MEMORANDUM

To:	Jason Widstrom, P.E. Department of Public Works City of Falls Church	From:	Doug Beisch, P.E. J. Alex Forasté, P.E.
Subject:	CITY MS4 TRACKING TOOL & CHESAPEAKE BAY PROGRAM BMPs	Date:	February 20, 2014

Background

The US Environmental Protection Agency (EPA) established the Chesapeake Bay Total Maximum Daily Load (TMDL) in 2010 as a "pollution diet" with accountability measures and initiatives established to restore the Chesapeake Bay. This "diet" requires a 25% reduction in nitrogen, 24% reduction in phosphorous, and 20% reduction in sediment over the baseline load. To address this, the Commonwealth of Virginia developed the Phase 1 Watershed Implementation Plan (WIP) in November of 2010, and the WIP Phase 2 in March 2012, which outlined how it would achieve these reductions. One of the plan components that the state committed small Phase II MS4s to was phased load reductions from existing land sources (retrofits) over three successive five (5) year permit cycles. This numeric requirement was embodied in the Chesapeake Bay TMDL Special Condition of the small MS4 general permit.

As a small MS4, the City of Falls Church is now tasked with the challenge of identifying load reductions from existing sources of at least 5% over the 2009 baseline year by 2015 in an Action Plan, with on-the-ground reductions achieved by 2018. At least 40% of the total on-the-ground load reductions must be achieved by 2023. While Virginia's small MS4 general permit did not outline detailed acceptable means and methods to achieve the reductions, the Virginia Department of Environmental Quality (DEQ) subsequently developed a draft guidance document that does. This document is titled *DRAFT Guidance for the Chesapeake Bay TMDL Action Plan*, and is in its third version as a draft form. According to DEQ, as of late February 2014, the guidance was under internal review and DEQ's plan "*is [to] finalize in April and provide a series of outreach meetings to MS4 permittees during June and July*".

The DEQ guidance incorporates several of the EPA Chesapeake Bay Program Office (CBPO) final approved reports that outline recommendations of how states can account for load reductions by stakeholders. The reports were developed by several Expert Panels, organized by the CBPO.

Introduction

Williamsburg Environmental Group, Inc. (WEG), now Stantec developed a MS4 Tracking Tool and Standard Operating Procedures (SOP) for City staff, in coordination with the City of Falls Church and the Chesapeake Bay Foundation. The spreadsheet based tool includes activities that are listed in the City's MS4 Program Plan. The intent is that the tool and SOPs will enable more regular updates of City MS4 related activities as they occur, which will in turn lead to more accurate record-keeping, a more robust program plan execution, and facilitation of annual report documentation.

The tool also includes multiple activities that are listed as Virginia Department of Environmental Quality (DEQ) and CBPO approved Best management practices (BMPs) that may contribute to the Chesapeake Bay TMDL load reductions. The purpose of this memo is to coordinate and match to the extent possible the City of Falls Church activities reported in the MS4 Tracking Tool with the acceptable means and methods and BMPs approved to reduce loads to understand the potential for existing City activities to contribute to required reductions.

While the DEQ Guidance has not yet been officially approved, it is the most authoritative and applicable reference document for the purposes of assessing acceptable load reduction methods for this memo. To meet the required reductions, Falls Church can implement BMPs that are in the Virginia Stormwater Clearinghouse or have been approved by the Chesapeake Bay Program Office. Depending on the BMP selected, the following methods can be used to estimate the pollutant of concern (POC) reductions to be credited:

1. Efficiency BMPs – To calculate the credits generated by structural BMPs, Falls Church may use, as applicable:

    a. the efficiencies in the Virginia Stormwater Clearinghouse;

    b. the retrofit performance curves provided by the Bay Program; or

    c. the approved or interim Bay Program efficiencies.

2. Land Use Change BMPs – Load reductions will be credited on a per acre basis. These credits can be calculated using the conversion table (See Table 2).

