Virginia Stormwater BMP Clearinghouse Committee Meeting

Virginia Department of Forestry Building, Board Room
Charlottesville, VA
September 10, 2009

Meeting minutes by Jane Walker

Committee Members Present
Dean Bork, Landscape Architecture, Virginia Tech
Gary Boring, New River-Highlands Resource Conservation and Development (RC&D) Council
Joanna Curran, University of Virginia (UVA)
Lee Hill, Virginia Department of Conservation and Recreation (DCR)
Julia B. Hillegass, Hampton Roads Planning District Commission (HRPDC)
Greg Johnson, PHR&A
Mary E. Johnson, Virginia Association of Soil and Water Conservation Districts (VASWCD)
Roy T. Mills, Virginia Department of Transportation (VDOT)
Doug Moseley, GKY & Associates, Inc.
David Powers, Michael Baker, Jr. Inc.
David Sample, Biological Systems Engineering and Occoquan Watershed Monitoring Laboratory, Virginia Tech
James Talian, City of Lynchburg

Department of Conservation and Recreation (DCR) Staff Present
Chuck Dietz
Ved P. Malhotra
John McCutcheon

Virginia Water Resources Research Center (VWRRC) Staff Present
Stephen Schoenholtz
Jane Walker

Others Present
Tom Fitzpatrick, Hydro International
Leslie Middleton, Rivanna River Basin Commission
John Newton, Henrico County
Glen Payton, Filterra
Scott Perry, Imbrium Systems, Inc.
Brian Wagner, Bolzer and Associates
Keith White, Henrico County
Laurel Woodworth, Center for Watershed Protection (representing Joe Battiata)

Call to Order and Introductions
Lee Hill, DCR called the meeting to order. Each person introduced herself or himself.

Minutes from June 11, 2009 Meeting

Jane Walker reviewed the minutes from the June 11, 2009 meeting of the Clearinghouse Committee and asked if there were corrections or additions. No changes were proposed to the minutes.

Presentation: "Quantifying Pollutant Removal of Stream Restoration/Stabilization Using Natural Channel Design Concepts"

Keith White and John Newton of the Henrico County Department of Public Works gave a presentation to the committee on their proposal to use stream restoration to improve stream water quality. They distributed a six-page summary handout for review by the members after the meeting (Appendix 1).

Keith White began by explaining why they wanted to quantify the benefits of stream restoration. He offered that today's stormwater programs – Virginia Stormwater Regulations, Virginia Pollution Discharge and Elimination System (VPDES) permits, and total maximum daily loads (TMDLs) – require measurable standards to show compliance. He stressed that compliance will require "innovative, out-of-the-box thinking and the use of all available tools." He added that quantifying the benefits of stream restoration is essential to promoting the practice as a feasible way to address both pollutant removal and stream protection standards. Keith concluded that being able to promote stream restoration as a two-pronged compliance tool (quality and quantity) would result in the repair of eroding stream systems that would otherwise remain unstable.

John Newton explained that streams are typically unstable in urban areas, and that streambank erosion is a large contributor of downstream sediment. Because sediment carries other pollutants, such as phosphorous and nitrogen, stopping sediment transport stops pollutant transport. He explained that natural channel design reconnects stream systems: base flow channel, bank full bench, overbank flood fringe, and the floodplain. He showed illustrations of examples of stream restoration projects in Henrico County.

John Newton offered that Henrico County is proposing a three-step process for quantifying pollutant removal using natural channel design:

1. Quantify the pollutants in the sediment;
2. Quantify the sediment moving downstream; and
3. Calculate the pollutants moving downstream.

They quantify the phosphorus (or other pollutant of interest) in the sediment by taking samples of soil from the stream banks along each proposed project and analyzing the soil samples for phosphorous content. Thus, each phosphorus load is specific to each site. They quantify the sediment moving downstream by using the Bank Erodibility Hazard Index (BEHI), which incorporates data from the project stream system. They calculate the pollutants moving downstream from the known volume of pollutants in the sediment multiplied by the known volume of sediment moving downstream results in the pollutants moving downstream: $P_{load} = Sed_{trans} * P_{sed}$

where

- P_{load} = Pollutant load moving downstream
- Sed_{trans} = Sediment transporting downstream
- P_{sed} = Pollutant in the sediment.

John Newton stated that TMDL modeling in Montgomery County, Maryland shows that overland flow is not the most significant part of the sediment load measured downstream. Instead, streambank erosion is the major source of downstream sediment. Montgomery County is estimating phosphorous loading from actual stream data collected in Maryland and Pennsylvania (with more data collection expected). He explained that Montgomery County has proposed the use of the pollutant load calculation, but although it looks promising, the process has yet to be accepted by the Maryland Department of the Environment and EPA.

John Newton concluded his presentation by requesting input from the Stormwater BMP Clearinghouse Committee and asked if evaluating this calculation method is something that the Clearinghouse Committee could work on. He suggested the possibility of working with Maryland and Pennsylvania to develop a multi-state approach. He requested approval from the committee for moving forward with the concept and asked if an interim approval could be a possibility. He suggested that in the future a similar approach could be used for other pollutants (e.g., nitrogen) and asked if stream restoration provides any runoff reduction credit.

General Discussion of Presentation

Lee Hill explained that the Clearinghouse Committee could discuss the proposed process and provide input, but that its approval was not needed for Henrico County to move forward in the development of the process. He suggested that Henrico County (or any other county, city, or town) could propose natural stream channel design as a BMP for offsite credits and submit it as part of its general permit package to the Board for approval. He added that streambank stabilization BMPs and other BMPs could be evaluated by the Clearinghouse Committee once the VTAP is developed and in place. If the processes are approved by the committee and DCR, they would be posted on the Clearinghouse website.

Specific Discussion of Presentation

Someone asked how Henrico County could tell where the total phosphorus (TP) concentration in the sediment originates, from the streambank or upland runoff. Lee Hill offered that in a study of more than 50 sites in the Chesapeake Bay watershed in which he participated, the streambank typically had lower phosphorus concentrations than did the runoff. John Newton added that the historic landuse likely influences the amount of phosphorus in the streambank, citing that in their study, the streambank in an agricultural area had higher TP concentrations.

One member suggested that instead of using BEHI, aerials could be used. Keith White suggested that the disadvantage of using aerials is that it would take five or six years to accrue the necessary data.

Someone asked about the accuracy of the BEHI model, citing its importance in the outcome of the calculation. A member explained that the model was developed in the west (Colorado), is very general, and uses both data that is and is not site specific. Another member with experience using the model in Virginia said he had found it to give conservative estimates, saying that it tends to underestimate phosphorus.

Two academics voiced support for the proposed idea and suggested that the method should continue to be improved as the science improves. A member suggested that the method might prove very useful in rural areas and encouraged the Clearinghouse Committee to look at the method in more detail. Another member offered that study of this proposed approach by the committee returns to the question: "What is the role of this Committee?" He voiced support for expanding the role of the committee beyond evaluating manufactured treatment devices (MTDs) to also include evaluating processes such as this one.

It was suggested the method could be used to earn credits that could then be sold. Thus the method could be used to fund a stormwater position. A member suggested that a self-funding banking process works well. Keith White suggested that pooling together money earned from various restoration sites could be used to tackle other stormwater issues.

Stormwater Regulations Update

Lee Hill provided an update concerning the proposed new stormwater regulations. He explained that the latest proposed regulations would be published in the *Virginia Register* in the next day or two and posted on the Virginia Townhall website. He encouraged the committee members to read it.

At the September 17, 2009 meeting of the Soil and Water Board, to be held at the VCU MCV-Campus Molecular Medicine Research Center (1220 E. Broad Street) in Richmond, DCR will inform the Board members of the proposed changes to the stormwater regulations. On October 6, 2009, the Board will meet at the Patrick Henry Building in Richmond to vote on the proposed changes. The public will have a chance to speak at both meetings. Lee reminded the group that as currently written, the proposed regulations do not become effective until July 1, 2010

Lee Hill explained that DCR personnel are drafting responses to the public comments received on the proposed regulations and highlighted some proposed changes to the regulations that have resulted from public input. The received comments and proposed changes primarily relate to the following topics:

- Proposed Regulations Possibly Encouraging Sprawl
- Regulations in the Non-Chesapeake Bay Portions of the State
- Offsite Options
- Need for "Grandfathering" for Approved Projects
- Inspection Requirements
- Water Quantity and Flood Protection Provisions
- Exceptions to the Regulations
- Fees

Lee added that in addition to responding to the comments, DCR is in the process of summarizing the comments and responses and organizing them into a table (This mentioned summary table was published by DCR on September 28, 2009. See Appendix 2).

Lee Hill also updated the group on the additions to the Stormwater Clearinghouse Website. He stated that the runoff reduction method is currently posted on the Clearinghouse Website. Also, as updates are being made to the handbook, these are being posted on the website. The revisions

to the stormwater handbook are not yet complete. The handbook is being reviewed and edited by a Handbook Committee and will need to be completed by July 1, 2010.

Status of Virginia Technology Assessment Protocol (VTAP)

Jane Walker provided an overview of the latest changes to the VTAP (Appendix 3). A section entitled "Acronyms, Abbreviations, and Symbols Used in this Document" was added on page 4. One committee member suggested that the term "TMDL" be added to the list.

Jane Walker explained that Section 1 was altered to include "treatment designs" in addition to MTDs (See subsections 1.2, 1.3, and 1.5). As an example, the purpose of the VTAP is "…for approving and listing manufactured treatment devices or treatment designs on the Virginia Stormwater BMP Clearinghouse for stormwater management." One member suggested that a sentence be included in Section 1.2 stating how the protocol could be used in support of TMDLs.

Section 2.2 -- Stormwater Runoff Peak Rate Control was added, and in Section 2.3 -- Stormwater Runoff Quality Control, the bulleted item entitled "Particle Size Distribution Target" is new. Table 1 was also developed and added to Section 2. One member noted that the subsections in Section 2 were incorrectly numbered within the document and in the table of contents.

Table 1. The range of targeted percentages for given particle sizes from stormwater influent and effluent for laboratory tests and field test sites.

Particle Size Range (μm)	Influent Percent by Mass (%)	Effluent Percent by Mass (%)
0-10	0-30	0-40
10-30	15-40	0-5
30-60	10-35	0-5
60-100	0-10	0-30
100+	0-10	0-100

Tables 2, 3 and 4, shown below, were added to Section 3 -- BMP Certification Designations. As recommended by the committee at the June meeting, these tables were included as general information in the section, and not listed under the subsection for pilot use designation (PUD). It was suggested to change Table 2, column three to read "TP or TSS or SSC." It was suggested to possibly remove the row about precipitation in Table 4, with one member noting that when field testing a device, the precipitation distribution cannot be controlled. Jane Walker explained that this row was included in the table following discussions at the subcommittee meetings whereby devices tested under Type IA rainfall found in the Pacific Northwest (for TAPE certification) would not be expected to perform similarly under Virginia's conditions.

