Preliminary Report – Recommendations of Agriculture Workgroup to WIP Phase 3 Steering Committee

Introduction:

The Agriculture Workgroup[1] offers this initial report in response to upcoming events and activities pursuant to consideration of Pennsylvania's Chesapeake Bay Watershed Implementation Plan for Phase 3 (WIP-3). Participants in those events and activities may be helped by information on considerations and progress of workgroups so far.

We note initially that the recommendations and offerings contained in this report are preliminary in nature, and are subject to change – and potentially significant change – as additional information and data become available and more extensive evaluation and analysis of relative environmental effects are performed in upcoming months. Despite the considerable effort made by the Workgroup in our consideration and initial development of the Workgroup's preliminary recommendations, there are numerous factors that affect and may call into significant question the sufficiency or accuracy of recommendations we are offering in this report. Some of the significant factors lending to the uncertainty of these recommendations include:

- Areas of focus for agricultural Best Management Practices (ag BMPs) and the projected level of their implementation being recommended in this report represent the Workgroup's collective but qualitative belief of types and levels of practices that farms within Pennsylvania's Bay watershed can reasonably and capably implement. There has been virtually no evaluation of the likelihood that projected costs of enhanced practices recommended in this preliminary report can feasibly be financed through existing sources of public and private funding. The type and concentration of ag BMP implementation may be revised if additional evaluation of current funding sources is performed or additional funding sources are created and amounts provided for ag BMPs. Likewise, the Workgroup was not able to determine the length of time it may take for the type and concentration ag BMPs recommended to be fully implemented.

- The Workgroup does not have a clear understanding whether there will be any continued or additional commitment of federal, state, local or private funding sources for the type and concentration of ag BMPs being recommended preliminarily by this Workgroup. Full implementation of the recommendations contained in this report is expected to require a significant economic investment and significant development of technical staff. A positive or negative change in sources and amounts of funding would likely affect the Workgroup's recommendations.

[1] The Pennsylvania Watershed Implementation Plan Agriculture Workgroup is composed of 15 members including active farmers and representatives of farm and agribusiness organizations, environmental organizations, commercial farm consulting businesses, conservation districts, farm integrators, and state agencies working with the agricultural industry. Our objective is to develop a realistic and effective strategy for reducing nutrient and sediment loadings coming from farmlands in the Bay watershed, to the maximum extent practical for the farm community to implement. References to "the Workgroup" contained in this report are intended to mean the Agriculture Workgroup.

- There have been no studies or surveys performed to confirm that the type and concentration of performance of ag BMPs preliminarily recommended by the Workgroup will be actively accepted and pursued among farmers in the Bay Watershed. The need for increased compliance among farmers with directives of state and federal law is reasonable, and has been a primary component of Pennsylvania's WIP for the previous phases. And events such as the PA in the Balance conference in 2016 and coordinated watershed initiatives such as those performed in the Chiques and Conewago Creek watersheds have helped to identify conservation practices that effectively improve local water quality and are beneficial and feasible for implementation by the agricultural community. Based on collective experiences of those serving on the Workgroup, the menu of practices and degree of implementation represent our best judgment of reasonable acceptance and implementation by Pennsylvania farmers in the watershed.

- We are not offering at this time a recommendation regarding the methodology, manner or timing of reporting and collection of documentation and data on water quality improvement practices performed on farms. While development of a comprehensive and coordinated reporting and data collection system acceptable to EPA and convenient for participation by farmers and agricultural consultants is very important to Pennsylvania's future ability to demonstrate material reductions in levels of nutrient and sediment runoff and ensure current practices being performed are duly credited in the Bay Model, there are concerns associated with reporting that may inhibit farmers from active participation in reporting activities. The Agriculture Workgroup needs to further evaluate this issue before offering any definitive recommendation.