3. Urban Stream Restoration – load reductions should be estimated using either the appropriate methodology specified in the Chesapeake Bay Program Expert Panel guidance or current Bay Program interim values.

4. Virginia Nutrient Credit Trading Program – Falls Church may purchase credits from a nutrient credit bank approved by DEQ.

5. Nutrient Management – Nutrient Management can be credited when applied to unregulated land. Falls Church may not receive credit for nutrient management applied to regulate lands or golf courses.

6. Other BMPs Approved by the Director of DEQ.

A full list of the CBPO BMP Reports is provided in **Attachment A**. The status of each is listed, as only four are approved, but many are awaiting approval, in active development, or TBD. The following sections highlight individual line item activities listed in the City of Falls Church MS4 Tracking Tool that are potentially relevant and may allow the City to receive credit for Chesapeake Bay TMDL reductions.

Street Sweeping:
BMP VII.A

The City of Falls Church conducts street sweeping operations multiple times throughout the year to remove potential pollutants. In 2010, Falls Church reported that tandem sweeping occurs twice per month on all commercial streets, and once a month on all residential streets, municipal parking lots, and City-owned property yards. Documentation of these operations is reported in the Annual Report. The quantity of materials removed is calculated by multiplying the number of loads by the weight of the first load. Spoil materials are collected in a vacuum tank, stockpiled at the City property yard, and finally composted or sent to the regional landfill for disposal. Street sweeping operations currently has an interim CBPO established efficiency removal rate that is tentatively accepted by DEQ and creditable towards TMDL load reduction goals. The nutrient and sediment reduction efficiencies are as shown in Table 1 below.

Table 1. Chesapeake Bay Program Efficiencies for Street Sweeping Operations

Chesapeake Bay Program BMP	Total Nitrogen	Total Phosphorous	Sediment
Street Sweeping Mass Reduced per pound of sediment swept	0.18%	0.07%	100%

To understand the magnitude of sediment and load reductions that may be achieved using this practice, actual values from the City's Annual Report were applied to the above reported efficiencies. In 2010, the City of Falls Church reported removing 300 tons (600,000 lbs) of sediment via street sweeping operations. Using the Bay Program established efficiencies (See Table 1), Falls Church reduced the following amount of TN, TP, and Sediment:

- 600,000 lbs *100% = **600,000 lbs** of Sediment
- 600,000 lbs * 0.18% = **1,080 lbs** of Total Nitrogen
- 600,000 lbs * 0.07% = **420 lbs** of Total Phosphorous

It should be noted that an Expert Panel organized by the Bay Program is in the process of developing a guidance document for this practice and the interim values provided above may change. Though earlier deliberations and research were conducted, according to the CBPO calendar, the panel began its renewed research effort on street sweeping in September of 2013 and is currently conducting a literature review of existing published material. There are several potential changes that could occur. In addition to the possibility of the efficiency values themselves changing, it is also plausible that the panel will consider street sweeping practices prior to and after the 2009 Progress Run baseline year, and only grant credit for the "functional lift" or net difference, assuming it is a positive increase. This could have a significant impact on the ability of the City to receive credit for street sweeping.

The method of reporting may also change. Goulet, Chair of the CBPO Urban Stormwater Workgroup, recommended in 2011 two methods to compute projected nutrient reductions associated with street sweeping may be acceptable. The first, and most preferred method, is the mass loading approach. This is based on measured tonnage of sediment removed at the point of disposal, conversion of the mass solids to dry weight, and apportioning the fraction of fine sediments that represent total suspended solids (TSS). It was estimated that TSS may constitute between 10% and 30% of the total sediment. Nutrient content of the sediment was then estimated as 0.0025 lbs TN of dry weight and 0.001 lbs TP of dry weight. The second method, which has greater uncertainty, is the "qualifying street lanes approach". This method first estimates nutrient loads from the total impervious roadway areas swept. Then, depending on the type of

sweeping (mechanical or regenerative/vacuum) reduces the total load by a fraction to estimate the load removed. This method assumes bi-weekly sweeping and other factors.