Table 2. Summary of the testing requirements for manufactured treatment devices to receive the pilot use designation (PUD), conditional use designation (CUD), and general use designation (GUD) in Virginia.		
Certification Level	Testing Required to Receive Certification	Test Parameter Required to Receive TP Certification
PUD	Full-scale Lab or Field	TP, TSS, and/or SSC
CUD	≥ 2 approved field sites	TP, TSS, and/or SSC
GUD	≥ 5 approved field sites	TP

Table 3. The number of installations allowed in Virginia and the testing requirements for manufactured treatment devices certified in Virginia at the pilot use designation (PUD), conditional use designation (CUD), and general use designation (GUD).				
Certification Level	Maximum Number of Installations Allowed in Virginia	Minimum Number of Field Test Sites	Assumed TP Performance Credit	Parameter to be Tested at Va. Sites
PUD	5	2 approved sites needed for CUD; 5 approved sites needed for GUD	Variable (≥ 20%)	TP
CUD	15 (total includes any PUD installations)	5 approved sites for GUD	Variable (≥ 20%)	TP
GUD	No Limit	None	Based on Field Test Results	None

Table 4. Urban stormwater test conditions for certification in Virginia.	
Condition Influencing Stormwater	Test Conditions
Precipitation	Type II Distribution (Distribution obtained at NOAA Atlas 14)
Temperature	26.0°F-86.1°F Long-term Monthly Average 44.6 °F-66.7°F Long-term Annual Average (From Virginia State Climatology Office: http://climate.virginia.edu/virginia_climate.htm)
Particle Size Distribution	Refer to PSD Target in Section 2.3 – Stormwater Runoff Quality Control

One member questioned the value of testing MTDs since only 30% of the products installed in Virginia during the test period are to be tested. He noted that manufacturers will need to spend lots of money so that we can be confident that the product works 30% of the time. He suggested

instead the use of lab test results. Another member voiced opposition to such an approach, stating that MTDs function and perform very differently in field situations compared to the lab setting.

A representative of a stormwater BMP manufacturing company who attended the meeting stated that the Clearinghouse Committee should seek input from 15-20 manufacturers about whether or not they could afford testing five products in order to receive a GUD. He explained that the TARP and TAPE methods cost his company $450,000 per site, and if they had to spend that much at five sites to receive certification in Virginia, they could not afford it. If approved, the proposed VTAP process would chase all manufacturers out of the state. A representative of a different manufacturing company stated that his company would need to invest over $1,000,000 for each device. Most of the treatment devices that his company sells cost $5,000 - $6,000 per product so they cannot earn enough to pay for the testing. He added that North Carolina only wanted testing at three sites, and no manufacturer has stepped forward in that state. A committee member who regularly monitors stormwater runoff asked why it costs so much for the manufacturers. She requested that the manufacturers develop a budget to educate the committee members on the expenses that lead to such high costs.

Lee Hill pointed out that Virginia is not requiring retrofits for poor-performing test sites, which would help reduce the potential costs of testing. A committee member added that Virginia will accept data from other states, which will reduce costs. In response, a representative of a manufacturing company stated that no other state requires phosphorus testing so they lack data. Lee Hill added that Virginia has had phosphorus in its regulations since 1990 so for 19 years manufacturers have known that Virginia needs phosphorus data.

The vendors stated that the currently proposed VTAP is a "non-starter" from a time commitment stand point, cost perspective, and the number of sites and rain events needed. One representative from a manufacturing company asked if the increase in testing at five sites would provide significantly more information than testing at one site. A committee member questioned that given the unpredictable nature of field testing and the variability associated with field test sites, could the committee really learn much from testing at five sites.

It was suggested that field test sites be established across Virginia whereby MTDs could be tested under "controlled field conditions" with rainfall simulators. It was suggested that the sites could be established in conjunction with the state's colleges and universities and students could monitor the results of the devices. Manufacturers would still need to pay for the monitoring, but it is expected to be less expensive than that anticipated under the currently proposed VTAP. Data could be collected in less time as well.

A committee member suggested that such sites could be used to compare two BMPs under the same conditions.

A vendor added that such sites could also be used to compare two non-proprietary BMPs. Another manufacturer added that he saw potential for such test sites as has been developed in New Hampshire. A third representative of a manufacturer pointed out that installing and uninstalling the devices at the test site would be a downside (extra expense) to the proposed plan.

One committee member voiced concern for using one site as a representative for all conditions in Virginia. He suggested that regional approvals be granted depending on the conditions under which the product was tested. He further suggested that test sites could be established at Old Dominion University, George Mason University, the University of Virginia, and Virginia Tech to cover all regions of the state. Another member suggested that the devices could be tested under different conditions at one site.

Following the general discussion, Lee Hill asked each committee member present if she or he had any significant changes or additions to the current VTAP document. Several stated that they had minor changes but nothing significant. Lee Hill stated that comments on the VTAP from the committee members should be sent to Jane Walker by September 28, 2009.

Lee Hill announced that Sections 6+ of the VTAP are currently under development by David Sample and a team of experts. He added that Sections 1-5 of the VTAP may be changed to reflect the testing procedure recommended in the later sections. DCR staff will review all sections and distribute an updated version to the committee members.

Registry of Manufactured Treatment Devices in Virginia

At the June meeting, it was suggested that a registry be added to the Clearinghouse for vendors to complete what their product is designed to do, how it is sized, and what parameters it targets. It was also suggested that vendors indicate where their devices are installed in Virginia.

At this meeting, the committee decided to move forward on the development of the registry. Jane Walker suggested that Appendix A of the VTAP could be modified and posted on the website so that the vendors could complete an online survey. It was suggested that a disclaimer be added so that localities know the devices have not been independently tested and approved in Virginia, but instead the vendors are voluntarily providing the information.

Next Meeting Dates:

The committee's next meeting is scheduled for December 10, 2009.

Adjourn:

With no additional business, the meeting was adjourned.

Appendix 1

Henrico County Presentation Handout

Quantifying Pollutant Removal of Stream Restoration / Stabilization Using Natural Channel Design Concepts

Quantifying Pollutant Removal of Stream Restoration / Stabilization Using Natural Channel Design Concepts

Goal

To develop a protocol to quantify the pollutant removal achieved by stream restoration / stabilization efforts that is based on accepted geomorphologic, biologic, and hydrologic criterion; and is implementable on a project specific basis in order to measure compliance with current and/or proposed stormwater management technical criteria.

Background

Henrico County successfully employs stream restoration as part of the County's Virginia Pollutant Discharge Elimination System (VPDES) General Permit for Discharges of Stormwater from Large/Medium Municipal Separate Storm Sewer Systems (9 VAC 25-31-10 et seq.) in accordance with the current water quality criterion of the Virginia Stormwater Management Program (VSMP) Permit Regulations (4VAC50-60-10 et seq.) and the Chesapeake Bay Preservation Act and accompanying Regulations. This program has been reviewed and determined to be consistent with the requirements at that time by the Virginia Department of Conservation and Recreation (DCR) and the former Chesapeake Bay Local Assistance Department.

Looking forward, stream restoration/stabilization using natural channel design concepts is proposed as a tool for compliance with the draft water quantity criteria in the proposed VSMP Permit regulations (4VAC50-60-66). These types of projects also result in stormwater quality benefits by eliminating channel erosion and the accompanying transport of nutrients bound in the channel sediment (which has been identified as a significant source of sediment and nutrient load to the Chesapeake Bay and its tributaries) as documented in the County's existing program, and a growing body of quantitative data.

In addition, a natural or restored channel system uses vegetated overbank floodplain benches to convey larger storm events thus allowing for pollutant deposition and uptake by woody vegetation.

Also, stream restoration / stabilization projects may be the most beneficial and cost-effective retrofit management practice for meeting the newly issued MS4 permit required reductions of nutrients and sediments within impaired streams and waterbodies serving existing urbanized areas.

Therefore, Henrico County is seeking to implement a protocol based on available quantitative data for accurately documenting project specific water quality benefits resulting from stream restoration / stabilization management practices.

Methodology

Our proposal is to evaluate each stream restoration / stabilization project to determine the pollutant removal achieved by restoring / stabilizing the stream and eliminating a predominant source of phosphorus laden sediment – the unstable stream system. This evaluation involves 1) sampling the sediment in the streambanks to determine the phosphorus content, 2) conducting site specific assessment of the stream's potential erodibility and cross-sectional geometry, and 3) determining the sediment load reduction and associated phosphorus load reduction anticipated as a result of the stream restoration / stabilization project.

This methodology is illustrated through the following case studies:

Phosphorous in the Stream Bank

To determine the amount of phosphorous in stream banks, samples were taken at two representative sites. One is an urban watershed, Skipwith Site, and the other is a rural watershed, Nelson Site.

In both streams, samples were taken in four locations (A,B,C,D) within each cross section (See Fig 1).

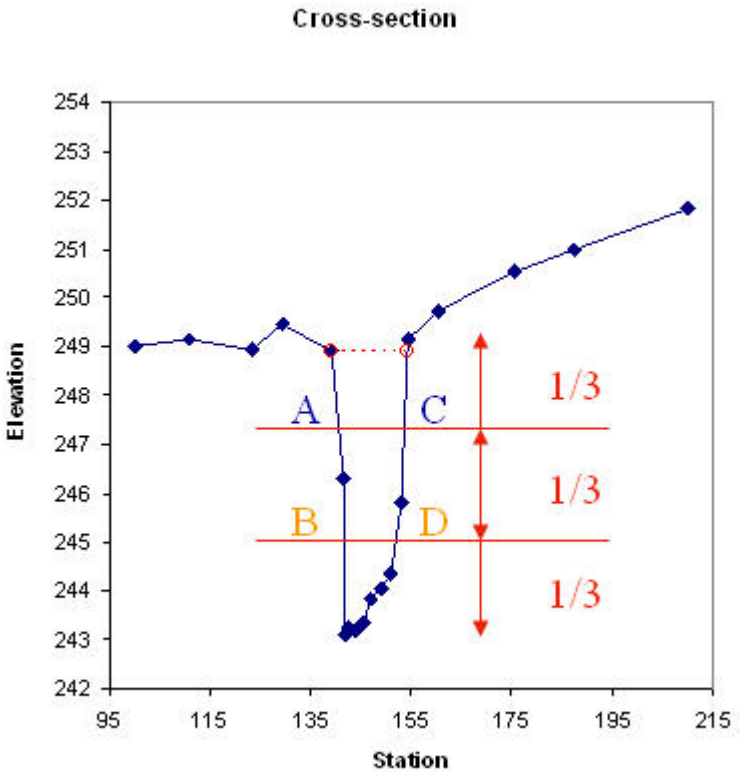


Figure 1

Cross sectional samples were taken at each distinctive reach along the stream (See Fig 2).

