Disconnecting Existing Impervious Area Runoff from Stormwater Drainage Systems
Expert Panel

The Center for Watershed Protection, Inc. ~~submits the following proposal to Virginia Tech to~~ will assemble an Expert Panel to evaluate the nutrient and sediment removal and runoff reduction benefits associated with disconnecting existing impervious area runoff from stormwater drainage systems. The ~~proposed~~ scope and charge of the panel includes investigation into the following methods of crediting impervious disconnection, with more details described in the Charge below:

1. Disconnection to pervious areas that are amended with compost and/or vegetative plantings
~~2. Monitoring or modeling to document that existing impervious areas are already disconnected~~
~~3.~~2. Evaluation of the site and drainage networks to determine if it can be retrofited to achieve full or partial disconnection via soils modification, vegetative plantings~~, changes in flow paths and/or retention within the drainage network,~~ followed by modeling to determine the degree of disconnection based on a ~~if it achieves the full~~ disconnection benchmark established by the Panel.

The Center's experience with both the Chesapeake Bay Program (CBP)'s Expert Panel process and with design and performance evaluation of stormwater retrofits make the organization uniquely qualified for this work. The ~~proposed~~ Expert Panel's Charge, Panel Chair, Membership, Scope of Work, and Timeline are provided below.

Charge for the Expert Panel

This panel will evaluate the nutrient and sediment removal and runoff reduction benefits associated with disconnecting existing acres of impervious cover through several engineering and/or field assessment methods as defined within this Charge.

Background

Disconnecting impervious cover has proven to be ~~the potential to be a~~an excellent strategy to reduce stormwater runoff and ~~possibly~~ sediments and nutrients generated from urban land and the Chesapeake Bay Partnership has identified numerous practices that effectively disconnect impervious cover through the Expert Panel Process (e.g., urban filtering practices, urban filter strips, runoff reduction practices…). Using soils that have been modified to enhance their runoff reduction capabilities have not been considered among these practices. The Urban Stormwater Workgroup (USWG) has consistently voted this practice as a top priority for launching an expert panel to define its pollutant reduction capability.

During 2014, the USWG evaluated the potential to create a land use category to represent disconnected impervious cover in the Phase 6 Chesapeake Bay Watershed Model (CBWM), but concluded that available mapping and monitoring data could not accurately differentiate between connected and disconnected impervious cover at the scale of the Bay watershed at the present time (Sample et al, 2014, Tetra Tech, 2014). Consequently, the USWG did not recommend that a separate land use category be created for disconnected impervious cover in the next phase of the watershed model. This recommendation was subsequently endorsed by the WQGIT and Modeling Workgroup.

The preferred approach was to investigate methods to calculate credits for this best management practice (BMP~~), in one of two ways~~). The Panel can consider and modify these approaches based on available science and their best professional judgment.

> Direct or otherwise spread stormwater runoff from impervious cover of existing development (not new or re-development) to an acceptable area of pervious cover

where it may be effectively stored and infiltrated into the soil using protocols that have been explicitly developed by the Expert Panel that increase the infiltration capacity of the receiving soils such as deep soil tilling with compost augmentation. These protocols will represent an entirely new set of practices for treating urban runoff which involves changing the existing hydrologic properties of the soils receiving and generating runoff. In many cases, this will usually entail some modification to the soils of the pervious cover receiving the runoff, such as soil tilling, compost or other soil amendments, phyto-remediation or special plantings that can increase that can increase soil infiltration.[1] These modifications are needed because most urban soils have likely lost their original capacity to infiltrate runoff due to the mass grading and engineered soil compaction that has historically accompanied land development.

It is anticipated that relatively few parcels in the watershed will qualify for full disconnection. Therefore, the panel should explore a modified method whereby the site and drainage network are re-evaluated to determine if it can be effectively "retrofited" to achieve full disconnection via modifications to the soils or vegetation of existing pervious cover or changes in the flow path or retention within the existing drainage network. The cumulative effect of these modifications on the hydrologic response for the entire site would need to be documented using the Panel's recommended hydrologic engineering model(s) (i.e., achieving the full disconnection benchmark). The panel would then evaluate whether the existing retrofit adjustor curves would be suitable to assess the sediment and nutrient reduction potential for this new category of stormwater retrofit or whether some other methodology is preferable.

What is NOT within the scope of this expert panel

Several types of impervious cover disconnection have already been addressed by previous expert panels, and are therefore, outside the scope of this new impervious disconnect expert panel.