In summary, there is great potential for street sweeping to assist the City of Falls Church with achieving Bay load reductions. However, there are several outstanding policy and technical decisions that can significantly alter the effectiveness of the practice for crediting purposes.

For more information, see **Reference Documents (7 and 8)**

Catch Basin Cleaning:
BMP VII.A

This practice is not explicitly included in the City's MS4 Tracking Tool, however it is closely related to the above street sweeping category and the concept is the same. Goulet (2011) noted that

> "*no Bay municipality cleans out its network of storm drain inlets or catch basins frequently enough to produce water quality improvements…However, it is clearly possible to implement a systematic, water quality-based storm drain cleanout program where quarterly cleanouts would be performed at targeted inlets with the highest accumulation rates.*"

The mass loading approach described in the above section may be used to quantify load reductions. The above statement is from the Chair of the Urban Stormwater Workgroup (not a guidance document). However recommendations for crediting this practice, concurrent with street sweeping, is under development by the Bay program.

For more information, see **Reference Document (7)**

Habitat Restoration Events:
BMP III.D

The City of Falls Church schedules and executes Habitat Restoration Events in City parks and public right-of-ways in or near stream corridors and flood plains. Activities involve the removal of harmful invasive species, planting and/or replanting with native species for the purpose of stormwater control, erosion control, and habitat restoration. The City reports the area of invasive plant removal, the area restored with new plantings, and the number and species of new plants.

Habitat Restoration can encompass a variety of acceptable BMP types already approved by the Chesapeake Bay Program and DEQ. These BMPs are grouped as either Land Use Change BMPs, Efficiency BMPs, or both. The following sections describe several DEQ tentatively approved BMPs with descriptions of how the specific Falls Church habitat restoration activities may be quantified.

Land Use Change BMPs

Land Use Change BMPs are credited by the number of acres converted. There are currently three types of land use changes that are applicable to urban lands and have been approved by the Bay Program and DEQ:

1.) Impervious Urban Surface Reduction;

2.) Grass Buffers; and

3.) Urban Tree Planting

Credits for this type of BMP can be calculated using Table 2 below in the Potomac River Basin. Falls Church may also receive credit for non-contiguous urban tree planting. In that case, 100 trees are equal to 1 acre of tree planting.

Table 2. Land Use Change Conversion Efficiency Table for the Potomac River Basin

Basin	Land Use from	Conversion to	Edge of Stream Reductions		
			TN (lbs/ac/year)	TP (lbs/ac/year)	TSS (lbs/ac/year)
Potomac	Impervious	Forest	13.91	1.80	1252.01
Potomac	Impervious	Grass	12.56	1.34	623.28
Potomac	Impervious	Pervious	6.75	1.42	1119.05
Potomac	Pervious	Forest	7.16	0.38	132.96
Potomac	Pervious	Grass	5.81	0.00	0.00

Falls Church should continue to check for updates to approved BMPs because the Bay Program Expert Panel continues to consider and approve more land use change BMPs, and Virginia has indicated, "*as more land use change types are approved [by CBPO], they may be employed by permittees*".

Forest Buffers

Forest Buffers can be credited as both a land use change and an efficiency BMP. The land use change component should be credited in accordance with the applicable section of **Table 2** above. The efficiency is applied at a 2-to-1 ratio for upland acres. For instance, if 1 acre of buffer is installed, the efficiency can be applied to up to 2 upland acres, provided (1) there are two upland acres that drain to the buffer and (2) stormwater drains to the buffer as sheetflow. The efficiency values for installed Forest Buffers are provided in Table 3.

