Appendix A: Technical Requirements to Enter Agricultural Ditch and Drainage Management Practices in the Phase 6 Watershed Model

Version: ~~September~~ February 4, 2020 ~~2019~~ (Revised DRAFT for CBP and WTWG review)

Presented to the WTWG for Review and Approval:

Background: In accordance with the *Protocol for the Development, Review, and Approval of Loading and Effectiveness Estimates for Nutrient and Sediment Controls in the Chesapeake Bay Watershed Model* (WQGIT, 2015) each BMP expert panel develops a technical appendix to describe how the panel's recommendations will be integrated into the Chesapeake Bay Program's modeling and reporting tools including NEIEN, CAST and the Watershed Model.

Q1. How are these BMPs defined in the Phase 6.0 Chesapeake Bay Watershed Model?

A1. The panel's report describes many management approaches to agricultural ditch and drainage systems. The BMPs recommended by the panel for purposes of nutrient and sediment reductions in the Phase 6 Watershed Model are defined as follows:

Table A-1. Proposed CBP definitions for recommended agricultural ditch BMPs in the Phase 6 Chesapeake Bay Watershed Model.

BMP	Proposed CBP Definition
Blind inlets	Drain structure backfilled with pervious materials (gravel or sand) that filter drainage water prior to entering subsurface tile drain. Eligible when installed to replace existing tile riser.
Blind inlets w/ P-sorbing materials	Drain structure backfilled with phosphorus sorption material (PSM) solid media that filter drainage water prior to entering subsurface tile drain. Eligible when installed to replace existing tile riser.
Denitrifying Bioreactors	Structure that diverts agricultural tile-drainage water to pass through a media chamber filled with a carbon source for denitrification of dissolved nitrate to occur.
Monitored Denitrifying Bioreactor for spring or seep	Structure that diverts emerging groundwater to pass through a media chamber filled with a carbon source for denitrification of dissolved nitrate to occur. The treated flow volume and nitrate concentrations are directly measured to calculate the annual removal of N.
Drainage Water Management	The process of managing water discharges from surface and/or subsurface agricultural drainage systems, to raise and lower the water level within the soil profile

	throughout the year following an operation and maintenance (O&M) plan.
P removal systems	A landscape-scale filter that traps dissolved phosphorus from agricultural drainage water using phosphorus sorption material (PSM).
Monitored P removal system	A landscape-scale filter that traps dissolved phosphorus from animal production areas using phosphorus sorption material (PSM). The amount of phosphorus removed (lbs)
Saturated buffers	Diversion of tile-line flow to a subsurface, perforated distribution pipe used to divert and spread drainage system discharge to a vegetated area to increase soil saturation.

Q2. How will these agriculture ditch BMPs be simulated in the Phase 6.0 Watershed Model?

A2. The saturated buffer BMP is a *load source conversion* and *efficiency value* BMP that converts eligible crop load sources to Ag Open Space. The buffer then also reduces TN loads from upland acres by 20%; 10 upland acres are treated per 1 acre of saturated buffer. ~~.~~

All other recommended agriculture ditch BMPs described here are considered *efficiency value* BMPs, which reduce TN, TP or Sediment loads from eligible load sources according to the percentage values listed in Table A-2 below.

Q3. What are the TN, TP and TSS reduction efficiencies for agriculture ditch BMPs in the Phase 6.0 Watershed Model?

A3. Reduction efficiencies for each BMP are summarized Tables A-2.

Table A-2. Summary of recommended reduction efficiencies for agriculture ditch BMPs

BMP	NRCS P Code	Reduction efficiency			Application	Credit duration
		TN%	TP%	Sediment%		
Blind inlets	620, 606	0	40	60	Drained area (ac.)	5 Yr
Blind inlets w/ P-sorbing materials		0	50	60	Drained area (ac.)	5 Yr
Denitrifying Bioreactors	605	20	0	0	Drained area (ac.)	10 Yr

Monitored denitrifying bioreactor for spring or seep		Measured (lbs-N)	0	0	N removed (lbs)	Annual
Water Control Structures	587	0	0	0	--	--
Drainage Water Management	554	30	0	0	Effective Drainage Control Area (ac.) ~~Control Zone or Drained/Impacted Area (ac.)~~	Annual
P removal systems	782	0	50	60	Drained area (ac.)	4 yr*
Monitored P removal system for animal production area		0	Measured (lbs P)	0	P removed (lbs)	Annual
Saturated buffers	604	20	0	0	Drained area (ac.)	10 Yr

* P removal structures can theoretically be designed for any lifespan, but the panel recommends a credit duration of 4 years for design and for the Watershed Model simulation purposes.