Figure 2 - Skipwith Site

The Skipwith Site results had an average concentration of 111 mg/kg (See Table 1 for complete results)

Date Received: 4/25/08 Date Reported: 04/29/2008

REPORT OF ANALYSIS

Page: 1

LAB NO.	SAMPLE ID	ANALYSIS	RESULT	UNIT	METHOD
8669	X1-A	Phosphorus	200	mg/kg	SW 846-6010B
8670	X1-B	Phosphorus	300	mg/kg	SW 846-6010B
8671	X1-C	Phosphorus	100	mg/kg	SW 846-6010B
8672	X1-D	Phosphorus	200	mg/kg	SW 846-6010B
8673	X3-A	Phosphorus	10	mg/kg	SW 846-6010B
8674	X3-B	Phosphorus	10	mg/kg	SW 846-6010B
8675	X3-C	Phosphorus	100	mg/kg	SW 846-6010B
8676	X3-D	Phosphorus	100	mg/kg	SW 846-6010B
8677	X6-A	Phosphorus	100	mg/kg	SW 846-6010B
8678	X6-B	Phosphorus	100	mg/kg	SW 846-6010B
8679	X6-C	Phosphorus	100	mg/kg	SW 846-6010B
8680	X6-D	Phosphorus	10	mg/kg	SW 846-6010B

ALE-MISC

Paul Chu, Ph.D.

Table 1

Using the Bank Erodibility Hazard Index (BEHI) to quantify bank sediment loads, the amount of Phosphorous moving downstream can then be calculated (See Table 2)

	BEHI Sediment Supply			TP
	ft^3/LF/year	Tons/LF/year	Tons/year	lb/year
Reach 1	0.30	0.02	1.5	0.60
Reach 2	1.20	0.06	54.0	5.94
Reach 3	0.74	0.04	25.7	3.98
		Total	81.2	10.52

Table 2 – Skipwith Site

Actual cross sectional data was collected and compared over an 8 month period at the Skipwith Site (See Table 3). This data was used to compare to the BEHI data. This comparison indicated that the BEHI method underestimated the sediment loss and added confidence to the conservative nature of the BEHI method.

	Surveyed Cross-Section Sediment				TP
	ΔX-Sect Area	Linear Dist.	Volume	Tons	lb/year
XS1	(-)1.3	95	(-)124	(-)5	(-)3.0
XS2	(+)1.3	268	(+)348	(+)14	(+)8.5
XS3	(+)1.4	303	(+)424	(+)17	(+)2.8
XS4	(+)5.8	328	(+)1900	(+)77	(+)12.7
XS5	(-)0.1	408	(-)41	(-)2	(-)0.4
XS6	(-)1.0	237	(-)237	(-)10	(-)2.2
		Total	(+)2270	(+)92	(+)18.4

The same data collection technique was done for the Nelson site. The Nelson site had an average concentration of phosphorous of 285 mg/kg, 251 tons/year of sediment load, and 143 lb/year of phosphorous moving downstream.

To compare the results we divided the results for each site per 100 feet of stream. Results are in Table 3

Site	Sediment Load	Phosphorous Load
Skipwith	4.64 tons/year/100ft	0.6 lbs/year/100ft
Nelson	2.79	1.59

Table 3

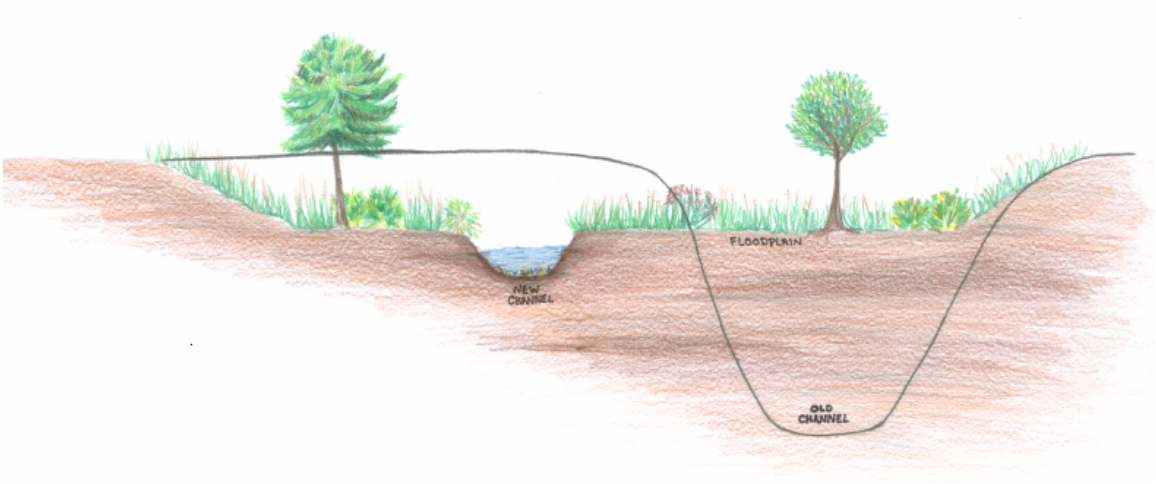
The results indicate that the urban watershed (Skipwith) had more physical erosion within the stream system, but that the rural watershed (Nelson) had a greater phosphorous concentration within the streambank sediments, and therefore the greater load.

Natural Channel Design (NCD) as a BMP

The streams in our urban settings are degrading. As new development is added to the previously unregulated existing developed areas, the previously stressed channel systems have continued to erode, regardless of new detention and peak rate control ordinances. Stream bank erosion is a large contributor, if not the largest contributor, to the documented downstream impairments related to sediment load. Therefore, restoring these stream systems will greatly reduce the sediment and the associated nutrient load to the recieving water bodies.

In addition, as demonstrated through the data, it is not solely the urban streams that must be addressed. Although urban streams exhibit greater magnitudes of erosion and sediment transport, the rural stream systems tend to contribute the larger nutrient loads. Stabilizing and restoring both the urban and rural stream systems is critical to improving water quality.

Reconnecting stream systems: the base-flow channel, bank-full bench, over-bank flood-fringe, and the flood plain is the key to protecting the channel through the entire flow regime and thereby reducing channel erosion, sediment transport, and by default pollutant transport. The data shows that NCD will reduce the sediment and phosphorous load originating within the stream systems. Establishing a straight forward process for implementing NCD will create an incentive for developers to dedicate resources to fix these degraded systems. Unfortunately, the current stream mitigation banking system makes it easier for development to purchase credits created elsewhere, than to actually fix streams within the affected jurisdiction or watershed.



Appendix 2

Virginia Soil and Water Conservation Board
Summary of Public Comment and Response

September 28, 2009

Virginia Soil and Water Conservation Board
Summary of Public Comment and Response
September 28, 2009

Pursuant to the Virginia Administrative Process Act [§ 2.2-4012 (E) of the Code of Virginia] and the Virginia Soil and Water Conservation Board's Public Participation Guidelines [4VAC50-11-50 (E)] you are being provided with this summary of the major issues raised by the public regarding the two stormwater regulatory actions concerning Parts I, II, III and Part XIII of the Virginia Stormwater Management Program (VSMP) Permit Regulations (4 VAC 50-60) and the Board's response to those issues. As required, this document is being sent to all those who commented on the proposed regulations during the public comment period. A more detailed document including all comments received and responses to them is available on DCR's website at http://www.dcr.virginia.gov/lawregs.shtml or by calling 804-786-6124 or by email to pam.landrum@dcr.virginia.gov.

Public Comment Status

During the 60-day public comment period that ran from June 22, 2009 to August 21, 2009, 3,421 comments were received on the two stormwater regulatory actions (Parts I, II, III and Part XIII). The comments included those received during the five public hearings held around the state, those submitted on Virginia's Regulatory Town Hall website, and those directly provided to the Department of Conservation and Recreation on behalf of the Board. A majority of the comments received were supportive of the proposed regulations; however, several key issues were raised that are reflected in the summary below. Please note that due to the large volume of comments received and the size of the comment document, we are providing you with a general summary of the comments and the revisions being recommended in the final regulations. As with the detailed comment document, the actual regulatory language for the recommended amendments will be made available at the website address noted above in advance of the October 5th Board meeting, where the final regulations will be considered.

Key Issues Raised on the Part I, II, and III Regulatory Action

Issue Raised: Proposed Regulations will lead to sprawling development patterns

Comments received from the public indicated that the Board should consider adding additional flexibility to the technical standards for small infill sites, redevelopment sites, or sites within locality designated Urban Development Areas (UDAs). The concern raised was that the new stormwater standards for water quality and quantity were going to be more difficult to achieve in urban areas (both redevelopment areas and UDAs) and on small parcels and could result in development moving to more rural locations to build, where it was suggested that the standards might be easier to achieve. Some commenters also suggested that as development density was increased, that achieving the standards would be more difficult thus resulting in less dense development, stale zoning, and a more sprawling growth pattern.

Summary of Draft Final Language:

- Land disturbance between 2500 sq. ft. and 1 acre in the Chesapeake Bay Preservation Act area would be held to the 0.45 lbs/ acre/ year phosphorus standard. (unless they are part of a "common plan of development" in which case, the "common plan of development" standard applies).
- A 10% reduction in phosphorus below the predevelopment load for redevelopment sites disturbing less than 1 acre would be required. The proposed standard of 20% shall remain the threshold for redevelopment sites disturbing greater than or equal to 1 acre.
- Within a UDA in the Chesapeake Bay Watershed (greater than or equal to 1 acre), a qualifying local program may establish with Board approval a standard between 0.28 and 0.45 lbs/ acre/ year phosphorus in accordance with specified factors set out in the regulation.

Issue Raised: Regulations should not apply the same stormwater quality standard in the non-Chesapeake Bay portions of the state as in the Bay Watershed

This issue was raised by commenters as the 0.28 lbs/ acre/ year phosphorus water quality standard was derived using the Chesapeake Bay Watershed Model and it was suggested that the standard was not applicable to the southern rivers (those river basins that do not drain to the Chesapeake Bay). Others suggested that the

standard was acceptable to apply statewide as they noted that stormwater is a real and growing threat to the health and integrity of Virginia's waters and the value of those waters to the citizen's of the Commonwealth. It was noted that some of the most biologically significant rivers and streams in the entire country exist outside of the Bay Watershed.

Summary of Draft Final Language:

- A 0.28 lbs/ acre/ year phosphorus standard applies in the Chesapeake Bay Watershed for new development; 0.45 applies for non-Bay areas.
- Localities which have lands that drain into both the Bay watershed and non-Bay watersheds may choose which standard to apply to non-Bay areas.
- Localities statewide may always elect to use a stricter standard. (ex: Swift Creek Reservoir in Chesterfield County which has a 0.22 phosphorus standard for residential development)
- Land disturbance between 2500 sq. ft. and 1 acre in the Chesapeake Bay Preservation Act area would be held to the statewide 0.45 lbs/ acre/ year phosphorus standard. (unless it is part of a "common plan of development" in which case, the "common plan of development" standard applies)

Issue Raised: Need for expanded availability of "offsite options" should the necessary reductions not be fully achievable onsite.
Developers wanted to ensure that an offsite strategy would exist should they not be able to meet their necessary reductions on site. Commenters recommended that the state institute a program with a reasonable and fixed cost to developers to create a "safe harbor". Some comments suggested that the funds should be expended on agricultural best management practices while others recommended that the funds be applied to urban retrofits or a blend of agricultural and urban options. There were suggestions offered that the state buy down option should only be allowed after all other local options are considered while others wanted this option to be available at all times.