A. Recommended type and concentration of agricultural BMPs:

References to "agricultural BMPs" in this portion of the report are meant to consistent with activities in type and manner that are creditable in the Chesapeake Bay Model:

1. Agricultural Compliance: Compliance by farmers with requirements imposed under state and federal law has been a primary component in Pennsylvania's WIP for the previous two phases, and will likely be a primary component in WIP-3. To meet the essential requirements of state and federal law, every farm operation must develop and implement an Agriculture Erosion and Sedimentation Control Plan (Ag E&S Plan) or a conservation plan for management and control of soil erosion and stormwater runoff from farm fields and areas where heavy concentrations of animals are likely to be present (Animal Heavy Use Areas). In addition, farms that generate or land apply animal manure must develop and implement a manure management or nutrient management plan for control and efficient utilization of nutrients and proper management of conditions that are likely to adversely impact water quality. Larger animal farms whose animal density meet the threshold of a Concentrated Animal Operation (CAO) or a Concentrated Animal Feeding Operation (CAFO) are subject to more extensive planning requirements and formal review and approval of plans and operations. Continued and more complete attainment and documentation of agricultural compliance can still provide significant measured results in narrowing

Pennsylvania's TMDL gap for nitrogen and phosphorus, and will likely provide material and positive results in reduction of sediment runoff. Components and benchmarks for agricultural compliance recommended by the Workgroup include:

- Development and implementation of nitrogen-based "core" nutrient planning on 90% of applicable crop and hay lands receiving manure.
- Development and implementation of both nitrogen-based and phosphorus-based "core" nutrient planning on 90% of those crop and hay lands receiving animal manure from CAO farms subject to "Act 38" nutrient planning requirements under Pennsylvania's Nutrient Management Act.[2]
- Development and implementation of Ag E & S or conservation plans on 90% of crop and hay lands.
- Implementation of proper runoff controls on 90% of feed/barnyard areas on permitted CAFO farms.
- Implementation proper runoff controls on 67% of feed/barnyard areas on non-permitted farms.

Projected Nitrogen and Phosphorus Reductions and Projected Costs – Attainment of Compliance Benchmarks[3]

Reduction Nitrogen (lb)	Percent Reduction Nitrogen to Total PA Reduction Need	Reduction Phosphorus (lb)	Percent Reduction Phosphorus to Total PA Reduction Need	Total Projected Cost (Dollars)
8,113,000	15%	236,000	12%	$30,587,900

2. Performance of Practices for Improvement of Soil Health: More recent research and studies have identified numerous opportunities for farmers to implement crop and soil management practices having potential to substantially improve local water quality while significantly improving the farm's long term soil health and productivity. Water quality and soil health are both critical to the future viability of farms in the watershed. The Workgroup recognizes that farmers will be more receptive to implementing crop and soil management practices that have been demonstrated to increase yield, reduce costs of production and improve the farm's future economic viability. Components and benchmarks for crop and soil

[2] Act 38 of 2005, recodified under Chapter 5 of Title 3 of the Pennsylvania Consolidated Statutes.

[3] Projected nutrient reductions and costs in this and other tables appearing in this preliminary report are based on evaluations and applications of CAST. Costs projected do not include the cost of additional workforce needed to administer the implementation of an enhanced compliance program.

management activities to improve soil health recommended by the Workgroup include:

Residue Management:

- Year-round attainment of 30% field residue or canopy cover on 67% of lands used for production of corn silage, small grain and double-copped lands.
- Year-round attainment of 60% field residue or canopy cover on 67% of lands used for production of other crops.

Management and Use of Cover Crops: [4]

- Planting and management of non-harvested cover crop on 33% of land used for production of silage crops that receive fall manure application.
- Planting and management of non-harvested cover crop on 50% of non-sileage crop land that receives a fall manure application.
- Planting and management of non-harvested cover crop on 50% of crop land that does not receive a fall manure application.

Prescribed Grazing:

- 50% of land used for pasture follow prescribed grazing plans, including, where appropriate, sufficient fencing to exclude animals from streams.