Table 3. Efficiencies for Forest Buffers Applied to Two Upland Acres per Acre of Buffer

Practice	TN	TP	TS
Forest Buffer	25%	50%	50%

As an illustrative example, consider the following calculation:

Falls Church wants to install a 35' wide buffer along 311 linear feet of stream (.25 acres) to reduce Total Nitrogen loads at Edge of Stream (EOS). The land to be converted to a forested buffer currently is classified as urban pervious. Using the Chesapeake Bay Program Watershed Model Phase 5.3.2, the estimated Total Nitrogen loading rate in the Potomac River Basin from regulated urban pervious for all acres draining to the buffer is 10.07 lbs/yr. Because a forested buffer is a land change *and* an efficiency BMP, determining Total Nitrogen credit is a two-step process.

(1) Using Table 2, converting pervious surface to forest uses a conversion factor of 7.16 lbs/acre of Total Nitrogen yields the following:

7.16 lbs TN/acre * 0.25 acres = 1.79 lbs of Total Nitrogen

(2) In addition to the land change credit, Falls Church will also receive an efficiency credit. Upland acres are treated by forest buffers at a 2:1 ratio, which yields the following:

0.25 acres converted * 2 = 0.5 upland acres treated

With a removal efficiency of 25% for Total Nitrogen (See Table 3), the rate of nitrogen removed can be determined.

10.07 lbs TN * 25% = 2.52 lbs TN/acre

The amount removed can be calculated by multiplying the removal rate by the upland acres treated.

2.25 lbs TN/acre * 0.5 acres = 1.26 lbs TN

By combining the reductions as an efficiency and land change BMP, the total reduction yields:

1.79 lbs TN (land change) + 1.26 lbs TN (efficiency) = **3.05** lbs TN removed

Similar calculations can be made for TP and sediment.

Wetland Restoration

Wetland Restoration can be credited as an efficiency BMP. The Chesapeake Bay Program established varying efficiencies depending on the region. Table 4 below shows the established efficiencies for the applicable region for Falls Church.

Table 4. Chesapeake Bay Program BMPs, Established Efficiencies Regionally Impacted

Chesapeake Bay Program Hydrogeomorphic Region affected efficiencies				
BMP	**Region**	**TN**	**TP**	**SED**
Wetland Restoration	Coastal Plain Dissected Uplands Non-Tidal; Coastal Plain Lowlands Tidal; Coastal Plain Uplands Tidal; Coastal Plain Lowlands Non-Tidal; Coastal Plain Uplands Non- Tidal	25%	50%	15%

For more information, see **Reference Documents (1, 2 and 8)**

Rain Barrel Workshop:
BMP IV

The City of Falls Church schedules and executes Rain Barrel Workshops for its Citizens. While simply executing the workshop isn't enough to receive credit, Falls Church could potentially receive credit by tracking how many rain barrel systems were installed as a result of the workshop and used on a regular basis. The Virginia Stormwater Clearinghouse includes rainwater harvesting for capture and reuse as a Runoff Reduction Practice (RR). An established efficiency of up to 90% removal for TN and TP, as long as they are built to the Clearinghouse design specification and depending on water use, is possible. For any rainwater harvesting system not designed to the requirements of the Clearinghouse, Falls Church can use retrofit curves developed by the Bay Program.

Other important information the City would need to collect include:

- Whether the project is classified as a new development or redevelopment;

- Water Use by Homeowner;
- Total drainage area treated;
- Year installed

To receive credit for this practice, additional follow-up and tracking procedures would be required on the City's part to ensure actual use over time. For a complete list of accountability procedures, Falls Church should reference the Bay Program Approved Final Report for New State Stormwater Performance Standards.

For more information, see **Reference Documents (1, 8)**

Public Education and Outreach
BMP II.A – F.

The City of Falls Church utilizes multiple methods to educate the public about stormwater and nutrient management including locally distributed publications, posting downloadable information to the City website, broadcasting of Public Access television content, and preparation and distribution of brochures.

The Chesapeake Bay Program Expert Panel categorized education outreach methods for nutrient management as either:

- *Retail Methods*: (Also referred to as "Active Methods") Rely on direct engagement with individual property owners to develop Urban Nutrient Management (UNM) plans based on field visits, training and direct technical assistance. Another retail form of outreach is to encourage or require certification of commercial fertilizer applicators on appropriate UNM practices.