- Methods to disconnect impervious cover used to comply with new state stormwater performance standards for new development or redevelopment projects (e.g., multiple structural and non-structural practices to reduce runoff are already established by a previous prior expert panel).
- Homeowner BMPs such as rain gardens, rain barrels, dry wells and downspout disconnections that are used to retrofit existing residential properties (e.g., credits for these on-site retrofit practices have already been established by the retrofit expert panel).
- Urban filter strips, urban filtering practices, urban or agricultural stream buffers, and shoreline management practices that accept stormwater runoff from adjacent areas (e.g., credits and qualifying conditions for these types of runoff disconnection practices have already been established by previous expert panels).

In addition to the practices listed above, other ongoing or existing urban stormwater BMPs approved, or under review, by the Chesapeake Bay Program (CBP) are outside the scope of this expert panel, including bioretention and other infiltration practices as defined by the CBP.

Other Important Notes for Panel

[1] For example design specifications for soil amendments, see Chesapeake Stormwater Network (2013), Virginia Design Specification No. 4, available online at: http://chesapeakestormwater.net/wp-content/uploads/downloads/2014/05/VA_BMP_Spec_No_4_SOIL_AMENDMENT_FINAL_Draft_v2-0_01012013.pdf

During its deliberations, the panel is expected to be mindful that the disconnection practice is only proposed for Phase 6 of the CBWM, and not the current Phase 5.3.2. This is extremely important because the target sediment and nutrient loads for impervious and/or pervious cover may change as a result of future model calibration during the mid-point assessment, particularly if existing urban loads are shifted to new land use categories, such as the urban stream corridor. The impervious disconnect panel will need to closely liaise with the CBPO modeling team to make sure that their technical assumptions about urban loadings are consistent with these future modeling decisions.

Commented [JCH1]: If we are dropping the second approach for credit as a BMP, then we may not need to make this statement anymore. A new efficiency or a new category of retrofits could fit in the current model.

Commented [BS2R1]: Agree.

Expert Panel Chair:
Bill Stack, Deputy Director of Programs at the Center for Watershed Protection, will chair the Expert Panel on Impervious Disconnection (ID). Bill is a professional engineer with more than 35 years of experience in water resources management. As the Sediment Reduction and Stream Restoration Coordinator for the CBP for the past three years, Bill co-led the Expert Panel on Stream Restoration, led the development of revised recommendations on Stream Restoration for the "test drive period," coordinated the Urban Shoreline Erosion Control Expert Panel, and participated on the Urban Stormwater Retrofits and Nutrient Discharges from Grey Infrastructure Expert Panels. His CV is provided as an attachment to this proposal.

Expert Panel Membership:
The ID Expert Panel will include the following individuals who are recognized topic experts and have expertise in environmental and water quality related issues. The panelists have indicated their commitment to serve on the Panel with letters of support, which are provided as attachments to this proposal along with their CVs.

1. *Joe Battiata, Senior Water Resources Engineer, Center for Watershed Protection:* Joe is a professional engineer with 18 years of experience in stormwater management, including design and implementation of stormwater retrofits, development of design specifications for stormwater BMPs and computations to demonstrate compliance with stormwater regulations. Joe led the development of the BMP specification on impervious cover disconnection for the Virginia Department of Conservation and Recreation's Stormwater Handbook and was a member of the CBP Expert Panel on Urban Filter Strips/Stream Buffer Upgrades.
2. *Dr. Gregory Evanylo, Professor and Extension Specialist, Crop and Soil Environmental Sciences, Virginia Tech:* Dr. Evanylo has expertise in chemistry, bioavailability, transport and environmental effects of nutrients, trace elements, and organic matter in land-applied residual by-products. He is internationally recognized for his Extension programming and applied research on composting, nutrient management, and fate of carbon and metals in land-applied residuals.
3. *Jason Papacosma, Watershed Programs Manager, Arlington County, VA Department of Environmental Services:* Jason has 16 years of experience in all aspects of watershed and MS4 Permit management, including leading the County's effort to conduct retrofit inventories for all its watersheds, development of stormwater regulations, stormwater plan review, stormwater facility inspection, and water quality monitoring. He was a member of the CBP Expert Panel on Urban Stormwater Retrofit Projects.
4. *Steve Stewart, Natural Resources Manager, Baltimore County, MD Department of Environmental Protection and Sustainability:* Steve has 25 years of experience in all aspects of watershed and MS4 Permit management, including watershed management plans, monitoring, and TMDLs. He was a member of the CBP Expert Panels on Urban Stormwater Retrofits, Urban Stream Restoration, and Urban Filter Strips/Stream Buffer Upgrades.
5. *Ryan Winston, PE, Doctoral Student, Department of Biological and Agricultural Engineering, NC State University:* Ryan has extensive experience conducting research on the performance of a wide variety of stormwater BMP retrofits. He was a member of the CBP Expert Panel on Urban Filter Strips/Stream Buffer Upgrades.