Summary of Draft Final Language:

- Creates a new section numbered 4VAC50-60-69 that contains the following 5 offsite options:
  - **COMPREHENSIVE PLAN**: Maintains the proposed option where if a local comprehensive watershed stormwater management plan has been adopted by a locality for the area within which a project is located, then the development may be able to use offsite options to achieve all or part of the water quality and quantity technical criteria.
  - **LOCAL PRO-RATA**: Expands the use of this option currently contained in the proposed regulations. A locality may use a pro rata fee in accordance with § 15.2-2243 of the Code of Virginia or similar funding mechanism to achieve offsite the water quality and quantity reductions required. Participants will pay a locally established fee sufficient to fund improvements necessary to adequately achieve those requirements.
  - **DEVELOPER SITE**: Maintains the proposed option where if no comprehensive plan or pro rata program exists, or where a locality allows the use of this option, a development project may use offsite options to meet water quality technical criteria if they control or own property within the same HUC and modifies the language to specify that controls may also be located within the upstream HUCs in the local watershed that the land disturbing activity directly discharges to.
  - **NUTRIENT OFFSET**: Incorporates the new offset option passed by the 2009 General Assembly (HB2168). This option only applies to water quality requirements and is subject to stipulations in the legislation.
  - **BUY-DOWN**: Adds a new option to allow the developer at his discretion to meet the 0.28 lbs/ acre/ year phosphorus standard, where applicable, or pay the difference at a set fee per acre/per pound into a state fund. This option may be used where the other 4 options are not available, where the fee established by a locality to offset a pound of phosphorus removal on-site under their pro-rata program exceeds $23,900, or where a locality otherwise elects to allow the use of the option. In a UDA, the payment shall be $15,000 per pound of phosphorus not treated on site and in all other cases the payment shall be $23,900. Payments will be deposited to the Virginia Stormwater Management Fund. The Virginia Soil and Water Conservation Board shall establish priorities for the use of these payments by December 1 of each year (a list of priorities for consideration is provided). Amongst several specified priorities, at least 50% of the payments shall be used for projects to address local urban stormwater quality issues. Of the remaining funds, a priority for the purchase of nutrient offsets is established. Limitations on the use of this option are also provided.

Issue Raised: Need for "Grandfathering" for Approved Projects

A number of commentors expressed the need for project grandfathering as landowners and developers have invested significant time and money into zoning analysis and modifications, site and subdivision plans, construction of infrastructure, etc. all based on certain financial assumptions and computations established at the conception of the project. Suggestions were made from some to use elements of the state vesting law as a grandfathering standard. The comments offered a wide spectrum on the requirements where grandfathering should be considered (ex. zoning versus site plan approval versus general permit coverage) and a variety of dates were suggested by which the requirements need to be met by and for how long a project may remain grandfathered.

Summary of Draft Final Language:

- Establishes a new section on Grandfathering numbered 4VAC50-60-48.
- Establishes a Part II B that contains today's existing stormwater standards and labels the new water quality and quantity provisions as Part II A.
- Grandfathers projects under the Part II B water quality and quantity provisions that meet specified requirements from the vesting law as of the July 1, 2010 and that have obtained VSMP general permit coverage prior to July 1, 2010.
- Where these conditions are met, the project is grandfathered to June 30, 2014.
- If permit coverage continuously remains in effect, the project will remain subject to today's existing criteria until June 30, 2019.
- Should permit coverage not continuously remain in effect or if project construction continues beyond June 30, 2019, portions of the project not completed shall be subject to the new Technical Criteria (Part II A).
- Grandfathers a project that is part of a common plan of development or sale that received VSMP general permit coverage prior to July 1, 2010. In those cases, the same standard that applied to the common plan of development will apply to the land disturbing activity within it.

Issue Raised: Local Government concern regarding resources needed to meet inspection requirements

As the new regulations are expected to result in an increase in the use of small LID practices on individual lots (such as rain barrels, rain gardens, etc.), localities expressed concern that they would not be able to inspect all of these practices on the 5-year schedule outlined in the regulations. The commenters requested that amendments be made to limit the scope of required recurring inspections of residential properties and enforcement against residential property owners with small, decentralized stormwater management facilities.

Summary of Draft Final Language:

- Amends 4VAC50-60-124 (Stormwater Management Facility Maintenance) so that a maintenance agreement shall not be required for a stormwater management facility located on an individual residential lot, provided it is demonstrated to the satisfaction of the qualifying local program that future maintenance of such a facility will be addressed through a deed restriction or other mechanisms. Amends 4VAC50-60-114 (Inspections) to limit owner and locality inspections to only those for which a maintenance agreement is required. Authorizes a qualifying local program to develop a strategy for addressing maintenance of stormwater management facilities designed to treat stormwater runoff solely from an individual residential lot on which they are located, which may include periodic inspections, homeowner outreach and education, or other method targeted at promoting the long-term maintenance of such facilities.

Issue Raised: Concerns about the stringent nature of the Water Quantity and Flood Protection provisions:

Some commenters stated that the water quality standard will have perhaps even greater impact on development costs than water quality requirements and may increase the size of BMPs resulting in increased costs and loss of developable land and that changes to the standard be considered. Others noted that changes should be limited to those related to development on prior developed lands within a UDA that discharge to an unstable channel in order to encourage redevelopment within UDAs. In this situation it was recommended to improve upon the pre-developed condition rather than the forested condition.

Summary of Draft Final Language:

- Section 4VAC50-60-66 was modified to specify that stormwater discharged from a site to an unstable channel must be released at or below a "good pasture" peak flow rate condition, unless the pre-developed condition for the site is forest, in which case, the runoff from the site shall be held to the forested condition.
- Exceptions to the "good pasture" standard are provided for a land disturbing activity that is:
    - less than 5 acres on prior developed lands; or
    - less than 1 acre for new development.

  Under the exceptions, the sites are expected to improve upon the pre-developed runoff condition.
- Where localized flooding exists during the 10-year 24-hour storm, the post-development peak flow rate must not exceed the predevelopment peak flow rate based on "good pasture" conditions unless the pre-developed condition for the site is forest, in which case, the peak flow rate shall be held to the forested condition.
- Same as above, exceptions to this standard are provided to a land disturbing activity:
    - less than 5 acres on prior developed lands; or
    - less than 1 acre for new development.
- Under the exception, post-development peak flow rate for the 10-year 24-hour storm must be less than the predevelopment peak flow rate from the 10-year 24-hour storm.

Issue Raised: Exceptions to the Regulations:

Some suggested that there is need for greater specificity on when an exception is appropriate. It was noted that given that the permittee can find relief through the use of offsite controls, the granting of exceptions should be rare and that these regulations must establish a more detailed standard so that the local program can be evaluated in the appropriate use of exceptions. Some suggested that the local government should be allowed to require that the developer provide a contribution that represents the full opportunity cost of not providing stormwater management onsite.

Summary of Draft Final Language:

- Language was added to 4VAC50-60-122 specifying that any exception to the water quality technical criteria of 4VAC50-60-63 subdivisions 1 and 2 shall require that all available offsite options be utilized before an exception is granted and that any necessary phosphorus reductions unable to be achieved on site be achieved through a payment made in accordance with subsection B of 4VAC50-60-69.

Key Issues Raised on the Part XIII Regulatory Action

Issue Raised: Local share of fees may be insufficient to administer program:

A number of localities noted that the construction permit fees established were insufficient to cover their costs associated with plan review, permit issuance, and program administration and requested authority to establish fees above the baseline fees established in Part XIII. Some localities also noted that they would incur upfront costs associated with establishing a stormwater management program before fees became available.

Summary of Draft Final Language:

- Authority was provided in 4VAC50-60-700 for a qualifying local program to establish greater fees than those specified by in Part XIII should they demonstrate to the Virginia Soil and Water Conservation Board that such greater fees are necessary to properly administer the qualifying local program. It also specifies that any fee increases generated beyond those established in Part XIII shall not be subject to the fee distribution formula set out in 4VAC50-60-780.
- The Department is considering providing one-time grants to assist those localities that need to establish new stormwater management programs.

Appendix 3

Handout

Guidance for Evaluating Stormwater Manufactured Treatment Devices
Virginia Technology Assessment Protocol
(VTAP)

Guidance for Evaluating Stormwater Manufactured Treatment Devices

Virginia Technology Assessment Protocol (VTAP)

Prepared by:

Virginia Department of Conservation and Recreation

Research Protocol Subcommittee of the
Virginia Stormwater BMP Clearinghouse Committee

You can print or download this document from DCR's Website at:
http://www.dcr.virginia.gov

or from the Virginia Stormwater BMP Clearinghouse at:
http://www.vwrrc.vt.edu/swc

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Acronyms, Abbreviations, and Symbols Used in this Document

ASCE – American Society of Civil Engineers
BMP – best management practice
CD – compact disc
cfs – cubic feet per second
Clearinghouse Committee – Virginia Stormwater BMP Clearinghouse Committee
CUD – conditional use designation
D_{50} – mass median particle diameter (µm)
DCR – Virginia Department of Conservation and Recreation
e.g. – Latin *exempli gratia*, "for example"
EMC – event mean concentration
EPA – United States Environmental Protection Agency
ER – efficiency ratio
et al. – Latin *et alii*, "and others"
etc. – Latin *et cetera*, "and so forth"
gpm/ft^2 – gallons per minute per square foot
GUD – general use designation
GULD – general use level designation (from TAPE)
i.e. – Latin *id est*, "that is"
mg/L – milligrams (one thousandth of a gram) per liter
MTD – manufactured treatment device
µm – micron or micrometer (one millionth of a meter)
NJ – New Jersey
NOAA – National Oceanic and Atmospheric Administration
O&M – operation and maintenance
% – percent
PLD – pilot level designation (from TAPE)
PP – particulate phosphorus
PSD – particle size distribution
PUD – pilot use designation
QAPP – quality assurance project plan
SOL – summation of loads
SP – soluble phosphorus
SRP – soluble reactive phosphorus
SSC – suspended sediment concentration
SUP – soluble unreactive phosphorus
SWM – stormwater management
TAPE – Technology Assessment Protocol -- Ecology
TARP – Technology Acceptance Reciprocity Partnership
TER – technology evaluation report
TP – total phosphorus
TSS – total suspended solids
USEPA – United States Environmental Protection Agency
VSMP – Virginia Stormwater Management Program
VTAP – Virginia Technology Assessment Protocol
VWRRC – Virginia Water Resources Research Center
WQV – water quality volume

1 -- Introduction

The Virginia Department of Conservation and Recreation (DCR) evaluates and approves manufactured (proprietary) devices deemed to be reasonable methods of prevention, control, and/or treatment of stormwater runoff. Methods under consideration or approved by DCR are listed on the Virginia Stormwater Best Management Practices (BMP) Clearinghouse: http://www.vwrrc.vt.edu/swc. This document, the *Virginia Technology Assessment Protocol* (VTAP), describes the assessment process for listing manufactured treatment devices on the Clearinghouse.