- *Wholesale Methods*: (Also referred to as "Passive Methods") Rely on media and/or social marketing campaigns that utilize a combination of TV, radio, internet, newspaper, billboard and other media methods to influence homeowner norms and awareness relative to desired fertilization behaviors.

The Panel concluded that there was no evidence that *wholesale* methods caused enough habit change among homeowners to receive nutrient reduction credit. Public education and outreach efforts currently conducted by Falls Church would be categorized as *wholesale*. *Retail* outreach and training showed the most promise to actually influence homeowners and change nutrient management habits. Consequently, they concluded nutrient reduction credits are available for Nitrogen and Phosphorous on a per acre basis for residential, commercial, institutional, or public land with qualifying UNM plans. These reductions were justified with 10 core UNM practices explained in detail in the Expert Panel Approved Final Report for Urban Nutrient Management (See Reference Document 3).

Falls Church could receive credit for reductions by utilizing *active* outreach methods and implementing UNM plans to interested landowners. Available reduction credits for Nitrogen and Phosphorous are below in Table 5 and Table 6, respectively. The Bay Program distinguishes between "high" and "low" risk lawns based on a "*range of landscape and behavioral factors that affect the relative risk of nutrient loss and therefore the effectiveness of urban nutrient management...*" to include slope/soil risk, fertilizer application rate, and lawn care practices. An estimated 80% of pervious land in the Bay watershed was considered to be in the "low" risk category, while 20% were considered "high" risk. If it is not feasible to distinguish lawn risk, a blended rate can be used.

Table 5. Nitrogen Reduction Credits for Qualifying UNM Per Acre of Residential, Commercial, Institutional or Public Land

Nitrogen Reduction Credits	
Turf Management Category	**Annual Nitrogen Reduction Rate**
Low Risk Lawns[1]	6% reduction of pervious load
High Risk Lawns[1]	20% reduction of pervious load
Blended Rate[2]	9% reduction of pervious load
[1] Regardless of fertilization regime (including non-fertilized lawns) [2] State-wide credit, assuming 80% of lawn acreage falls into the low category and 20% is high risk	

Table 6. Phosphorous Reduction Credits for Qualifying UNM Per Acre of Residential, Commercial, Institutional or Public Land

Phosphorous Reduction Credits	
Turf Management Category	**Annual Nitrogen Reduction Rate**
Low Risk Lawns	3% reduction of pervious load
High Risk Lawns	10% reduction of pervious load
Blended Rate	4.5% reduction of pervious load

A lower maximum removal rate is assigned to Phosphorous because only half of the 10 Core UNM practices listed work to reduce Phosphorous export, and reductions in Phosphorous fertilizer application area already accounted for by the state-wide Phosphorous reduction credit for pervious land.

Some key components of an acceptable UNM plan are listed below. For a complete list of UNM plan components, required record keeping, and the 10 Core UNM Practices, The Bay Program approved final report for Urban Nutrient Management should be referred to (Reference Document #1).

1. UNM plan be prepared by a trained expert;
2. Consistent with State applicable UNM practices;
3. Documentation of landowner and location;
4. Signed commitment by landowner to implement plan

For more information, see **Reference Documents (3 and 8)**

Other Acceptable BMPS Not Reviewed and Alternative Proposals

Other Acceptable BMPs not Reviewed

This memo focuses solely on the line item activities listed in the MS4 Tracking Tool spreadsheet that may qualify for credit. Accordingly, many other acceptable structural and non-structural practices that will commonly be used by other municipalities are excluded from this memo, including:

- Urban Stream Restoration; WEG prepared a white paper in October of 2013 to investigate and demonstrate the effectiveness of this practice, applying the Bay protocols to three case studies;
- Structural BMP Retrofits – the Stormwater (or BMP) Clearinghouse and most of the Bay Program BMPs;
- Environmental Site Design BMPs;
- BMP Enhancements or Conversions;