Q4. What should jurisdictions submit to NEIEN to receive credit for agriculture ditch BMPs in the Phase 6 Model?

A4. For blind inlets or blind inlets with P-sorbing materials jurisdictions should report the following information to NEIEN:

- *BMP Name:* Blind Inlet OR Blind Inlet with P-sorbing materials
- *Measurement Name:* Drained Area (Acres) OR Count (number of eligible blind inlets) for conversion to acres at 1 acre per blind inlet
- *Geographic Unit:* Qualifying NEIEN geographies including: Latitude/Longitude; *or* County; *or* Hydrologic Unit Code (HUC12, HUC10, HUC8, HUC6, HUC4); *or* State
- *Date of Implementation:* Year the inlet was installed
- *Load Source:* All crop, pasture and hay load source groups; default is ~~CROP(?)~~AG

For denitrifying bioreactors, once the new recommendations are incorporated into the Model (see Q9 below), jurisdictions should report the following information to NEIEN:

- *BMP Name:* Bioreactor
- *Measurement Name:* Drained Area (Acres) OR Count [conversion to acres at 5 acres per 1 bioreactor]
- *Geographic Unit:* Qualifying NEIEN geographies including: Latitude/Longitude; *or* County; *or* Hydrologic Unit Code (HUC12, HUC10, HUC8, HUC6, HUC4); *or* State

- *Date of Implementation:* Year the bioreactor was installed
- *Load Source:* All crop, pasture and hay load source groups; default is ~~CROP(?)~~AG

For directly measured water spring bioreactors once the new recommendations are incorporated in the Model (see Q9 below), jurisdictions should report the following information into NEIEN:

- *BMP Name:* Monitored Spring Bioreactor
- *Measurement Name:* Pounds of nitrogen removed (lbs TN)
- *Geographic Unit:* Qualifying NEIEN geographies including: Latitude/Longitude; *or* County; *or* Hydrologic Unit Code (HUC12, HUC10, HUC8, HUC6, HUC4); *or* State
- *Date of Implementation:* Year the measured removal occurred
- *Load Source:* AG

For drainage water management, once the new recommendations are incorporated into the Model (see Q9 below), jurisdictions should report the following information to NEIEN:

- *BMP Name:* Drainage water management
- *Measurement Name:* Effective Drainage Control Area~~Zone~~ (Acres), a.k.a., Control Zone, Impacted Area, or Drained Area
- *Geographic Unit:* Qualifying NEIEN geographies including: Latitude/Longitude; *or* County; *or* Hydrologic Unit Code (HUC12, HUC10, HUC8, HUC6, HUC4); *or* State
- *Date of Implementation:* Year the practice was implemented
- *Load Source:* All crop, pasture and hay load source groups; default is ~~CROP(?)~~AG

For P-removal systems, once the new recommendations are incorporated into the Model (see Q9 below), jurisdictions can report the following information to NEIEN:

- *BMP Name:* P-removal system
- *Measurement Name:* Treated Area (Acres) OR Count [conversion to acres at 5 acres per system]
- *Geographic Unit:* Qualifying NEIEN geographies including: Latitude/Longitude; *or* County; *or* Hydrologic Unit Code (HUC12, HUC10, HUC8, HUC6, HUC4); *or* State
- *Date of Implementation:* Year the system was implemented
- *Load Source:* All crop, pasture and hay load source groups; default is ~~CROP(?)~~AG

For directly measured P-removal systems applied to animal production areas, once the new recommendations are incorporated into the Model (see Q9 below), jurisdictions can report the following information to NEIEN:

- *BMP Name:* Monitored P-removal system
- *Measurement Name:* Pounds of phosphorus removed (lbs)
- *Geographic Unit:* Qualifying NEIEN geographies including: Latitude/Longitude; *or* County; *or* Hydrologic Unit Code (HUC12, HUC10, HUC8, HUC6, HUC4); *or* State
- *Date of Implementation:* Year the measured removal occurred
- *Load Source:* Feedspace (permitted or non-permitted)

For saturated buffers, once the new recommendations are incorporated into the Model (see Q9 below), jurisdictions can report the following information to NEIEN:

- *BMP Name:* saturated buffer
- *Measurement Name:* ~~Drained Area (Acres)~~~~Acres~~Area of buffer (acres) ~~or~~OR length of buffer ~~in~~(linear feet); ~~(~~if linear feet is chosen, then NEIEN will assume that each project is 30 feet wide in compliance with NRCS Practice Code 604 and convert to acres~~)~~
- *Geographic Unit:* Qualifying NEIEN geographies including: Latitude/Longitude; *or* County; *or* Hydrologic Unit Code (HUC12, HUC10, HUC8, HUC6, HUC4); *or* State
- *Date of Implementation:* Year the saturated buffer was implemented
- *Load Source:* All crop, pasture and hay load source groups; default is ~~CROP(?)~~AG

Q5. Are these agriculture ditch BMPs annual or cumulative?