Projected Nitrogen and Phosphorus Reductions and Projected Costs – Attainment of Soil Health Benchmarks

Reduction Nitrogen (lb)	Percent Reduction Nitrogen to Total PA Reduction Need	Reduction Phosphorus (lb)	Percent Reduction Phosphorus to Total PA Reduction Need	Total Projected Cost (Dollars)
7,689,000	15%	327,300	16%	$30,358,300

3. Enhanced NM Planning - Lands Not Receiving Animal Manure: Traditionally, nutrient management regulation of farms in Pennsylvania has focused on farms that produce or use animal manure as a nutrient source. Efforts to additionally engage farm operators that use commercial fertilizer instead of animal manure in crop production in developing and implementing nutrient management plans for efficient management and use of fertilizer for may provide substantial returns in improving water quality. Numerous farms not using manure in crop production may already have developed and are implementing enhanced nutrient management plans, as

[4] Recommendations assume no change to current acreage of commodity cover crops reported.

successful management of nutrients for crop utilization will help manage and reduce costs for purchase of crop nutrients. However, governmental actions to support or require greater attainment of enhanced nutrient planning on farms not generating or receiving animal manure has been very limited. And historically, non-animal farm operators have negatively viewed proposed actions to impose greater requirements for enhanced development and implementation of nutrient management plans. The Workgroup believes there can be potential benefits from performance of enhanced nutrient management planning on farms not generating or receiving manure, but also believes there may still be strong resistance in accepting governmental actions that would mandate such planning. Components and benchmarks for enhanced management activities on farms not generating or utilizing manure in crop production that are recommended by the Agriculture Workgroup include:

- Attainment of 20% of crop land not currently receiving animal manure managed pursuant to a nitrogen-based and phosphorus-based nutrient management plan.

- Attainment of 20% of crop land not currently receiving animal manure managed with plans that both: (i) address both nitrogen and phosphorus; and (ii) implement enhanced nutrient management practices for rate, timing and placement of land application of nutrients.

Projected Nitrogen and Phosphorus Reductions and Projected Costs – Attainment of Enhanced NM Benchmarks

Reduction Nitrogen (lb)	Percent Reduction Nitrogen to Total PA Reduction Need	Reduction Phosphorus (lb)	Percent Reduction Phosphorus to Total PA Reduction Need	Total Projected Cost (Dollars)
817,000	2%	44,200	2%	$18,140,250

4. Enhanced Development and Operation of Manure Storage Facilities: The Workgroup recognizes substantial benefit to water quality that can be attained through additional on-farm installation and use of manure storage systems that have sufficient storage capacity and are located or relocated to be consistent with state and federal location standards. But we also understand that there are extensive criteria for design and construction of these facilities and management of soil and stormwater runoff that must be legally complied with. And there are high costs associated with hiring the design and construction professionals needed for compliance with these criteria and the use of materials used in construction of the facilities. Despite reasonable and good faith efforts by farmers and professionals to design and install effectively working manure storage systems, some systems may need further design and construction alterations after original construction in order to function at the level of effectiveness originally envisioned. For some animal farming operations, such as those in the production of hogs and poultry, the manure storage system is designed and constructed as part of a more integrated animal housing

system. For others, such as dairy, manure systems cannot be designed and constructed with nearly the same degree of integration and cost efficiency. In our attempt to offer recommendations, the Agriculture Workgroup has tried to recognize the serious economic challenges that most farmers face in constructing the type of manure storage facilities needed for effective water quality management, especially without a prevailing source of available public funding. Current sources of public funding fall considerably short of farmer need. And because of relative efficiency in design and construction of manure systems with other on-farm structures, there may be greater opportunity for attainment of construction of effective manure storage systems in production of some animal species over others. Components and benchmarks for enhanced manure storage development recommended by the Agriculture Workgroup include:

- Attainment of 90% of swine and poultry operations with sufficient on-farm manure storage capacity to prevent frequent land application of manure. This will aid the farm in applying manure to land for optimum crop intake (i.e. BMP manure application).