6. *David Sample, PhD, PE, D. WRE, Assistant Professor and Extension Specialist, Virginia Tech:* Dr. Sample conducts research to improve the water quality performance of existing and new urban stormwater infrastructure.
7. *Franco Montalto, PhD, PE, Associate Professor, Drexel University Department of Civil, Architectural and Environmental Engineering:* Dr. Montalto**:** conducts research on runoff reduction performance of green infrastructure practices, and is co-chair of ASCE-EWRI Technical Committee on Low Impact Development Computational Methods.
~~7.~~8. *Justin Shafer, Environmental Engineer, City of Norfolk, VA:* In his role with the City of Norfolk's Department of Public Works, Mr. Shafer manages the City's compliance with the Chesapeake Bay and local TMDLs. He has experience on expert panels and extensive experience with BMP implementation and water quality improvement efforts in the Tidewater region.

In addition to the topic experts, the Panel membership will include a representative from the CBP Watershed Technical Work Group (WTWG) and a representative from the CBP modeling team, to be assigned by the CBP. An additional regulatory support person will be provided by EPA Region III. All Panel members will be asked to disclose any potential conflicts of interest prior to serving on the Panel.

Scope of Work:
The specific tasks to accomplish the project objectives are described below.

Task 1. Assemble Panel
The Center will work with the Panel Coordinator to draft the scope and charge of the Panel for review by the source sector Workgroups, the Water Quality Goal Implementation Team (GIT) Chair and Vice Chair, and the other GITs. The Scientific and Technical Advisory Committee (STAC) will also be afforded the opportunity to comment before final approval. The Center will revise the Panel scope and charge and membership based on input from these various stakeholders and will contact approved panelists about moving forward. A brief description of the key Panel roles is provided below:

- Panel Coordinator: The Panel coordinator will assist the Panel Chair and the Panel to help them deliver a quality report in the specified timeframe by providing logistical support (scheduling calls/meetings, operating webinar and conference lines, etc.) and strategic guidance on the expert panel process. He/she will also serve as liaison between the Expert Panel and the wider CBP partnership.
- Panel Chair: The Chair will be the chief strategist and panel lead. The Chair will work with the Coordinator and Panel members to assign specific tasks and ensure the Panel is on schedule. The Chair will use his/her expertise to facilitate productive technical discussions among the panelists. The Panel Chair and Panel members are responsible for developing the Expert Panel report that conforms in form and content 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* (CBP BMP Protocol).
- Panel Members: The Expert Panel is responsible for following the specific charge of the Panel, as well as adhering to the BMP Protocol. Panelists will participate and offer their own unbiased expertise and best professional judgment throughout the process, and will perform assigned or voluntary tasks that assist the development of the final Panel report.
- Modeling Team Representative: The modeling team representative will serve as liaison between the CBP modeling team and the Expert Panel, relaying and responding to questions that the Panel has for the modeling team regarding the simulation or incorporation of the BMP(s) into Phase 6 of the CBP Watershed Model, Scenario Builder, or other modeling tools.

He/she will also assist with the development of the Technical Appendix, which accompanies each Panel report.

- WTWG Representative: The WTWG representative serves as a Panel member to offer his/her expertise with BMP tracking and reporting, which is a crucial piece of the Panel's final report.
- EPA Region III Representative: This representative will serve as a resource for regulatory questions that may arise during the Panel's work.

Panel support will be provided by the Center for Watershed Protection staff Reid Christianson, who will assist with literature review and synthesis as well as review of modeling/monitoring approaches to document disconnection.

Task 2. Literature Review and Synthesis

The Expert Panel chair will coordinate a review and synthesis of the literature (published/academic and gray literature) on the nutrient, sediment and runoff reduction performance of ID. The literature search will focus on the following major research questions:

1. What existing methodologies (models, etc.) are available to assess the degree of impervious disconnection?
2. What is the nutrient, sediment and runoff reduction performance of soil/vegetative/hydrologic modifications to pervious areas that accept runoff redirected from existing impervious cover?
3. How do site, design and maintenance characteristics (e.g., slope, size of impervious area, soil type) affect this performance?

The Panel will search for relevant academic literature through university databases that provide access to numerous journals in the ecological, hydrologic, engineering and biological sciences. Internet searches will also be conducted to look for other relevant materials such as technical reports, state/local stormwater manuals, or impervious cover based-TMDL plans that may provide documentation of methods to assess impervious disconnection. The abstracts of all relevant articles will be obtained and read and, if the data presented is relevant to the research questions, the publication will be obtained and entered into a catalog. Articles will be cataloged with complete reference information. The Panel Chair and Coordinator will determine the interface most suitable to share publications with the Expert Panel (i.e., Sharepoint or other web-based sharing software)

All of the literature entered into the catalog will be read to extract key information and to make an assessment of the study's relevance as well as the reliability of the resource. Key information that will be summarized includes: type of study, methods used, timeframe, geographic location, and relevant findings, including ancillary benefits of the BMP. Where studies with negative pollution reduction data are found, they will be considered the same as all other data. Data sources will be characterized according to the data source characterization matrix and other considerations described in the CBP BMP Protocol in order to determine how much influence (i.e. 'weight') the data should have on resulting estimates. A summary report will be developed that synthesizes the major findings of the literature review.

