apples comparison as between the five methods – three of which already are discussed in terms of final disposition of nutrients. Like freezing/rendering, the process doesn't end in the composting shed. Ignoring the final disposition of composting mortality is not a fair comparison on the factor most important to bay restoration efforts and by extension to this three-year endeavor – nutrient impact.

Third, the finished product of composting affects nutrient reduction in three ways:

1. The composted carcasses will be land applied,
2. But so too will the litter mixed in with it
3. Moreover, pure litter on a farm – without mortality mixed in – will not necessarily be land applied; it may be diverted from land application to an alternative use.

To illustrate, consider two identical poultry farms – each produces 100 lbs. of mortality and 1,000 lbs. of litter per flock – but one uses freezing/rendering and the other composting.

At the first farm, it's possible to contribute nothing to the nutrient load. 100 lbs. of mortality is zeroed out at the rendering plant and 1,000 lbs. of manure is zeroed out at the mushroom farm.

At the second farm, to compost 100 lbs. of mortality, ~300 lbs. of manure must be used. At the end of the process, some N escapes to the watershed via leaching, runoff and volatilization per Table II.3.1, but all the P in the 100 lbs. of mortality – and all of the P in the 300 lbs. of manure – is kept, and in fact concentrated, and then land applied. Only the remaining 700 lbs. of pure litter can be zeroed out at the mushroom farm.

This is a very unsophisticated illustration but it demonstrates that the composting process creates an additional and new source of nutrients – and that the process also taints a co-composting material that could otherwise be zeroed out if transported to an alternative use.

> Nutrient losses and transfers during land application is not within this panel's scope. Other panels have looked at land application in detail and the panel plays no part in assessing those existing model procedures. The system considered in the panels' work was drawn around the production unit in order to give each disposal method equal footing. The panel did provide estimates of nutrients available for land application either on the farm or elsewhere in or out of the watershed. A more detailed response concerning carbon-rich material being brought into the system is addressed below. The case studies brought up by Greener Solutions helps to illustrate the use of this panels work by modelers. The mortalities stored frozen and rendered is

in fact "zeroed out" of the agricultural sector of the model (the nutrients discharged to the atmosphere and surface water by the rendering plant will reappear in the model via other data inputs). In the case of the second farm composting litter, phosphorus in the litter generated on the farm and land applied goes into the land application part of the model. The phosphorus in mortalities created on the farm is currently considered as part of the manure stream, but could be counted separately in later updates to the model based on the work of this panel. The nutrients from litter sent to the mushroom farm is not zeroed-out, unless it's a case where the modeling teams advises that those should be considered "outside the watershed" or effectively "zeroed out."

Fourth, as stated repeatedly in the panel's report, the co-composting material is MORE important than the carcasses when it comes to

1. Nutrient content – See, e.g., report at 116 "total acreage needed for spreading depends on nutrients added with co-composting materials."
2. Volatilization – See e.g., report at 111 ("There is a large variability in the nitrogen loss from carcass compost piles. This variation is caused primarily by co- composting materials added to piles to aid in composting rather than the carcasses themselves.")
3. Leaching and runoff – see, e.g., report at 114 ("Glanville et al. (2006), Gilroyed et al. (2016), and Hutchinson and Seekins (2021) all found that co-composting material, not the carcasses, significantly influenced leachate and air emission quality and quantity.")

To repeatedly declare the importance of the co-composting material in every facet of the analysis of the composting methodology and then overlook its impact in the final result of the process seems inconsistent and reduces the value of the panel's conclusions.

The report did state the importance of co-composting materials in nutrient losses from mortality composting. If the impression is that co-composting materials are more important than mortalities in the final deposition of mortality composting, perhaps the panel should reconsider the wording used in this section. Going back to the sources cited, the co-composting material influencing air emissions and leachate is manure and other "green" materials and not carbon-rich "brown" material. In the case of broiler mortality composting, poultry litter and recycled mortality compost are used as inoculum. Since these materials are generated in the production area of the farm, nutrients contained in inoculum will not alter the land needed for application of the litter-mortality waste stream. One of the challenges Extension specialists advising poultry producers on mortality composting face is convincing farmers that they should use less inoculum and more carbon-rich material. The farmers see litter as a free resource and wood chips, sawdust, etc. as an expense to be avoided. The purpose of the carbon-rich material is to add Carbon to the mixture and add as little N and P as possible. Going through the calculations to determine the amount of carbon-rich material needed to bring the poultry mortality compost mixture up to an initial C:N to induce the composting process, shows that very little P (compared to carcasses and litter) is added. Considering off-farm carbon material added to mortalities in the calculations used to generate Table II.3.5 and would not significantly increase the acreage needed to spread the nutrients contained in mortalities.