Virginia DCR also publishes the *Virginia Stormwater Management Handbook* (DCR 1999). The handbook, currently being revised, provides information for stormwater management programs regarding basic hydrology and hydraulics, stormwater best management practice selection and pollution removal efficiencies, and administrative guidelines to support compliance with state stormwater regulations. A link to the handbook as well as additional information can be found on the Clearinghouse: http://www.vwrrc.vt.edu/swc.

1.1 – Authority

Virginia's stormwater management programs are implemented according to the Virginia Stormwater Management Law and Virginia Stormwater Management Regulations. The law is codified at Title 10.1, Chapter 6, Article 1.1 of the *Code of Virginia,* and the regulations are found at Section 4VAC50-60 of the *Virginia Administrative Code*. The Law provides authority for the Virginia Soil and Water Conservation Board to *". . . establish minimum design criteria for measures to control nonpoint source pollution and localized flooding . . . ."* (§10.1-603.4 2) and to *". . . [delegate to the Department (sic DCR) . . . any of the powers and duties vested in it by [the law] . . . ."* (§10.1-603.2:1.2). By extension, DCR thus maintains the authority to establish, approve and update standards and specifications of the best management practices (BMPs) that may be used within Virginia to control stormwater runoff.

Because treatment technologies are evolving rapidly, the DCR needs to be able to make changes to BMP standards and add new practices as new information becomes available. For this reason, DCR has partnered with the Virginia Water Resources Research Center (VWRRC) to establish the Virginia Stormwater BMP Clearinghouse Committee (Clearinghouse Committee). DCR staff and members of the Clearinghouse Committee have worked together to develop and design the Virginia Stormwater BMP Clearinghouse. The Clearinghouse (http://www.vwrrc.vt.edu/swc/) is where the approved list of BMPs – both public domain practices and manufactured treatment devices (MTDs) – and their associated standards and specifications are found. This guidance document shall be used to evaluate MTDs for certification in Virginia. These approved removal efficiencies will be the ones that state agencies and local stormwater management programs will recognize and approve when the devices are used in specific stormwater management plans.

This VTAP document was developed by the DCR and the Clearinghouse Committee in 2009 in anticipation of updated stormwater regulations in Virginia. The Clearinghouse is referenced within the VSMP Permit Regulations effective July 1, 2010.

1.2 -- Purpose of Virginia Technology Assessment Protocol (VTAP)

The purpose of VTAP is to:

1. Define the structure and procedures to follow for approving and listing manufactured treatment devices or treatment designs on the Virginia Stormwater BMP Clearinghouse for stormwater management.
2. Establish minimum monitoring guidelines and methods for evaluating and reporting on the appropriate uses of manufactured treatment devices or treatment designs for stormwater management.

DCR and the Clearinghouse Committee support the Technology Acceptance Reciprocity Partnership (TARP) and thus the *TARP Protocol for Stormwater Best Management Practice Demonstrations* (see the "TARP Protocol" section below). Use of the TARP Protocol, however, does not eliminate state review or approval of projects proposing to use TARP-certified stormwater management technologies, nor does it require Virginia to "rubber stamp" the approval or certification of another state. Those seeking reciprocal certification from Virginia of practices and methods previously certified by another state must still demonstrate consistency with the procedures articulated in this document.

The VTAP is an extension of the TARP Protocol and is specific to Virginia, which has established total phosphorus load limits. It provides a means to obtain a reasonable level of statistical confidence in the performance of a manufactured treatment device with respect to its operation and total phosphorus reductions. The VTAP defines a testing protocol and process for evaluating and reporting on the performance and appropriate uses of manufactured treatment devices that address post-construction stormwater runoff.

By obtaining accurate and relevant data, evaluators can assess performance claims and make informed decisions whether or not to approve manufactured treatment devices for use in Virginia. Local governments statewide can apply the use level designations listed on the Clearinghouse to evaluate the suitability of these devices for use in their communities.

TARP Protocol

For technology evaluations following the elements of the TARP Protocol, the state partners in California, Massachusetts, Maryland, New Jersey, Pennsylvania, and Virginia have agreed to:

1. Address technology review and approval barriers in policy and regulations that do not advance knowledge of a technology's performance or recognize innovative approaches to meet environmental protection goals;
2. Accept the performance tests and data, and acknowledge the approval results of a partner's review of a technology demonstration, as appropriate, in order to reduce subsequent review and approval time;
3. Increase expertise in the applications and advantages of technologies that may have superior environmental and economic benefits for controlling stormwater pollution;
4. Use the TARP Protocol, as appropriate, for state-led initiatives, grants, and verification or certification programs where the objective is to document performance efficiency and cost of best management practices;
5. Share technology information with potential users in the public and private sectors using existing state supported programs; and
6. Monitor and evaluate the results of using the TARP Protocol, and periodically review and revise the Protocol to maintain its viability.

The TARP Protocol describes a set of uniform criteria acceptable to the endorsing states. However, specific state requirements must be considered when applying for certification or verification of a stormwater BMP in a particular state. Each partner reserves the right to evaluate any application and request specific information in order to satisfy an individual state's requirements.

1.3 -- Applicability

This testing protocol is intended for detention, flow-based (volume and peak rate) manufactured treatment devices (MTDs) and designs and may not be suitable for all stormwater treatment practices. The protocol is NOT for use in the evaluation of erosion and sediment control technologies or products. This protocol is also NOT intended for conducting research on conventional/traditional (i.e., public domain) BMPs.

The assessment protocol deals with MTDs that are designed for (1) reducing stormwater runoff volume, (2) reducing peak runoff rate, and/or (3) reducing total phosphorus (TP). Devices designed to remove pollutants other than phosphorus (e.g., nitrogen, oil/grease/hydrocarbons, metals, bacteria, etc.) will not be certified in Virginia at this time. However, links to information about MTDs approved in other states for the removal of pollutants other than phosphorus will be provided on the Clearinghouse.

This protocol is not intended for conducting research on experimental devices. Technologies with limited data will only be evaluated for the **Pilot Use Designation** (PUD). The DCR will not consider an application for a **Conditional Use Designation** (CUD) or a **General Use Designation** (GUD) unless the application includes sufficient performance data that clearly demonstrate acceptable feasibility and the likelihood that the device will achieve desired performance levels using the manufacturer's recommended sizing criteria, pretreatment requirements, and maintenance schedule.

1.4 -- Roles and Responsibilities

1.4.1 -- Virginia Department of Conservation and Recreation (DCR)

The Virginia Department of Conservation and Recreation is responsible for the Stormwater Management Programs in Virginia (see **Section 1.1 -- Authority**). For this reason, the DCR may obtain recommendations from outside evaluators and the Clearinghouse Committee, but is ultimately responsible for granting or denying use designations.

The Department of Conservation and Recreation:

- Assumes the duties of the contracted evaluators (see below) when necessary;
- Grants use level designations;
- Approves extensions and changes made to use level designations;
- Provides oversight and analysis of all submittals to ensure consistency with the DCR's stormwater management requirements; and
- Reviews new information and updates the VTAP as needed.

1.4.2 – DCR's Contracted Evaluators

The DCR may contract with a qualified and independent individual or entity to assist with the assessment process.

When contracted, DCR's evaluators:

- Review all applications for completeness;
- Review all quality assurance project plans (QAPPs);
- Provide recommendations to the DCR for approval or denial of QAPPs;
- Review technology evaluation reports (TERs) for completeness and conformance with Clearinghouse procedures and protocols; and
- Provide recommendations and assessments to the Clearinghouse Committee and DCR regarding pollution removal efficiencies to assign to devices and whether or not to certify/approve devices at requested use designation levels.

1.4.3 -- Clearinghouse Committee

Members of the Virginia Stormwater BMP Clearinghouse Committee will review TERs and provide recommendations to the DCR. The reviewers represent both academics and practitioners that have experience with stormwater BMPs but are not affiliated with the proponent of the technology or other stormwater BMP manufacturers/vendors.

The Clearinghouse Committee:

- Interacts with the DCR staff to assess how well the VTAP process satisfies the DCR's stormwater treatment BMP selection objectives;
- Meets quarterly to provide oversight review of use level designation applications and technology engineering reports; and
- Provides recommendations and assessments to the DCR regarding pollution removal efficiencies to assign to devices and whether or not to certify/approve devices at requested use designation levels.

1.4.4 -- Virginia Water Resources Research Center

The Virginia Water Resources Research Center facilitates the VTAP review process by coordinating with the DCR and the Clearinghouse Committee.

The Virginia Water Resources Research Center:

- Develops and maintains the Virginia Stormwater BMP Clearinghouse under the direction of the DCR and the Clearinghouse Committee; and
- May facilitate outside research and evaluations, when requested, by coordinating with stormwater BMP designers, regulators, researchers, and manufacturers regarding the scientific review of existing BMP test data or new monitoring and testing.

1.4.5 -- Proponent of Technology

The proponent of the technology (MTD) refers to the person/company that is promoting the project through the VTAP process. The proponent can be the manufacturer, the product vendor, consultant, etc.

The proponent:

- Submits the use level designation application;
- Submits QAPPs for all field monitored test sites;
- Informs the DCR of changes in the QAPP; production, manufacturer standing, key personnel, etc.;
- Submits interim status reports; and
- Submits the TER.

1.4.6 – Proponent's Technical Advisor

The proponent's technical advisor provides outside, objective oversight of performance testing. This qualified technical advisor is paid for by the proponent of the technology and is not provided by the DCR, the DCR's contracted evaluators, the Clearinghouse Committee, or the VWRRC.

The DCR *requires* the use of a technical advisor for all applications: **Pilot Use Designation** (PUD), **Conditional Use Designation** (CUD) and **General Use Designation** (GUD). Independent consultation must begin at the onset of the testing program.

At a minimum, the technical advisor:

- Reviews and approves the QAPPs for all field-monitored test sites;
- Provides oversight of QAPP implementation at field-test sites by periodically inspecting site conditions, sampling equipment, sample handling, etc.;

- Prepares a TER that includes a summary of test results and research conclusions and compares these with the proponent's performance claims;
- Provides information about the technology to DCR and the Clearinghouse Committee to be included on the Clearinghouse.