Task 3. Panel Meetings

The Panel Chair will convene up to eight Panel meetings, including a stakeholder forum, to facilitate productive technical discussions among the panelists. Meetings #2 and #6 will be held at the CBP in Annapolis and the rest will be held by telephone conference. The Panel Chair will prepare materials for presentation at each Panel meeting and identify key questions to guide the discussion. At least one Panel meeting will be dedicated to review/discussion of the literature review results and one meeting will be centered around preliminary (strawman) recommendations for developing effectiveness estimates.

The second Panel meeting will be dedicated to an open stakeholder forum where interested parties, other than the Expert Panel members, can share and present scientific data with the Panel members. The intent is to provide an open exchange of information that may help inform the Panel as it moves forward with its deliberations. The Center will lead the Forum, which will be a half day meeting to be held at the CBP in Annapolis. At this meeting, the Panel Chair will present the charge of the Panel and will solicit feedback from attendees on specific issues to address with the Panel and relevant resources and research. The first part of the meeting will be open to stakeholders and the second part will constitute just the Panel members.

Task 4. Develop Report
The Expert Panel will use the literature synthesis and results of discussions at Panel meetings to develop a draft report that includes the following:

- Identity and expertise of Panel members
- Practice name/title and detailed definition
- Recommended nitrogen, phosphorus, sediment loading and runoff reduction effectiveness estimates
- Justification for the selected effectiveness estimates, including a list of references used and a detailed discussion of how each reference was considered, or if another source was investigated, but not considered.
- Description of how best professional judgment was used, if applicable
- Land uses to which the BMP is applied
- Load sources the BMP will address and potential interactions with other practices
- Description of pre-BMP and post-BMP circumstances, including the baseline conditions for individual practices
- Conditions under which the BMP works/does not work/or varies in its effectiveness
- Temporal performance of the BMP including lag times between establishment and full functioning (if applicable)
- Unit of measure (e.g., feet, acres)
- Locations within the Chesapeake Bay watershed where this practice is applicable
- Useful life; effectiveness of practice over time
- Cumulative or annual practice
- Description of how the BMP will be tracked, reported, and verified:
- Suggestion for a review timeline
- Outstanding issues that need to be resolved in the future and a list of ongoing studies, if any
- Documentation of any dissenting opinion(s) if consensus cannot be reached
- Operation and maintenance requirements and how neglect alters performance
- Any ancillary benefits or unintended consequences beyond impacts on nitrogen, phosphorus and sediment loads.
- A technical appendix that describes changes that will be made to the modeling and reporting tools to accommodate the BMP(s).

Task 5. Approval Process
The Panel Chair will work with the Panel Coordinator to go through the CBP review and approval process. This will involve presenting the draft recommendations to the Urban Stormwater Work Group (USWG), WTWG and the WQGIT and addressing and responding to any comments received during the comment period. The budget and schedule assume only one meeting with each workgroup plus two additional meetings with the Modeling Team if needed. Any additional meetings would be subject to additional expenses and an extension of the timeline. The Chair will seek the Panel's input in the event that significant comments are made, or major revisions are requested, as the report is reviewed by the CBP partnership. Although the Panel Chair and Coordinator are responsible for

managing the comment process, Panel members may be expected to address and respond to comments received during the comment period, as appropriate.

Project Timeline:
The project will be completed over a 12-month timeframe as shown in Table 1. The estimated start date for this work is May 2015.

Table 1. Project Timeline

Task	Key Deliverables	Completion Date (Months from Award)
Task 1. Assemble Panel	Final panel charge and membership	Month 1
Task 2. Literature Review and Synthesis	Catalog of research studies Synthesis report	Month 3 Month 4
Task 3. Panel Meetings	1st panel meeting 2nd Panel meeting and stakeholder forum 3rd Panel meeting 5th Panel meeting 4th Panel meeting 6th Panel meeting 7th Panel meeting 8th Panel meeting Minutes from the Panel meetings	Month 2 Month 3 Month 4 Month 5 Month 6 Month 7 Month 8 Month 9 Months 3-9
Task 4. Develop Report	Draft Panel report	Month 9
Task 5. Approval Process	Review and approval by USWG Review and approval by WTWG Review and approval by WQ GIT Final approved report with recommendations	Month 10 Month 11 Month 12 Month 12