Fifth, without considering the fate or final disposition of the compost, the analysis misses a significant issue: once the process is done where will the compost be land applied?

As the report states at page 118, "[a]t the end of the compost process, the producer has a valuable soil amendment." Finding a destination for that soil amendment, however, can be challenging. First, many modern poultry growers focus solely on poultry and grow no crops. Therefore, these "no-land" operations have no need (and often no land) for spreading this soil amendment. Second, even some farms that grow crops are prohibited from using manure/litter/compost on their fields because of high legacy nutrients in the soil. Third, according mass balance studies, supply of nutrient rich material is outstripping crop demand, so finding a home for this excess material is becoming more and more challenging.

> Most poultry farms in North America produce more nutrients than is able to be assimilated on land owned by the farm. However, finding a solution to this situation is not within the charge of this panel. This panel's report can help shed light on the additional land needed to assimilate mortality nutrients if their final disposition is in fact land application.

Sixth, poultry mortality is already reflected in the model as part of the manure/litter load, so the results of the panel's analysis could be plugged directly into load calculations and/or modeling scenarios. (That may not be true for other animal types, but that's not a reason to leave out valuable information the poultry industry could use.) This makes sense as litter, manure and mortality are already combined – and as the report states at page 113 "the carcass disintegrates and becomes more or less congruent with the carbon-rich material" so all three sources are considered a homogenous mix – from both the perspective of the panel and the model.

> Not certain what valuable information the panel did not provide.

Seventh, the "fate," i.e., final disposition, of N and P across selected practices includes "Field application" of compost, according the panel's charge on page 8.

> This was taken into account by the panel. The approach taken provides this information for all disposal methods not just composting.

Finally, the data should reflect the reality on the ground so the analysis could be used by nutrient management professionals and policy makers for planning purposes. Table II.3.4. and Table II.3.5 on page 117, which calculates how many acres are needed to properly land apply the nutrients found in a carcass – after the carcass has gone through the composting process, but without the nutrients created by the co-composting material – really illustrates why the real value in the analysis is in the final disposition of the process. No one can use the data in those tables. It's not possible to spread just carcasses post-composting.

The difficulty the panel encountered, presumably, is that there are several potential sources for co-composting material and identifying and analyzing all of them would be a huge separate assignment; however, it cannot be that the solution is to forgo the analysis with co-composting material, especially when it has been established that the co-composting material is the bigger factor vis-a-vis nutrient content, leaching and volatilization.

Instead, a common co-composting material could be used to run the acreage calculations, and explain in a footnote that other co-composting materials will skew the results up or down (and that that analysis is a separate research project in the future). For example, nearly all poultry farms on Delmarva (and

probably elsewhere) primarily use litter/cake for composting. This makes sense because, as the report explains on page 112:

There is very little capital investment required to implement a compost program for carcass management. Most farm operations already have the infrastructure, land, co-composting materials, and material handling equipment necessary for composting.

In other words, most producers use what they have on hand, i.e., poultry growers use litter/cake rather than pay to have outside materials brought in. So, the panel could use the litter/cake research on nutrient content, leaching and volatilization already found elsewhere in the report to run the numbers and create an example – an example that also happens to be accurate for a large majority of poultry growers. Those numbers would reflect the reality on the ground and could be used by nutrient management professionals, bay modelers and policy makers for planning purposes.

> The question of nutrients introduced from off-farm carbon-rich materials has been answered above. The individual members of this panel have performed the calculations for compost nutrient composition numerous times.