- Attainment of 75% of other livestock operations with sufficient on-farm manure storage capacity to prevent frequent land application of manure. This will aid the farm in applying manure to land for optimum crop intake (i.e. BMP manure application).

Projected Nitrogen and Phosphorus Reductions and Projected Costs – Attainment of Enhanced Manure Storage Development Benchmarks

Reduction Nitrogen (lb)	Percent Reduction Nitrogen to Total PA Reduction Need	Reduction Phosphorus (lb)	Percent Reduction Phosphorus to Total PA Reduction Need	Total Projected Cost (Dollars)
7,058,000	13%	303,900	15%	$204,624,300

5. Precision Feeding and Management of Diet: Studies have shown a corresponding link between the type and amount of feed and sustenance consumed by an animal and the type and level of nutrients contained in manure the animal generates. This relationship may provide opportunities for reduction in levels of nutrients traditionally present in animal manure simply through a more precise management of the animal's feed intake. Supplementing feed provided to hogs and poultry with the enzyme phytase enhances the animal's ability to utilize phosphorus content in animal feed, thus reducing the amount of resulting phosphorus in the animal's manure. Precision feed management has been shown to provide opportunities for reducing nitrogen and phosphorus in manure generated by cattle, and programs for implementation of dairy cattle precision feeding practices are duly credited in the Bay Model. The Workgroup believes such practices can be implemented on many dairy operations without significant adverse impact on

efficiency or cost of production. The Agriculture Workgroup recommends attainment of dairy precision feeding on 33% of Pennsylvania dairy operations.

Projected Nitrogen and Phosphorus Reductions and Projected Costs – Attainment of Precision Feeding and Diet Management Benchmarks

Reduction Nitrogen (lb)	Percent Reduction Nitrogen to Total PA Reduction Need	Reduction Phosphorus (lb)	Percent Reduction Phosphorus to Total PA Reduction Need	Total Projected Cost (Dollars)
610,000	1%	61,200	3%	($1,752,290)

6. Development of Integrated Systems for Elimination of Excess Manure:
Integrated, county-based or region-based programs for elimination of excess manure through transportation out of the Bay watershed or beneficial uses is a practice that is given a high level of nutrient reduction credit in the Bay model, relative to other practices, because of the high degree of confidence in quantifying and verification of the amounts of nutrients being removed from the watershed. However, costs associated with the development and implementation of a continuous, integrated, and area-wide system of excess manure elimination are extremely high and variable. There may also be opportunities for development of manure treatment systems that reduce or eliminate levels of nutrients generated on-farm or regionally through technology-based activities. The Workgroup recommends efforts to develop coordinated regional systems to facilitate elimination of excess manure through enhancement of manure transportation and manure treatment systems. It is imperative that pursuit of manure systems be supported by proven data and analysis that show the system will be economically feasible to construct and operate and that reductions in nitrogen, phosphorus and sediment will result from its operation.

Projected Nitrogen and Phosphorus Reductions and Projected Costs – Attainment of Integrated Excess Manure System Development Benchmarks

Reduction Nitrogen (lb)	Percent Reduction Nitrogen to Total PA Reduction Need	Reduction Phosphorus (lb)	Percent Reduction Phosphorus to Total PA Reduction Need	Total Projected Cost (Dollars)
957,000	2%	181,500	9%	$?????? [5]

[5] Due to the variability of costs associated with the many technologies that could be used to address excess manure nutrients, it was not practical at this time to project with reasonable certainty the total cost to be incurred for attainment this benchmark.