1.5 -- Protocol Limitations, Release of Liability, and Disclosure

This protocol has been published for the purpose of evaluating or generating performance claim data for manufactured treatment devices and treatment designs for certification in Virginia for stormwater management. Neither the DCR; its contracted partners, including the VWRRC; nor the Clearinghouse Committee accept responsibility or liability for performance of stormwater technologies being evaluated using the VTAP.

2 -- BMP Performance Goals

2.1 -- Stormwater Runoff Volume Reduction

Runoff volume reduction is defined as the total volume of rainfall and runoff reduced through canopy interception, soil infiltration, evaporation, rainfall harvesting, engineered infiltration, extended filtration or evapotranspiration at small sites. Stormwater management experts throughout the United States, participating in a panel of experts for the National Academies of Science during the past two years (2007-2008), have recently recommended that stormwater managers should change our strategies for reducing pollution. Instead of relying simply on the various treatment processes employed in stormwater BMPs, we should focus our compliance criteria on reducing the volume of runoff. In response, the Virginia DCR has incorporated the **Runoff Reduction Methodology** as part of the Virginia Stormwater Management Program (VSMP) Permit Regulations. The intent of Virginia's Runoff Reduction Methodology is to (1) reduce the total volume of runoff carrying pollutants, and (2) to maintain predevelopment hydrology.

Pollution treatment is defined as the change in pollution concentration in runoff due to the treatment processes the practice incorporates. The **total pollutant load** removed by a practice is the product of the runoff volume reduction and the reduction achieved by the practice's treatment process(es). Virginia's new approach to water quality protection will, in fact, provide for enhanced pollution reduction as runoff volume is reduced and, in the process, accomplish a significant amount of groundwater recharge using the same BMPs.

Manufactured treatment devices for which the proponents desire to receive certification for runoff volume reduction must demonstrate the percentage of the total runoff flowing into the device that is removed from the flow prior to runoff exiting the device. Proponents must also demonstrate whether that removed flow is (1) permanently removed from the surface discharge (e.g., through infiltration into a stone base or soil beneath the device), (2) shunted aside temporarily for slower discharge following the storm event, or (3) is subject to some other specified process. Limitations of the device must be disclosed. For example, if site constraints prevent the use of the device in the Tidewater or karst regions of Virginia, this limitation must be stated.

Underground storage devices that provide only void space for water storage do not need to undergo the assessment process. If a device is used to reduce water volume and/or improve water quality, it will need to undergo the assessment process.

2.2 -- Stormwater Runoff Peak Rate Control

Peak rate control is defined as the process of controlling or reducing the maximum discharge of stormwater runoff from a drainage area. Methods to achieve this goal generally assume that the stormwater runoff is channelized and/or concentrated into a conveyance system. In other words, the hydrologic model assumes a single point of discharge for the drainage area. Peak rate control is then achieved by providing an outlet structure designed to limit the flow, and a storage volume sized to detain the developed condition runoff volume.

Although the hydraulics of storing water and restricting the rate of release tend to be non-proprietary, the use of innovative materials, configurations, trash and debris control devices, or other components for achieving the goals of stormwater runoff peak rate control may be subject to testing for certification in Virginia. In order to evaluate such manufactured devices or designs, it is necessary for proponents to provide design information on the storage volume component -- such as underground vaults, chambers, or other vessels for storing runoff -- and the outlet control. Additional information must adequately cover long-term operation and maintenance, longevity of materials, and possible unforeseen negative consequences of installing such devices.

2.3 -- Stormwater Runoff Quality Control

The goal of the VTAP regarding runoff quality control is to determine how much a specific MTD can remove total phosphorus (TP). MTDs seeking certification for runoff quality control in Virginia will only be approved for TP removal at this time (see **Section 1.3 – Applicability**).

The removals cited below are desired targets. Each target lists the removal efficiency and describes the influent characteristics.

- Total Phosphorus (TP) Target:
  - 50% TP removal for influent with TP concentrations ranging from 0.15 mg/L to 0.5 mg/L and meeting the particle size distribution target described below.

- Total Suspended Solids (TSS) Target:
  - 80% removal of TSS for influent with TSS concentrations ranging from 100 mg/L to 200 mg/L and meeting the particle size distribution target described below;
  - > 80% removal of TSS for influent with concentrations greater than 200 mg/L and meeting the particle size distribution target described below; and
  - < 20 mg/L of effluent TSS for influent with concentrations less than 100 mg/L and meeting the particle size distribution target described below.

- Suspended Sediment Concentration (SSC) Target:
  - 80% removal of SSC for influent with SSC concentrations ranging from 100 mg/L to 200 mg/L and meeting the particle size distribution target described below;
  - > 80% removal of SSC for influent with concentrations greater than 200 mg/L and meeting the particle size distribution target described below; and
  - < 20 mg/L of effluent SSC for influent with concentrations less than 100 mg/L and meeting the particle size distribution target described below.

- Particle Size Distribution (PSD) Target:
  To test and approve BMPs, the particle size distributions of the influent and effluent need to be measured and reported for at least five runs in laboratory tests or five storms in field tests. For field test sites, at least one storm needs to have 10 or more consecutive dry days between storms, and at least one storm needs to have only 1-dry day between storms.

  The influent and effluent should have distributions of particle sizes in the ranges shown in Table 1. Because the particle size range of 10-60 μm has been associated with the majority of the total phosphorous in stormwater, it is important that the influent contain 50% of its

particles in this size range. Furthermore, the effluent should show a reduction such that no more than 10% of the particles are between 10-60 μm in size.

Table 1. The range of targeted percentages for given particle sizes from stormwater influent and effluent for laboratory tests and field test sites.		
Particle Size Range (μm)	Influent Percent by Mass (%)	Effluent Percent by Mass (%)
0-10	0-30	0-40
10-30	15-40	0-5
30-60	10-35	0-5
60-100	0-10	0-30
100+	0-10	0-100

The VTAP program is open to certifying devices with influent characteristics (e.g., concentration and PSD) and pollutant reduction efficiencies that differ from the cited target levels. Devices will be assigned pollutant removal efficiencies based upon the conditions under which the device was tested and the resulting verified data pursuant to the VTAP.

A future goal of the VTAP is to exhibit removal of other pollutants (e.g., sediment, nitrogen, oil/grease/hydrocarbons, metals, bacteria, etc.). Certifications for the removal of pollutants other than TP will not be granted in Virginia at this time. The Clearinghouse, however, will provide web links to information about MTDs approved in other states.

2.2.1 -- Total Phosphorus (TP) Treatment

The water quality regulatory criterion in VSMP Regulations (4VAC 50-60-63) is aimed at removal of Total Phosphorus (TP). The criterion is essentially a load limit or no-net-increase type of standard, stating that after development, the load of phosphorus leaving the development site in stormwater runoff may not exceed 0.28 lb./acre/year. The mean Event Mean Concentration (EMC) of TP in urban/suburban runoff (influent) in Virginia for BMP compliance computation and site conditioning is 0.26 mg/L. These criteria may provide the basis for testing for Virginia certification.

2.2.2 -- Total Suspended Solids (TSS) and Suspended Sediment Concentration (SSC) Treatment

DCR has not established water quality regulatory criteria pertaining to the removal of total suspended solids (TSS) or suspended sediment concentration (SSC) from stormwater runoff. Although MTDs are not certified for TSS or SSC in Virginia, the Clearinghouse will provide web links to information about MTDs approved for TSS or SSC in other states. In addition, TP certification at the PUD or CUD level may be awarded in Virginia for devices that have been based on TSS or SSC data if the submitted data are considered valid.

3 -- BMP Certification Designations

Use designations are based on the quality and quantity of performance data and other information that the proponent supplies. There are three use designations for manufactured treatment devices in Virginia: **Pilot Use Designation** (PUD), **Conditional Use Designation** (CUD), and **General Use Designation** (GUD). The goal for the proponent is to obtain a GUD, whereby the technology may be marketed throughout Virginia, subject to conditions that the DCR may apply as a result of the testing and assessment of the practice. The device may not be installed in Virginia unless the DCR grants it the status of PUD, CUD, or GUD. Table 2 summarizes the testing requirements that must be met to receive each certification level. Table 3 provides information for testing the MTD at each certification level once awarded.

Table 2. Summary of the testing requirements for manufactured treatment devices to receive the pilot use designation (PUD), conditional use designation (CUD), and general use designation (GUD) in Virginia.

Certification Level	Testing Required to Receive Certification	Test Parameter Required to Receive TP Certification
PUD	Full-scale Lab or Field	TP, TSS, and/or SSC
CUD	$\geq$ 2 approved field sites	TP, TSS, and/or SSC
GUD	$\geq$ 5 approved field sites	TP

Table 3. The number of installations allowed in Virginia and the testing requirements for manufactured treatment devices certified in Virginia at the pilot use designation (PUD), conditional use designation (CUD), and general use designation (GUD).

Certification Level	Maximum Number of Installations Allowed in Virginia	Minimum Number of Field Test Sites	Assumed TP Performance Credit	Parameter to be Tested at Va. Sites
PUD	5	2 approved sites needed for CUD; 5 approved sites needed for GUD	Variable ($\geq$ 20%)	TP
CUD	15 (total includes any PUD installations)	5 approved sites for GUD	Variable ($\geq$ 20%)	TP
GUD	No Limit	None	Based on Field Test Results	None

The use of testing data collected in other states is allowed for assessment by the DCR. However, any field data to be included in the assessment process must be derived from testing

sites representative of the urban stormwater conditions expected in Virginia (Table 4). For the assessment of the MTD, the developed QAPP for each test site outside of Virginia is needed and thus must be submitted to DCR for review and approval as a test site for certification in Virginia. For example, any product verification in a rainfall distribution other than Type II, such as those approved in Washington's TAPE program must address the influence of the rainfall intensity, duration, peak flow, etc. Thus, a flow based system that is designed to treat the water quality flow rate would have to be sized for the Type II intensity – rather than the much lower Type IA of the Pacific Northwest.

Table 4. Urban stormwater test conditions for certification in Virginia.

Condition Influencing Stormwater	Test Conditions
Precipitation	Type II Distribution (Distribution obtained at NOAA Atlas 14)
Temperature	26.0°F-86.1°F Long-term Monthly Average 44.6 °F-66.7°F Long-term Annual Average (From Virginia State Climatology Office: http://climate.virginia.edu/virginia_climate.htm)
Particle Size Distribution	Refer to PSD Target in Section 2.3 – Stormwater Runoff Quality Control

3.1 -- Pilot Use Designation (PUD)

The **Pilot Use Designation** (PUD) allows limited use of devices for the purpose of collecting field performance data according to the VTAP when the performance data do not meet the standards of applying for CUD or GUD. A PUD certification for phosphorus treatment may be granted for MTDs that were tested for TSS or SSC removal in the laboratory at full-scale size using Sil-Co-Sil 106. Because devices will be assigned pollutant removal efficiencies based upon the resulting verified data, there is no specified TP, TSS, or SSC removal level required by DCR for phosphorus treatment at the PUD certification level.

