APPENDIX G

Date: January 6, 2016

From: Tom Schueler
CBPO Stormwater Coordinator
Chesapeake Stormwater Network

To: Urban Stormwater Workgroup
Watershed Technical Workgroup

Re: Response to Comments on Street and Storm Drain Cleaning Expert Panel Report (Revised)

The Expert Panel Report was released on September 18, and a webinar was held on September 29 in which more than 30 individuals participated. The required 30 day comment period under the new joint BMP expert panel review process recently established by the WQGIT expired on Monday, October 19.

The following individuals and organizations provided comments as of October 23:

- Tom Maguire, Justin Shafer and Neely Law (members of expert panel)
- Unidentified individual on webinar
- PA DEP
- MDE SSA
- Chesapeake Bay Foundation
- City of Chesapeake
- Anne Arundel County, MD

This memo summarizes the comments received by the deadline, and presents a technical response. It is organized in three sections:

Section 1: Applicability and Qualifying Conditions for the Practice

Comment No. 1. *Does the storm drain cleaning credit apply to sediment removal operations that occur during ditch maintenance along open section roads?*

Response: No, it does not. The storm drain cleaning credit only applies to sediment and/or organic matter removed from within the storm drain system (i.e., catch basins, storm drain pipes and/or stormwater outfalls). Given its charge, the panel did not evaluate any research on pollutant removal achieved during rural or agricultural ditch maintenance or retrofits. Other ongoing expert panels and research projects are investigating possible practices to enhance nutrient and sediment removal in agricultural and roadside ditch networks.

Comment No. 2. *Does the storm drain cleaning credit apply to sediment removal operations that occur in open, concrete-lined conveyance channels?*

Response: Yes, the practice is very similar to storm drain pipe or catch basin cleaning and should be credited in the same manner. These channels are located downstream of catch basins and provide an additional opportunity to capture pollutant loads before reaching the urban stream network.

Comment No. 3. *Can a community earn the street cleaning credit if it sweeps municipal or commercial parking lots, in addition to streets and roads?*

Response: Yes, but generally only when advanced street cleaning technology is used on the parking lot. In the past, most parking lots were swept using older mechanical broom sweepers that earn low or zero credit under this expert panel's recommendation.

Allowing parking lot cleaning will require two minor edits to Appendix E "Technical Requirements to Enter Practice into Scenario Builder". The first involves determining whether parking lots will be assigned to the new transport land use in the Phase 6 CBWM (or not). The second will involve additional text on how parking lot cleaning effort needs to be reported to get credit (e.g., report acres of parking lot swept, and then convert back to lane miles using the 1 acre = 1 curb lane mile rule).

Comment No. 4. Can the street cleaning credit be applied to roads and streets without curb and gutters?

Response: The expert panel explicitly considered this issue, and determined that there was insufficient monitoring data to determine whether it was effective to sweep streets without curb and gutters. The panel reviewed one study on the topic which is presented on page 21 of their report, and is excerpted below:

> In general, curbs and gutters create a trap that retains sediment and organic particles where they can be effectively swept. Streets without curb and gutters do not have a trap at the pavement edge, and the adjacent pervious area may actually become a net source of sediment when it is mobilized by contact with a sweeper broom (Smith, 2002).

The panel recommended more research be conducted on the effect of sweeping streets and highway shoulders that lack curb and gutters. Until that data becomes available, streets and parking lots without curb and gutter are eligible for credit.

Section 2: Technical Comments on the Panel Report

Comment No. 5. *The expert panel report should include a review of the limited monitoring data on the pollutant removal performance associated with storm drain and catch basin cleaning, as well as provide some standard definitions for the storm drain cleaning practice* (Maguire).

Response: Agreed. A new Section 4.7 has been added that summarizes storm drain cleaning research, and additional storm drain definitions have been added to Section 2. Tom Maguire provided draft text for both sections, which is shown in blue font in the revised expert panel report.

Comment No. 6. *Should the panel have applied a sediment delivery factor to reflect that not all street solids will ever reach the storm drain system?* (MDE)

Response: The expert panel strongly concurs that only a fraction of the street solids picked up by sweepers would ever reach the Chesapeake Bay, due to their large particle size. This is one of the reasons why the panel eliminated the hopper method for earning street cleaning credit (see also response to Comment 10).

The panel directly addressed the street solid delivery issue by using the WinSLAMM model to quantify the fraction of street solid mass that is actually conveyed from the street to the storm drain and ultimately discharged from the storm drain pipe. The documentation report prepared by Tetra Tech (2015) provides specific details on how the particle size of street solids was accounted in the simulation model. In general, the model simulates the particulate concentration for each storm event, based on the rainfall depth, runoff coefficient, street solid particle size distribution and street delivery factor for a defined street system.