- Urban Nutrient Management – on unregulated lands;
- Nutrient Trading;
- Treatment Trains;
- Alternative Proposals

Alternative Proposals

The DEQ Guidance clearly states that: "*If alternative proposals are made, such proposals should be reviewed and accepted or denied based on their technical adequacy and compliance with appropriate laws and regulations*." This means that it may be possible for the City of Fairfax to incorporate other activities that are currently being completed, but not credited. For instance, while current City public education events are not currently credited towards Bay reductions, pet waste campaigns including the installation of pet waste stations in parks near waterbodies may qualify. Clearly, utilized pet waste stations reduce both bacterial loads, as well as nutrients in runoff from these areas. The challenge is quantify these reductions in a reliable way. Chesterfield County plans to conduct a baseline survey of waste in dog parks along the James River. Following installation of the pet waste stations, a second survey (same season) will be conducted to provide a comparative and quantifiable reduction of pet waste between the two periods. Recent research by the Center for Watershed Protection outlined a potential strategy to translate bacterial load reductions into nutrient load reductions.

A second example is the restoration of deep migrating headcuts in headwater streams, which contribute to significant sediment and nutrient export downstream. The current Bay protocols, specifically #1, does not adequately quantify sediment loss from these types of headcuts, as it only considers lateral erosion (instead of lateral and vertical) through use of the BANCS method. An alternate approach can more accurately represent the prevented sediment loss that would be realized by restoring a severely degraded headwater stream in such a condition.

These are two of potential alternative proposals that do not fit into the more traditional and/or approved BMPs, but may constitute an acceptable means and method to reduce loads, pending DEQ approval.

If you have any questions, please contact us.

STANTEC CONSULTING SERVICES INC.

J. Alex Forasté, P.E.
Phone: (804) 267-3474
Fax: (804) 267-3470
Email: alex.foraste@stantec.com

Attachment: (1) References
(2) EPA CBPO List of BMPs: Approved, Ongoing, and TBD

Reference Documents:

(1) Chesapeake Bay Program Office (CBPO). October 2012. *Recommendations of the Expert Panel to Define Removal Rates for New State Stormwater Performance Standards*. http://www.chesapeakebay.net/documents/Final_CBP_Approved_Expert_Panel_Report_on_Stormwater_Performance_Standards_LONG.pdf

(2) Chesapeake Bay Program Office (CBPO). October 2012. *Recommendations of the Expert Panel to Define Removal Rates for Urban Stormwater Retrofit Projects*. http://www.chesapeakebay.net/documents/Final_CBP_Approved_Expert_Panel_Report_on_Stormwater_Retrofits--_long.pdf

(3) Chesapeake Bay Program Office (CBPO). March 2013. *Recommendations of the Expert Panel to Define Removal Rates for Urban Nutrient Management*. http://www.chesapeakebay.net/documents/Final_CBP_Approved_Expert_Panel_Report_on_Urban_Nutrient_Management--short.pdf

(4) Chesapeake Bay Program Office (CBPO). May 2013. *Recommendations of the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects*. http://www.chesapeakebay.net/documents/Final_CBP_Approved_Expert_Panel_Report_on_Stream_Restoration_revised102813_LONG.pdf

(5) City of Falls Church. January 2014. Draft *MS4 Tracking Tool* spreadsheet. Department of Public Works.

(6) City of Falls Church. October 2012. *Small MS4 Program Plan - Annual Report – Program Year 4*. Department of Public Works.

(7) Goulet, N. 2011. Street Sweeping/BMP Era Recommendations. Letter addressed to CBPO Urban Stormwater Workgroup

(8) Virginia Department of Environmental Quality (VDEQ). October 2013. DRAFT Guidance for the Chesapeake Bay TMDL Action Plan, version 3. Water Division.