7. Enhanced Development of Forested and Grassed Buffers: Enhanced development of forested and grassed buffers adjacent to surface waters can provide substantial benefit in improving and protecting water quality. When compared with other conservation practices for water quality improvement, increased establishment of buffers is commonly recognized as one providing relatively higher environmental return per dollar invested. However, the practical challenges and burdens associated with establishment and maintenance of buffers, whether forested or grassed, would most commonly and predominantly fall upon those persons whose lands would be additionally committed for buffer use. Considerable personal time and effort would likely need to be dedicated by the landowner for initial planting and for maintenance of buffer vegetation. And the landowner may need to commit additional effort and cost in responding to conditions that threaten adequate development of vegetation in the buffer area. And the very act to commit additional areas for establishment and maintenance of buffers essentially eliminates those land areas from use for other purposes, such as crop production and pasturing animals.

Governmental action that summarily mandates private landowners to establish buffers on their property is unreasonable and unfair. The Workgroup appreciates those opinions by others involved in the WIP-3 process that mandating buffer installation should not be pursued in WIP-3. The true challenge is to identify a plan for buffer enhancement that will be environmentally effective and will encourage extensive participation by landowners to establish buffers on their lands. While some landowners may look favorably on committing their lands for buffers solely because of the contribution to water quality improvement that commitment will provide, we believe a significant portion of landowners will be far less willing to burden themselves and their land to establish and maintain buffers without additional incentives to do so. In an effort to strike a balance of benefit and reality, the Workgroup recommends:

- Attainment of an additional 25% of agricultural land adjacent to streams for establishment of forested buffers at least 35 feet in width, including where appropriate, sufficient fencing to exclude animals from streams; and

- Attainment of an additional 15% of land adjacent to streams for establishment of grassed buffers at least 35 feet in width including where appropriate, sufficient fencing to exclude animals from streams.

Projected Nitrogen and Phosphorus Reductions and Projected Costs – Attainment of Enhanced Forested and Grassed Buffer Development Benchmarks

Reduction Nitrogen (lb)	Percent Reduction Nitrogen to Total PA Reduction Need	Reduction Phosphorus (lb)	Percent Reduction Phosphorus to Total PA Reduction Need	Total Projected Cost (Dollars)
8,070,000	15%	1,001,400	49%	$44,979,634 [6]

Additional Consideration in Buffer Implementation: Given the inherent conflicts and uncertainty that may arise from landowner participation, a Bay watershed-wide approach in development of forested and grassed buffers may not provide optimum benefits to water quality improvement, relative to dollars spent. The Workgroup recommends and strongly encourages further consideration be given to more locally targeted approaches that identify areas of greater relative benefit from establishment of buffers and apply more concentrated effort to encourage and incentivize participation among landowners in those areas. The Workgroup also recommends the commitment of additional public funds to incentivize landowners committing lands adjacent to waterways for forested and grassed buffer development and management and to provide training and support for additional individuals who can provide technical and maintenance assistance to owners of farms in development and management of buffer areas that provide effective environmental benefits and help enhance opportunities for future supplemental income on the farm.

Cumulative effects and costs projected for type and concentration of agricultural BMPs recommended: The table below provides the total estimated nitrogen and phosphorus reductions to be achieved and the total estimated total costs to be incurred upon attainment of all conservation measures on farms recommended in this preliminary report:

Projected Nitrogen and Phosphorus Reductions and Projected Costs if ALL Benchmarks Recommended in This Preliminary Report Is Attained

Reduction Nitrogen (lb)	Percent Reduction Nitrogen to Total PA Reduction Need	Reduction Phosphorus (lb)	Percent Reduction Phosphorus to Total PA Reduction Need	Total Projected Cost (Dollars)
33,314,000	63%	2,155,500	106%	$326,938,000 [7]

[6] Cost estimate shown is based on an assumed scenario of 20 percent increase in acreage of forested buffer and 20 percent increase in acreage of grassed buffer, and does not reflect the relative percentages recommended in this preliminary report.

[7] Total cost figure does not include the costs and cost adjustments noted in footnotes 5 and 6.