Consequently, the WinSLAMM model provides a more fine-grained simulation of street solids and suspended sediment dynamics that occur in streets, gutters, storm drains and outfall pipes (and explains why the projected sediment removal rates associated with most street cleaning scenarios is so low).

The sediment loads that are discharged from storm drain pipes are still subject to the edge of field sediment delivery factor in the phase 5.3.2 CBWM. The panel references this in section 3.4 of the report (page 16).

> It should be noted that not all of the sediment load generated from urban impervious cover actually reaches the Chesapeake Bay in the watershed model. The sediment loads at the edge of pavement are adjusted downward by a sediment delivery factor in the current version of the CBWM. For a more thorough discussion of the sediment delivery factor, please consult the discussion in SR EP (2014).

The specific mechanics of how sediment delivery ratios are calculated may change in the next version of the CBWM (e.g., adding more impoundments and reservoirs), but these details go well beyond the charge of this expert panel report.

Comment No. 7. *Given the large particle size distribution for street solids, and the preferential pickup of large particles by sweepers, how does this square with the fine particle size (clay/silt) measured in the streams and rivers that flow to the Bay (MDE).*

Response: As noted the response to comment No. 6, the majority of medium and coarse-grained particles in street solids never reach the storm drain, stream network, or ultimately the Chesapeake Bay. The sediment reductions simulated by the WinSLAMM model primarily reflect the fine-grained particles that are observed at the river input monitoring stations further downstream (see also response to comment No. 10).

Comment No. 8. *Given the Figure 6 graphic showing poor pickup efficiency for regenerative air sweepers, why are they still considered an advanced cleaning technology ? (MDE)*

Response: MDE is correct when it notes that Figure 6 shows that regenerative air sweepers were not as effective as vacuum assisted sweepers in removing small sediment particles in the Selbig and Bannerman (2007) study. However, their study, as well as three other recent street cleaning studies, showed that regenerative air sweepers did have high sediment pick-up efficiencies which were generally comparable to those achieved by vacuum-assisted sweepers (Sorenson, 2013, SPU, 2009 and CSD, 2010). Consequently, the expert panel concluded that both qualify as Advanced Sweeper Technologies (AST) and thereby can earn higher pollutant removal rates than traditional mechanical broom sweepers.

Comment No. 9. *How did the panel evaluate street sweeping rates in the context of the role of downstream bank erosion in terms of the urban sediment load simulated by the Chesapeake Bay Watershed Model?*

Response: The panel acknowledges that downstream bank erosion in a major source of sediment loads in urban watersheds, as was established by the original Langland and Cronin (2003) report and validated more recently by a STAC research report (Sample et al, 2015). This important finding is implicitly addressed by the use of the Langland and Cronin curve relating urban sediment load to subwatershed impervious cover in the Version 5.3.2 CBWM (reproduced in Figure 1 of SR EP, 2013).

The USWG was recently updated on efforts to explicitly simulate how sediment loads might be allocated to upland areas versus the stream corridor in urban watersheds in the next version of the CBWM. The Center for Watershed Protection is testing several methods for doing so, and the decision to make any changes will be made by the Modeling Work Group, in conjunction with other stakeholders.

Predicting how these future modeling decisions will influence urban BMP removal rates (of any kind) is well beyond the scope of this or any other expert panel. The panel was not unduly concerned about how future modeling decisions might influence where urban sediment loads were generate, since they utilized an independent modeling approach to accurately define the upland sediment loads generated from streets.

Section 3: Panel Recommendations on Credits and Verification

Comment No. 10. *Could the panel document why the 2011 hopper credit for street cleaning was eliminated, since many communities would still like to report it?*

Response: The expert panel considered the hopper credit, but elected to eliminate it for both scientific and operational reasons.

Part of the scientific rationale for dropping the hopper credit can be found in response to comment No. 6, which describes how the particle size distribution of street solids influences how they are delivered to the storm drain system. This is also evident in Table 7, which shows the typical particle size distribution of street solids, based on a national data review. As can be seen, 90% of all street solids are either medium-grained (75 to 1000 microns) or coarse-grained (more than 1000 microns). Only 10% of the street solid particles are fine-grained silts and clays that can become entrained in the stormwater runoff and move easily through the watershed.