A5. Drainage water management, ~~-~~Monitored Denitrifying Bioreactor for Spring or Seep, and Monitored P removal system for animal production areas are~~is an~~ annual BMPs. The other BMPs are cumulative.

Q6. What is the credit duration for these BMPs in NEIEN and the Watershed Model?

A6. The credit duration for each BMP is summarized in Table A-2.

Q7 How will practices in the NEIEN appendix map to the proposed Phase 6 BMPs once they are incorporated for the next milestone period?

A7. A crosswalk between the BMPs in the current NEIEN appendix and the proposed BMPs are summarized in Table A-3.

Table A-3. Summary of how practices will map to ag ditch BMPs, as proposed, once incorporated into NEIEN

BMP in current Phase 6 NEIEN appendix, if applicable	Associated FSA or NRCS practice code, if applicable	Current BMP associated with the NEIEN BMP (status if not "released"; unit)	Proposed BMP mapping to CAST when panel recommendations incorporated into model (unit)
Subsurface Drain	620	Soil Conservation and Water Quality Plans (DRAFT; feet)	Blind Inlet (acres)
Underground Outlet	606	Soil Conservation and Water Quality Plans (DRAFT; feet)	Blind Inlet (acres)
--	--	--	Blind Inlet with P-sorbing materials (acres)
Structure for Water Control Water Control Structure	587	Water Control Structure (count)	--
Water Control Structure RI		Water Control Structure (count)	Drainage Water Management (acres)
--	554	--	Drainage Water Management (acres)
--	605	--	Denitrifying Bioreactor (acres)

--	--	--	Monitored Denitrifying Bioreactor for Spring or Seep (lbs-N)
--	782	--	P-removal system (acres)
--	--	--	Monitored P removal system for animal production area (lbs-P)
--	684	--	Saturated buffer (acres)

Q8. Are these practices eligible throughout the watershed?

A8. Implementation of these practices typically occurs in poorly-drained areas of the Coastal Plain, but they may still be applicable in other regions of the watershed. Thus, the panel did not constrain the eligibility of these practices to specific hydrogeomorphic regions (HGMRs), with the understanding that the practices are not selected or implemented unless relevant drainage issues exist at a site.

Q9. When will the panel's recommended BMPs be incorporated into the Watershed Model, CAST and NEIEN for progress scenarios? Until then, are there "interim" versions of the practices available for planning scenarios?

A9. The partnership has agreed to incorporate new/revised data inputs or BMPs following a certain schedule that aligns with jurisdictions' development of 2-year milestones. The most recent deadline for new BMPs or data inputs passed in April 2019; the next opportunity to incorporate the panel's recommended changes will be in 2021, when the model is updated for 2022-2023 milestones. Until then, BMPs can only be added as "interim" for planning scenarios. "Saturated buffers," "denitrifying ditch bioreactors," and "sorbing materials in ag ditches" currently exist as interim BMPs within CAST for planning scenarios. New interim versions of the drainage water management and blind inlet BMPs will be added for planning scenarios in CAST.

Q10. What if the units in Table A-2 are unknown? For example, what if I only know the linear feet of the saturated buffer or the number of denitrifying bioreactors and not the requested buffer area or drained area?

A10. Default conversions can be made in CAST for the BMPs and units listed in Table A-4 below.

Table A-4. Summary of default unit conversion rates for agricultural ditch and drainage practices when preferred unit is unknown or for planning purposes

	Preferred reporting metric (unit)	**Alternate unit, if applicable**	**Conversion factor from alternate unit when preferred unit is unknown**
Blind inlets OR Blind inlets w/ P-sorbing materials	Drained area (acres)	Count (number of eligible blind inlets)	1 acre per blind inlet

Denitrifying Bioreactors	Drained area (acres)	Count (number of eligible denitrifying bioreactors)	5 acres per denitrifying bioreactor
Drainage Water Management	Effective control drainage area (acres)	N/A	N/A
P removal systems	Drained area (acres)	Count (number of eligible P removal systems)	5 acres per system
Saturated buffers	Area of saturated buffer (acres)	Linear feet of buffer	Assumes 30 ft width and converts to acres (length in linear ft x assumed 30 ft width of buffer); 10 upland acres are treated per acre of saturated buffer