B. Additional Recommendations.

The success or failure of the recommendations included in this report will be greatly dependent on their practicality and the commitment of landowners and communities to implement them. Unless there is a greater effort to facilitate participation and performance of those directly impacted, plans devised pursuant to WIP-3 will not be productive. The local processes envisioned for development and implementation of practices to be performed under WIP-3 will be a key function to successful accomplishment of Pennsylvania's WIP-3 goals and objectives. There are still several major barriers that hamper successful accomplishment that the Workgroup believes need to be adequately addressed and offers the following recommendations:

1. Discourage Imposition of Legal Mandates on Stakeholders and Landowners: Development of strategies for feasible and effective execution of plans for water quality improvement under WIP-3 will most likely be very challenging. And the processes to reach consensus on ideas and recommendations that balance relative interests and concerns and accomplish the multitude of objectives that Pennsylvania intends to accomplish is likely to be very frustrating, especially for local stakeholders who will be expected to collectively make local decisions on performance of land use activities in furtherance of WIP-3. Given the challenge and frustration likely to arise from engagement in local decision making, some individuals involved have already advocated a politically and financially expedient "solution" to accomplish objectives through proliferation of local ordinances that legally mandate landowners to perform, or prohibit landowners from performing, land uses in furtherance of water quality objectives. The Workgroup is deeply concerned with any meaningful attempt to apply or condone this type of approach to attain Chesapeake Bay TMDL objectives. The Workgroup would recommend measures that clearly identify this type of approach as inappropriate in attempting to meet WIP-3 goals. More specific to the local WIP development process, the Workgroup recommends the establishment of rules that inhibit any attempt in whole or part to accomplish water quality improvement objectives through local ordinance regulation of land use.

2. Financial and Tax Incentives for Landowner Participation in Changing or Preserving Land Use: Potential facets of program activity under WIP-3, such as enhanced development of stream buffers, will likely have the practical effect of imposing more permanent restrictions or requirements on private landowners. Many landowners have been traditionally frustrated with governmental actions that impose significant restrictions in land use options without adequate compensation, while continuing to require the landowner to pay taxes on the areas of land so restricted. The Workgroup believes that programs and activities that exclusively or predominantly restrict land use options for water quality improvement must include features that provide financial and tax incentives to those landowners who voluntarily participate. We recommend that participating landowners be given adequate compensation for those portions of their lands that become restricted in use as a result of implementation of a BMP practice performed pursuant to WIP-3, and that such portions be fully excluded from property and related taxes for the life of that BMP practice.

3. Reporting and Confidentiality: Resolution of this issue in a manner acceptable to EPA, those who will be responsible for completing and documenting practices creditable in the Bay Model, and the general public is a critical component to WIP-3. Due credit in the Bay Model for BMPs actually performed will not occur unless those activities are "properly reported" and "verified." Current protocols for "proper" reporting and verification" of BMPs seriously inhibit the ability or willingness of landowners performing them to voluntarily report those practices. Accepted and feasible protocols for self-reporting by farmers employing BMPs or their agricultural consultants that qualify for pollution reduction credit in the Model will provide greater accuracy in evaluating Pennsylvania's progress toward its overall attainment of TMDL goals, and will more clearly identify areas of emphasis and priority in future activities and programs.

Current provisions of law would, however, deem any information provided through self-reporting or other similar reporting means as "public information" and subject to access by any individual who requests. The scope of access to information provided under the state's "right-to-know" laws have a hugely chilling effect on farmers' willingness to report, especially considering the authority provided in statute for citizens to initiate legal actions to enforce claimed violations of environmental laws.

Protocols for reporting and verification of self-reported information not financed by government sources provided effective protections in confidentiality of source and content of individual farm information reported, while attaining due credit in the Model for employment of those practices being performed. However, administration of those protocols was not simple or inexpensive, and most agencies are not legally provided similar ability to protect from public access the source and content of information. The Workgroup recommends revisions to state laws governing public access to information that would extend confidentiality and full exclusion from public access for any farm specific information reported by the agricultural industry and for any information reported in the course of any data reporting and collection initiatives established by the Commonwealth related to the performance of nutrient and sediment reduction activities.