The panel felt the new street cleaning credit based on the WinSLAMM modeling was greatly superior to the hopper credit, since it has a stronger technically and empirical foundation, explicitly accounts for street solids delivery, and provides municipalities with a greater range of street cleaning practices in which they can earn credit. By contrast, the old hopper credit method is prone to errors, especially if users do not fully understand the importance of all of its qualifying conditions (e.g., applies only to streets that have curb and gutters, are swept bi-weekly or more frequently by advanced street cleaning technologies).

From an operational standpoint, the panel concluded it was poor practice to continue to offer two methods to calculate credit for the same practice. The existence of two methods creates confusion and could become a major source of reporting problems and submission errors.

The panel did recommend a two-year grace period before the mass loading method for earning street cleaning credit should be phased out. Additional justification for the phase out of the hopper credit is provided in Section 6.3.

Comment No. 11. *PA DEP is hesitant to accept the panel's endorsement of a new transport land use in the Phase 6 CBWM without additional documentation on how it might influence future urban loads and BMP efficiencies in the Commonwealth.*

Response: Section 8,4 was eliminated from the final text. The actual authority to make land use changes to the CBWM (or, for that matter, any other changes to the CBWM),is reserved by other management entities within the Chesapeake Bay Partnership, and not individual expert panels. The decision to proceed with a new transport IC land uses in Phase 6 of the CBWM was made earlier this year by the Land Use Working Group, Modeling Work Group and Water Quality Goal Implementation Team.

Comment No. 12. *PADEP does not support the panels proposed verification protocol involving a single annual sample for the street cleaning practice, as it too onerous and costly for small local governments to implement.*

Response: Verification is critical for annual operational practices such as street cleaning, since the degree of effort will change from year to year in response to budget resources, the size, age and technology of the local sweeper fleet and weather conditions.

The panel's street cleaning verification protocol (Section 7.2, page 47) recommends a single annual high quality sample of sweeper waste characteristics for each unique street cleaning practice (SCP) that is being claimed by the community. This verification approach was adopted in lieu of more stringent verification efforts that would involve measuring hopper loads or volumes after each daily street cleaning trip as originally suggested by some panel members.

The panel's verification protocol (a) provides greater transparency about what is actually being picked up off the streets within a community, (b) collects high quality data that can be shared among communities to further refine the street cleaning practice in the future and (c) requires limited resources in terms of costs for staff time and sweeper waste sampling.

Notes were added to the report to indicate that panel commendations on tracking and verification are advisory in nature, a**n**d are not binding on any state. Individual Bay states can provide alternate verification methods for street cleaning, as long as they satisfy the general verification principles agreed to by the Chesapeake Bay Program Partnership (CBP, 2014).

Comment No. 13. *Need to provide more technical support and sampling guidance on how to separate sediment from organic matter in the proposed verification method for the storm drain cleaning credit (e.g., sediment tends to stick to organic matter even when dried --Law).*

Response: The panel concurs that communities need more guidance on the sampling methods for the verification protocols for both street and storm draining cleaning, and has added some additional references. The panel recommended two initiatives to provide more technical guidance to help communities effectively implement the new credits. (Section 8.3, and excerpted below:)

- Develop more detailed sampling guidance and standard operating procedures to support the proposed verification protocols for street and storm drain cleaning.

- Establish a support website for MS4s across the Chesapeake Bay watershed on street cleaning, which provides updated guidance, standard reporting forms, a downloadable version of the spreadsheet, and list of sweeper models that are eligible for higher credit. The website might also include an interface for users and practitioners to share their verification samples.

Comment No. 14: *Suggest changing "may" to "should" when it comes to the list of street cleaning record-keeping requirements provided on page 47, and require MS4s to report the total number of street miles that could potentially be swept in their community at least once every permit cycle (Wood, CBF).*

Response: In general, the reporting, tracking and verification recommendations developed by the expert panel are advisory in nature. The Watershed Technical Work Group is the final arbiter of what is required to be reported in Scenario Builder to get credit for pollutant reductions in the CBWM. Likewise, the state stormwater regulatory agencies are the ultimate authority on what records MS4 must retain to substantiate their local street cleaning effort.

While the panel agrees that communities should evaluate their entire street network when analyzing which combination of street cleaning practices could maximize pollutant reduction credits, they did not want to impose this as a local requirement or permit condition. The panel also observes that measuring the total street mileage in a community is easier said than done, given that actual street ownership is split between many different federal, state, local and/or private entities.

References:

Chesapeake Bay Program (CBP). 2014. Strengthening verification of best management practices implemented in the Chesapeake Bay watershed: a basin-wide framework. Report and documentation from the Chesapeake Bay Program Water Quality Goal Implementation Team's BMP Verification Committee. Annapolis, MD.

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