Part 2 of feedback: individual comments and suggested edits in the report

[Editor's note: We are currently working to extract the extensive comments and suggestions made in the report itself and summarize them into this appendix for a narrative record of the comments and responses. For now, and for the AgWG's reference, the PDF of Victor Clark's feedback in track-changes is posted on the September 16 calendar entry.]

[Editor's note: The following farmer's input was forwarded by Victor Clark with the farmer's permission (see above). The input is copied verbatim, but anonymously, as the individual may not have been aware that their input would be included in this appendix for publication.]

I do think 1 term that can be used is protein recovery or protein recycling. Ultimately with the swine that product is kept fresh and high quality and then is recycled back into the protein supply chain. basically that is completing the loop.

ALL this is done safely. As I have thought about this system. Its really a asset to that operation as they did away with all the composting management and the endless turkey vultures that were hanging around. (they are a real problem.) and we were upsetting the balance of nature here.

We Like the system and if we could get cost share moneys would expand it into PA.

The panel has reviewed the comments attached to the report provided by Greener Solutions. Most of the comments are contained within the general areas to which we have responded above in this appendix. An exception is the size of broilers grown on the Delmarva peninsula. We are aware that many farms grow birds larger than 8 pounds. Figures I.2.6 and I.2.10 provide data on mortalities collected weekly and cumulative nutrients produced through the grow-out of market weights beyond 8 pounds (7-week birds). Table I.2.4 provides annual production data for 4, 6, and 8-pound market weights to reflect the range of average weight of broilers marketed in each state (Table I.2.1.). The average weight of production is most important in the regional modeling of nutrients. Data on on-farm production of mortalities will be addressed in additional publications authored by individual panelists.

Frank Schneider, PA State Conservation Commission

[Editor's note: Copied here is text of the letter that was submitted on PA-SCC letterhead. Received via email on August 13, 2021.]

Reference: Estimates of Nutrient Loads from Animal Mortalities and Reductions Associated with Mortality Disposal Methods and Best Management Practices (BMPs) in the Chesapeake Bay Watershed

Jeremy,

Thank you for the time to provide a review and comments on the report titled "Estimates of Nutrient Loads from Animal Mortalities and Reductions Associated with Mortality Disposal Methods and Best Management Practices (BMPs) in the Chesapeake Bay Watershed"

Overall we found the report to be well done, informative, and an asset moving forward.

Pennsylvania offer the following editorial comments for suggestion, as no technical issues were identified

1. When the report discussed the different species (Broilers, Layer, Swine), they call out Lancaster Co specifically, which is not exactly the case. In general, Lancaster and the surrounding counties in the South Central part of the state contain the largest populations.
2. The layer housing descriptions may be outdated, or at least in Pennsylvania. Most new or remodeled facilities are now cage free and belt dried manure systems.

Again, Thanks for the opportunity to comment.

Sincerely,

Frank X, Schneider
Director, Nutrient and Odor Management Programs

CC: Jill Whitcomb, Pa DEP
Kate Bresaw, Pa DEP

The panel relied primarily on the 2017 Census of Agriculture (USDA-NASS, 2019) and a previous Chesapeake Bay Expert Panel report, *Animal Waste Systems, Recommendations from the BMP Expert Panel for the Animal Waste Management Systems in the Phase 6 Watershed Model* (Hawkins et al.,

2016), for providing information on animal populations and operating systems. Both of these publications used aggregate data on a county-by-county basis, and perhaps unfortunately, Lancaster County came out on top on each of those animal groups. Perhaps it would be more descriptive to state that South Central Pennsylvania contains the heaviest concentration of animal agriculture in the state, but we stated data on a county basis.

The statement in the laying hen section about housing and manure collection types, again was taken from Hawkins et al. (2016) and reflects the state of the industry in 2010-2015. It will be updated to read, "Almost all layers raised in the Watershed are housed in large confinement buildings (Figure I.2.11), most commonly in cages (although in recent years cage-free housing is becoming dominant). The most common manure handling system for layers is a two-level, high-rise house. Caged birds are housed in the upper level of the high-rise house (Figure I.2.12). Manure is dried and stored in the lower level (Hawkins et al., 2016). Most of the newer, cage-free facilities use belt-dried manure handling systems."