4. Increased Technical Assistance in Design and Implementation of Agricultural BMPs: To achieve the degree of progress in implementation of agricultural BMPs necessary to meet our TMDL obligations, there will need to be an extensive expansion to our current technical assistance workforce and support tools. The agricultural industry relies on the expertise from both private and public sector entities to obtain the necessary technical and programmatic support they need to implement and maintain BMPs that effectively reduce nutrient and sediment loadings from farms. The selection and design of these BMPs is very site specific, and requires significant staffing and support tools to provide this site-specific direction. Likewise, in order to accomplish the compliance benchmarks recommended, substantially more technically qualified personnel are needed, both to review and determine the degree to which individual farms are meeting their environmental obligations and to assist farmers in meeting their obligations in an economically sensible way.

The need for increased technical staff may be reduced to some extent with a streamlining of the permitting process for performance of certain environmental protection and restoration BMPs such as riparian and streambank improvements. The permitting process currently used in authorizing implementation of these practices can be complicated, time-consuming and expensive. Accelerating and streamlining the process for permit approval of riparian and streambank improvement activity are important to support faster installation of BMPs and a reduction in amount of technical assistance time needed to implement these practices.

The Workgroup recommends levels of investment that will significantly increase number of available technical and oversight staff to assist farmers in effective BMP implementation and documentation, as well as a streamlining of the process for permit approval of stream protection and restoration BMPs that facilitate achievement of the goals of this report.

5. Advanced Soil Health Initiatives: While implementation of programs and activities that will highly ensure recognition and crediting for pollution reduction in the Bay Model must be a primary objective in Pennsylvania's WIP-3, it need not be the only objective. Recommendations offered earlier for conservation activities related to "soil health" were specific to measures recognized for pollution reduction crediting in the Bay Model but do not encompass the entirety of effective soil health initiatives that may be implemented on individual farms. Farmers who have engaged in more advanced soil health initiatives devised and tailored specifically for land and soil conditions on their farms have had impressive results in minimizing stormwater and nutrient runoff throughout the entirety of the farm's land area. And these initiatives have provided corresponding benefits to the farmer in improvement of soil quality and retention of nutrients that would otherwise need to be replaced through farm inputs. Despite the relative infancy in establishment of programs for advanced soil health management and despite absence of recognition of advanced soil health management in the Bay Model, we believe there is high potential for programs for advanced soil health management to greatly improve water quality and provide widespread economic benefits to farmers who participate in these programs. The Workgroup recommends establishment and commitment of funding for administration of initiatives to facilitate advanced soil health management on farms. The Workgroup also recommends the Bay Program office establish in the Bay Model a creditable BMP for implementation of advanced soil health strategies or plans on farms.

6. Innovative regulatory incentives for attainment of priority agricultural BMP implementation initiatives: One regulatory approach that has been employed to encourage area-wide implementation of priority environmental practices is to provide a temporary exemption of regulated parties from meeting new state regulatory obligations if they demonstrate those priority practices are being performed. This type of incentive program is most relevant where farmers require additional time than what is provided in state law to meet new or additional regulatory obligations. As priorities become more clearly identified in Pennsylvania's Phase 3 WIP, this approach may be effective in encouraging greater commitment of financial and technical resources for implementation of those "non-compulsory" priority environmental practices that more effectively move Pennsylvania toward attainment

of benchmarked practices and corresponding nutrient reductions identified in Pennsylvania's Phase 3 WIP. The Workgroup recommends consideration and implementation of this approach in administration of future regulatory actions.