The DCR's evaluators (contracted and/or internal staff) and the Clearinghouse Committee will review all PUD applications and make recommendations to the DCR. The DCR will grant a PUD certification if it believes the practice has merit and should have field performance testing conducted.

Devices with PUD certification will be listed as such on the Clearinghouse. Before installing a PUD for testing in Virginia, the proponent must receive approval from the DCR for its product-specific QAPP and site-specific QAPP. The DCR may impose conditions for installations in Virginia. During the testing period, DCR will limit the number of installations of PUD devices in Virginia to a maximum of five. In addition, the proponent of the technology must notify DCR of all installation sites in Virginia. Testing is required at two approved field sites to move to the CUD level and 5 approved sites to move to the GUD level.

MTDs certified at the PUD level for stormwater runoff quality control will be granted an initial assumed TP performance credit ($\geq$ 20%) based on the evidence from prior testing. PUD certification applies for a specified testing period (typically two years), after which the practice may NOT be installed in Virginia until monitoring has been completed, and the test data are evaluated. Once the data have been evaluated, the proponent has three options: (1) submit a

technical evaluation report (TER); (2) request an extension from DCR for more time to conduct additional testing; or (3) cancel the certification request. The DCR will grant extensions on a case-by-case basis but will not allow additional installations during the extension period. No additional installations are allowed until the TER is approved by DCR and a CUD or GUD is granted. At the end of the test period, the test results from the approved field sites will be used to determine a TP removal credit.

The proponent of a poor performing PUD technology is not required to remove devices installed in Virginia but must implement its established remediation action plan at poor-performing sites in Virginia.

3.2 -- Conditional Use Designation (CUD)

The **Conditional Use Designation** (CUD) is for MTDs that have undergone rigorous testing. Proponents of MTDs with data from two or more approved field test sites may chose to submit a CUD application. Proponents seeking CUD certification for total phosphorus treatment should have field performance data showing TP, TSS, and/or SSC removal (After December 31, 2015, only TP data will be accepted for CUD certification). The CUD certification should be sought when data are insufficient to adequately evaluate performance claims under urban stormwater conditions in Virginia and/or the data were not collected in a manner consistent with the VTAP protocol.

The DCR's evaluators (contracted and/or internal staff) and the Clearinghouse Committee will review all CUD applications and make recommendations to the DCR. The DCR will grant a CUD certification if it believes the practice has merit and should have more field performance testing conducted. The DCR grants CUD certifications based on submission of sufficient performance data, the recommendations from its evaluators and the Clearinghouse Committee, and comments received from peer reviewers. Devices with CUD certification will be listed on the Clearinghouse. Proponents of technologies not granted a CUD must request to have their device immediately considered at the PUD level (PUD review fees waived) or resubmit the application at a later date at the CUD level (and pay all associated CUD review fees).

Technologies granted a CUD certification by the DCR are allowed to be installed in Virginia while more extensive field testing occurs. Proponents of CUD technologies must submit a product-specific QAPP and site-specific QAPP for each test site and cannot begin performance testing at sites in Virginia until both QAPPs are approved. The DCR may impose conditions for installations in Virginia.

DCR will limit the number of installations of CUD devices in Virginia to a maximum of 15, with MTDs installed in Virginia under the PUD certification counting towards this maximum. Testing is not required at all installations, but the proponent of the technology must notify DCR of all installation sites in Virginia. Testing is required at five distinct field sites for certification at the GUD level.

MTDs certified at the CUD level for stormwater runoff quality control will be granted an initial assumed TP performance credit ($\geq$ 20%) based on the evidence from prior testing. CUD certification applies for a specified testing period (typically two years), after which the practice may not be installed in Virginia until monitoring has been completed, and the test data are evaluated. Once the data have been evaluated, the proponent has three options: (1) submit a

technical evaluation report (TER); (2) request an extension from DCR for more time to conduct additional testing; or (3) cancel the certification request. The DCR will grant extensions on a case-by-case basis and reserves the right to allow or disallow for the continuation of marketing during the extension period. At the completion of the test period, the test results from the approved field sites will be used to determine a TP removal credit.

Until December 31, 2015, applications that show a reliable 80% removal or greater of TSS or SSC using field data (meeting the PSD target described above) or laboratory data (Benchmark Particle Size Distribution Sil-Co-Sil 106) will be granted a reciprocal TP credit of 25% removal at the CUD level until field testing is performed for TP removal and device-specific results are obtained. TP removal for the **General Use Designation** will be based on the results of performance field testing of TP, not TSS or SSC data.

The proponent of a poor performing CUD technology is not required to remove devices installed in Virginia but must implement its established remediation action plan at poor-performing sites in Virginia.

3.3 -- General Use Designation (GUD)

The **General Use Designation** (GUD) confers a general acceptance for the treatment device based on validated field performance claims. At a minimum, a product should have a substantial data set that verifies

- sizing for the land use type that was monitored -- specific treatment flow rate (gpm/ft^2 of filter media if a filtering device, or surface area of treatment chamber if a settling device) or volume capture;
- treatment performance (qualified by testing minimum and maximum influent loads, etc.);
- maintenance requirements and frequency of maintenance; and
- longevity for typical urban conditions in Virginia.

To obtain a GUD certification for stormwater runoff quality control, field testing for TP removal is required. The testing and evaluation must conform to the requirements in the VTAP and represent application conditions expected in Virginia.

Devices seeking a GUD certification must have been field tested in at least five field sites that are representative of urban stormwater conditions in Virginia. The easiest way to ensure that the testing occurs under the required conditions is to pick field test sites located in Virginia. When including test sites outside of Virginia, the proponent must show that the site will represent conditions commonly expected in Virginia (Table 4). Typical weather must be characterized by similar rainfall patterns, such as Type II rainfall. Providing storm intensity information and particle size distribution data from the proposed site will help assess how well the site represents conditions in Virginia. For the assessment of the MTD, the developed QAPP for each test site outside of Virginia is needed and thus must be submitted to DCR for review and approval as a test site for certification in Virginia.

To apply for the GUD certification, the proponent of the technology submits a GUD application, complete with QAPPs for the field test sites and TER, to the DCR. The DCR's evaluators (contracted and/or internal staff) and the Clearinghouse Committee will recommend to the DCR that a GUD certification be granted if they find the performance claims to be validated. The DCR grants GUD certifications for technologies based on submission of sufficient performance data,

the recommendations from its evaluators and the Clearinghouse Committee, and comments received from peer reviewers. Proponents of technologies not granted a GUD must specify to have their device immediately considered either at the PUD or CUD level (PUD or CUD review fees waived, respectively) or resubmit the application at a later date at the GUD level (and pay all associated GUD review fees).

Devices with GUD certification will be listed as such on the Clearinghouse. Technologies with a GUD certification from the DCR may be used anywhere in Virginia, subject to conditions the DCR may apply as a result of the testing and evaluation of the practice. Technologies that receive a GUD certification have no expiration date. If at a later date, it is discovered that a GUD certified technology is not performing at the level of the approved performance claim, the practice will be removed from the Clearinghouse until revisited so that either the design criteria are improved to achieve the listed performance or the performance claim is corrected.

4 -- Assessment Process

The Virginia Stormwater BMP Clearinghouse will maintain a vendor list on the Clearinghouse to assist local jurisdictions in identifying stormwater technologies and products. Technologies undergoing testing to meet GUD criteria may be listed on the Clearinghouse with either a pilot use designation (PUD) or a conditional use designation (CUD). Special restrictions apply to technologies with a PUD or CUD (refer to **Section 3 -- BMP Certification Designations).**

4.1 -- Overview of Virginia Technology Assessment Protocol

The assessment process in Virginia, illustrated in Figure 1, begins when the proponent submits a PUD, CUD, or GUD application package to DCR (application fee applies, see Table 5). Submitted applications are reviewed for completeness, and if complete, the DCR's evaluators (contracted or internal staff) will assess the application package and propose a use designation. If recommended by the DCR's evaluators, the technical evaluation report (TER), submitted as part of the application package, will be included on the Clearinghouse for peer review and comment. The DCR's evaluators will respond to the public comments and present their recommendations to the Clearinghouse Committee. The Clearinghouse Committee will review the application package, recommendations made by DCR's evaluators, and the public comments. The Clearinghouse Committee will develop a use designation recommendation and submit it to the proponent and to the DCR. The DCR will review all recommendations and determine an appropriate use designation. Certified technologies will be included on the Clearinghouse.

Table 5. Application and review fees for manufactured treatment devices seeking certification in Virginia.

Type of Review	Fee
Application Review	
PUD	$
CUD	$
GUD	$
Product-specific QAPP Review	$
Site-specific QAPP Review	$
TER Review	$
Re-review fee	Re-review fees are a percentage of the initial review fee.

Technologies that do not meet the GUD criteria may be listed on the Clearinghouse as either a PUD or a CUD. Once a PUD or CUD has been awarded, the proponent must provide quarterly status reports to the DCR. Proponents of technologies with certifications at the PUD or CUD level must contract with a technical advisor (an objective outside party) to develop and submit a product-specific QAPP to the DCR. Furthermore, for each field-testing site, a site-specific QAPP will need to be developed and approved by the DCR. Even if the testing site is located outside the state of Virginia, QAPPs are required for Virginia certification. Both product-specific and site-specific QAPPs will be reviewed by DCR's evaluators (QAPP review fees apply, see Table 5); the members of the Clearinghouse Committee will have the opportunity to review and comment on the QAPPs. DCR will review all recommendations and approve or disapprove the QAPPs.

Proponents may not begin performance testing at sites in Virginia until the DCR has approved both the product-specific QAPP and the site-specific QAPP. If the either QAPP is disapproved by DCR, the proponent must modify and resubmit the plan (re-review fees apply). Once the QAPPs are approved by DCR, field performance testing in Virginia may begin.

At the end of the testing period, the proponent of a MTD with either a PUD or a CUD submits a TER to DCR. The TER is reviewed in the same manner as the initial application package (described in the first paragraph of this section) (TER review fees apply). Approved technologies will be listed on the Clearinghouse. If the TER of the field-tested technology is disapproved for the CUD or GUD, the proponent will be notified of the DCR's decision and reason for it. The proponent may respond to DCR's disapproval by requesting to conduct additional testing and/or requesting to resubmit the TER (re-review fees apply). DCR may grant this permission at its discretion.