ATTACHMENT A. EPA Chesapeake Bay Program Office List of BMPs: Approved, Ongoing, and TBD

Workgroup: **Panel Chair (CH) Coordinator** **(CO)**	**BMP**	**BMP Status (new/ existing/ interim)** **Panel Start Date (Mo/Yr)**	**Panel Status**
Urban Tom Schueler (CO)	New State Stormwater Performance Standards (**REPORT**)	New 10/11	*APPROVED* (10/9/2012)
Urban: Tom Schueler (CO)	Urban Stormwater Retrofits (**Report**)	New 10/11	*APPROVED* (10/9/2012)
Urban: Tom Schueler (CO)	Urban Nutrient Management (**Report**)	Existing 12/11	*APPROVED* (3/11/2013)
Urban: Tom Schueler (CO) Bill Stack (CO)	Urban Stream Restoration (**Report**)	Existing 12/11	*APPROVED* (5/13/2013)
Agriculture: Jim Glancey (CH) Mark Dubin (CO)	Poultry Litter	N/A (Model data) 5/11	Panel membership chosen and developing volumetric database for historic and present poultry litter production
Agriculture: Chris Brosch (CH) Mark Dubin (CO)	Agriculture nutrient management, Precision/Decision Agriculture, and Enhanced Nutrient Management	Three existing and one interim 12/11	Short term recommendations for phase 5.3.2 Watershed Model (WSM) Approved by WQGIT, 10/15/2013

Agriculture: (Jack Meisinger (CH) Mark Dubin (CO)	Traditional and Commodity Cover Crops	Existing 02/11	Short-term recommendations for Phase 5.3.2 WSM Approved by WQGIT, 10/15/2013
Agriculture: Wade Thomason (CH) Mark Dubin (CO)	Conservation Tillage and Continuous No-till	Existing 02/12	Short-term recommendations for phase 5.3.2 WSM approved by WQGIT, 10/15/2013
Forestry: Sally Clagget (CO)	Urban tree planting/expanding tree canopy	Existing 03/12	Developing recommendations
Forestry: Sally Claggett (CO)	Riparian Forest Buffers	Existing 07/12	Developing recommendations
Urban: Tom Schueler (CO) Jeremy Hanson (CO)	Enhanced Erosion and Sediment Controls	Existing 07/12	Finalizing recommendations
Urban: Tom Schueler (CO) Cecilia Lane (CO)	Illicit Discharge Elimination	New 07/12	Developing recommendations
Urban: Sadie Drescher	Urban Shoreline Erosion Control Practice	New 01/13	Panel held first meeting January 2013
Urban: Neely Law (CO)	Urban filter strip.stream buffer upgrade expert panel	New 02/13	Panel held first meeting in February 2013
Urban:	Floating Wetlands	New 9/13	Literature review underway
Urban	Street sweeping (including catch-basin clean outs and bulk sediment removal)	Existing 9/13	Literature review underway
Wastewater: Mark Sievers (CO) Ning Zhou (CO)	Advanced onsite systems	New 01/12	Approved by WWTWG, 11/05/13
Watershed Technical: Sara Lane (CO) (Matt Johnston (CO)	Algal Turf Scrubbers	New 03/13	Panel developing recommendations

Agriculture	Manure Treatment Technologies	New TBD	
Agriculture	Animal Waste Storage	Existing TBD	
Agriculture	Manure Injection/incorporation	New TBD	
Agriculture	Cropland Irrigation Management	New TBD	
Agriculture	Agriculture Stormwater Management (including animal feeding operations (AFO) production area structures	New TBD	
Agriculture	Cropland Drainage phosphorous-sorbing materials	New TBD	
Agriculture	Heavy use pads (including poultry, concrete end, and litter load out)	New TBD	
Agriculture	Sink-hole grassed buffers	New TBD	
Agriculture	Vegetative Environmental Buffers (including wind breaks/plantings)	New TBD	
Forestry	Forest Management	New TBD	
Urban	Impervious disconnect	New TBD	
Urban	MS4 management measure	New TBD	
Wastewater	Advanced onsite systems, part 2 (broader view)	New TBD	