7. Reevaluation of existing funding sources and their uses: The total estimated costs for attainment of benchmarks of agricultural BMPs recommended in this preliminary report (at present value) is over $326.9 million – a highly challenging figure for the agricultural sector to finance under current sources and criteria for expenditures of available funds. Yet compared with environmental effects of improvement and pollution control measures that other sectors are able to implement, agricultural environmental improvement measures still provide a much better environmental return in nutrient pollution reduction. And recent study and evaluation by Penn State's Center for Nutrient of Solutions of conservation measures performed in several Pennsylvania watersheds empirically confirm that the basic agricultural conservation practices historically believed to improve water quality are very effective in reducing nutrient pollution. Given the relative costs and benefits of agricultural practices versus other measures to achieve TMDL goals, the Workgroup believes and recommends an extensive and comprehensive reevaluation of existing environmental funding sources and criteria for project funding, for the purpose of redirecting significant sums and uses of funding under existing point source and nonpoint source programs to uses consistent with agricultural environmental improvement measures identified and supported in Pennsylvania's Phase 3 WIP.

8. Enhanced Nutrient Management Planning for Biosolids: More recently, there here have been significantly increased volumes of municipal biosolids being moved and land applied onto Pennsylvania's agricultural lands, including those agricultural lands in the Chesapeake Bay Watershed. While providing nutrient benefits to those farms that utilize biosolids, the increased presence of biosolids is adding to the nutrient management challenge that already exists on Pennsylvania's lands. Current regulatory standards require generators of biosolids to perform nitrogen-based nutrient management planning and implementation when land applying biosolids on agricultural land. The Workgroup believes and recommends that required management planning and implementation should be expanded to also include management of phosphorus consistent with the nutrient management planning standards established for animal manure.

9. Expanded Coordination of Joint MS4 and Nonpoint Source Nutrient Pollution Reduction Actions and Offsetting: The current geography of MS4-regulated areas provides little meaningful opportunity for regulated municipalities to meet their permit obligations within their regulated urbanized area. The Workgroup believes that greater effort should be made to develop strategies that will allow and encourage MS4-regulated communities to meet their permitting obligations through cooperative and integrated deployment of nutrient reduction practices on farms outside their borders, thereby reducing pollution footprint in the Bay watershed well beyond the municipality's immediate borders.

10. Coordinated Streambank Measures: The Workgroup believes that increased forested and grassed buffer efforts may also provide substantial opportunity for enhanced nutrient reduction benefit when coordinated with localized streambank restoration. The Workgroup recommends increased effort be made to evaluate the feasibility of state and local administrative programs for assessing and implementing where appropriate coordinated streambank restoration projects to compliment local forested and grassed buffer development, with engagement of necessary technical personnel in performance of that evaluation.

11. Increased and Extensive Focus in Legacy Sediment Programs: The continued analysis performed by Franklin and Marshall College of the proliferation of earthen dams created over a century ago in several southern-tier Pennsylvania Bay Watershed counties and the degree to which deterioration of these dams can and do collectively contribute to nutrient and sediment pollution in the Bay – particularly in Lancaster County – should provide both Lancaster and Pennsylvania a profound means to improve local water quality and get due nutrient reduction credit toward attaining TMDL goals. F & M's improvements in technology and principles of analysis relative to discovery and measure of trapped nutrients and sediment in earthen dams, risk of likelihood of individual dam breaches, and relative degree of occurrence of breach among individual dams should be widely accepted among academic peers. And projects for removal of legacy sediment and local stream restoration in areas neighboring the removed dam have shown to provide significantly lower costs with much lower impact in acreage in land affected, relative to more traditional land conservation practices to improve water quality. The Workgroup strongly recommends aggressive pursuit in Pennsylvania of legacy sediment reduction and restoration projects as an integral component of Pennsylvania's Phase 3 WIP. The Workgroup also recommends a much stronger support and backing by Pennsylvania in attaining due recognition of legacy sediment improvement projects as creditable BMP activities in the Chesapeake Bay Model.