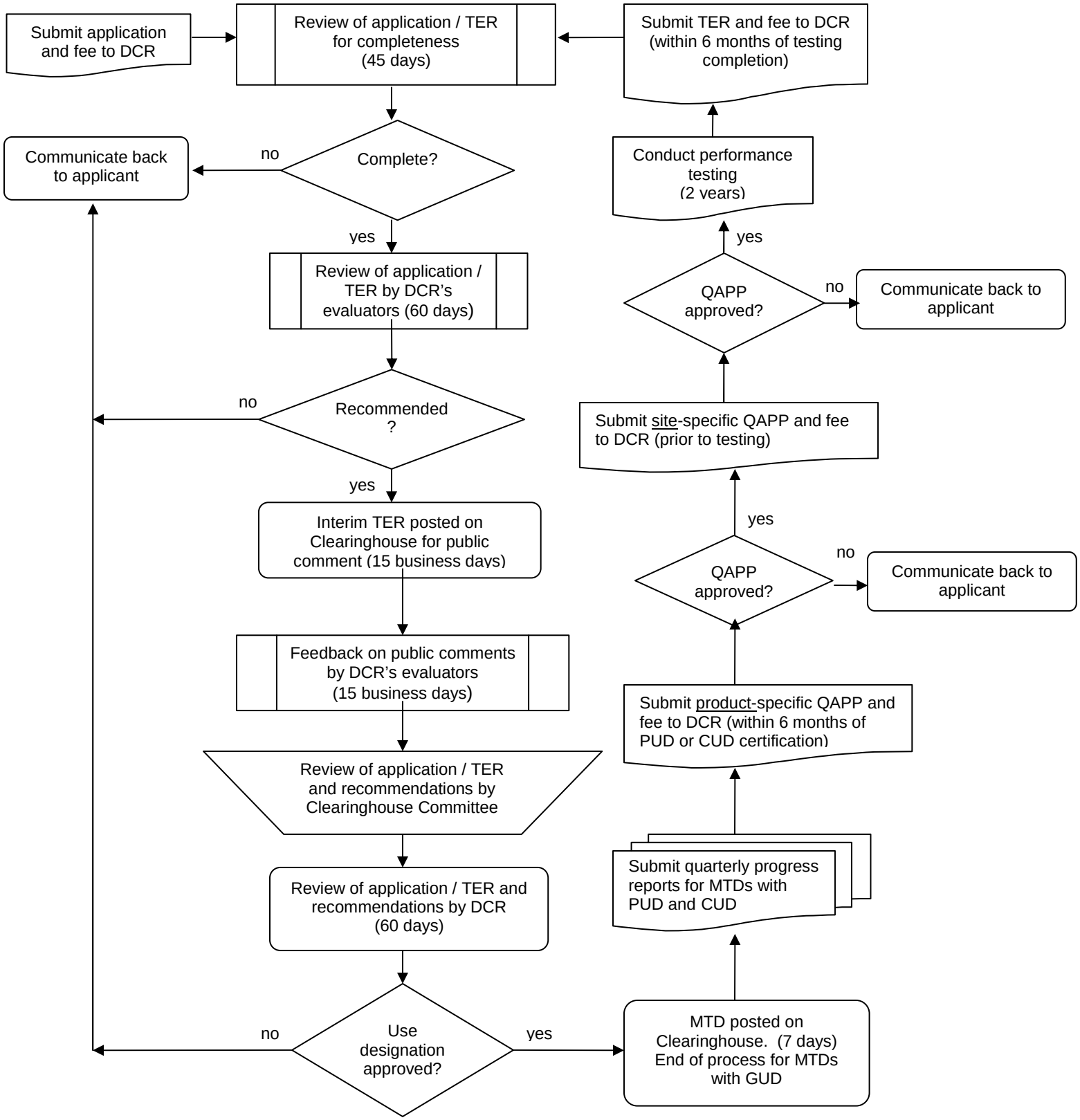

Figure 1. Flow chart illustrating the certification process in Virginia for stormwater manufactured treatment devices (MTDs).

4.2 -- Requesting/Revising Use Level Designations

The first step for a proponent wishing to market a manufactured treatment device in Virginia will be to amass the product information and data to determine the use designation level for which to apply. The proponent will need to ask a fundamental question:

Does the technology have field data that represent urban stormwater pollutant load and rainfall characteristics in Virginia, and do these data meet the VTAP requirements?

To determine the answer to this question, the proponent of the technology must be familiar with the VTAP as described in this document.

The following may be helpful guidance in selecting the most appropriate use designation level for which to apply:

- Proponents of MTDs with full-scale laboratory performance data and no, or limited, field testing data should submit a PUD application. TP, TSS, and/or SSC data can be used to receive TP certification at the PUD level. If TSS or SSC data from laboratory testing is reported, Sil-Co-Sil 106 should have been used.
- Proponents of MTDs with at least two field sites that represent urban stormwater conditions in Virginia should submit a CUD application. MTDs seeking CUD status for total phosphorus treatment should either have performance data showing TP removal and/or performance data showing TSS/SSC removal.
- Proponents of MTDs with field performance data that were
  (a) collected from at least five sites representing urban stormwater conditions in Virginia, and
  (b) conform to the VTAP
  should submit a GUD application. TP data are required to receive TP certification at the GUD level.

Proponents seeking a technology use level designation by the DCR will need to submit an application fee (Table 5). Proponents should mail their submission to the following address:

Virginia Department of Conservation and Recreation
Stormwater Management BMP Clearinghouse
203 Governor Street, Suite 206
Richmond, VA 23219-2094
E-mail: BMPClearinghouse@dcr.virginia.edu

The application will be initially reviewed for completeness. Submit two paper copies and an electronic version (E-mail attachment or CD) to the address above. Submit two paper copies and an electronic copy of quality assurance project plans, interim status reports, requests for extensions, and other correspondences to this address as well. Additional hard copies of submittals may by requested by DCR.

For assistance, please contact:

Ved P. Malhotra, P.E.
Stormwater Compliance Engineer
Virginia Department of Conservation and Recreation
Email address: Ved.Malhotra@dcr.virginia.gov
Phone: (804) 786-1863
Fax: (804) 786-1796

4.3 -- Assessment Timeline

The timelines below include required deadlines in bold-type font. Failure to meet these deadlines may result in a suspension or cancellation of a designation. The remaining items provide guidelines for the amount of time expected for a given step in the process. The evaluators will review submittals as quickly as possible and will communicate with the proponent of the MTD if delays or problems arise.

4.3.1 -- PUD Assessment Timeline

1. PUD application package, including the TER, is reviewed for completeness – Within 45 calendar days
2. If application is complete, PUD application is reviewed by DCR's evaluators (contracted and/or internal staff) – Within 60 calendar days
3. If recommended by DCR's evaluators, interim TER is listed on the Clearinghouse for peer review – 15 business days
4. DCR's evaluators review peer comments – 15 business days
5. Clearinghouse Committee reviews application and recommendations -- The Clearinghouse Committee meets quarterly and will review applications in the order they were received. Depending on the number of applications and TERs to be reviewed, the submitted application will be assessed at the earliest possible Clearinghouse Committee meeting.
6. DCR reviews application and recommendations – Within 60 calendar days
7. Proponents of technologies not granted a PUD may resubmit an updated application at a later date (and pay all associated PUD review fees). If approved by DCR, a MTD granted a PUD is listed on the Clearinghouse – Within 7 calendar days
8. Reporting time begins once granted the PUD. **Submit quarterly progress reports to DCR on April 15th, July 15th, October 15th, and January 15th for the preceding three-month period.** Continue submitting progress reports until TER is submitted.
9. **Submit product-specific QAPP that meets the VTAP's requirements within six months of receiving the PUD.**
10. Product-specific QAPP is reviewed by DCR's evaluators – Within 60 calendar days
11. If product-specific QAPP is approved, submit site-specific QAPP amendments prior to BMP installation in Virginia.
12. Site-specific QAPP is reviewed by DCR's evaluators – Within 30 calendar days
13. If site-specific QAPP is approved, monitor field installation – two years.
14. **Submit TER that meets the VTAP's requirements within six months of completing testing. PUD certification expires 30 months from the time when testing begins.** This timeframe allows for 24 months of monitoring and 6 months for writing the TER.
15. The TER is reviewed for completeness – Within 45 calendar days
16. If TER is complete, DCR's evaluators review the TER – Within 60 calendar days
17. If recommended by DCR's evaluators, interim TER is included on the Clearinghouse for peer review – 15 business days
18. DCR's evaluators review peer comments – 15 business days
19. Clearinghouse Committee reviews TER and recommendations -- The Clearinghouse Committee meets quarterly and will review applications in the order they were received. Depending on the number of applications and TERs to be reviewed, the submitted TER will be assessed at the earliest possible Clearinghouse Committee meeting.
20. DCR reviews TER and recommendations – Within 60 calendar days
21. The DCR issues a CUD or a GUD, revokes the PUD, or allows for an extension.

Failure to submit the product-specific QAPP within 6 months of receiving a PUD results in a cancellation of the PUD and removal from the Clearinghouse. The proponent must reapply for the PUD. Proponents with a PUD have a maximum of 12 months to begin implementation of the product-specific QAPP or communicate why. Failure to submit progress reports, failure to demonstrate satisfactory progress during the testing period, or failure to submit a TER within 6 months of completion of testing risks suspension or cancellation of the PUD and possible removal from the Clearinghouse. A suspension limits the additional installations to one in Virginia during the suspension period. The DCR will remove the suspension when the proponent demonstrates satisfactory progress in completing the required component. A cancellation requires the proponent to resubmit an application for the desired use level designation.

If proponents of PUD technologies require extensions on use level designation components (QAPPs, TER), they must submit a request to the DCR at least 2 weeks before the due date. The DCR will grant extensions only if the proponent shows that progress is being made.

4.3.2 -- CUD Assessment Timeline

1. CUD application package, including the TER, is reviewed for completeness – Within 45 calendar days
2. If application is complete, CUD application is reviewed by DCR's evaluators (contracted and/or internal staff) – Within 60 calendar days
3. If recommended by DCR's evaluators, interim TER is listed on the Clearinghouse for peer review – 15 business days
4. DCR's evaluators review peer comments – 15 business days
5. Clearinghouse Committee reviews application and recommendations -- The Clearinghouse Committee meets quarterly and will review applications in the order they were received. Depending on the number of applications and TERs to be reviewed, the submitted application will be assessed at the earliest possible Clearinghouse Committee meeting.
6. DCR reviews application and recommendations – Within 60 calendar days
7. Proponents of technologies not granted a CUD must request to have their device immediately considered at the PUD level (PUD review fees waived) or resubmit an updated application at a later date at the CUD level (and pay all associated CUD review fees). If approved by DCR, a MTD granted a CUD is listed on the Clearinghouse – Within 7 calendar days
8. Reporting time begins once granted the CUD. **Submit quarterly progress reports to DCR on April 15th, July 15th, October 15th, and January 15th for the preceding three-month period.** Continue submitting progress reports until TER is submitted.
9. **Submit product-specific QAPP that meets the VTAP's requirements within six months of receiving the CUD.**
10. Product-specific QAPP is reviewed by DCR's evaluators – Within 60 calendar days
11. If product-specific QAPP is approved, submit site-specific QAPP amendments prior to BMP installation in Virginia.
12. Site-specific QAPP is reviewed by DCR's evaluators – Within 30 calendar days
13. If site-specific QAPP is approved, monitor field installation – two years.
14. **Submit TER that meets the VTAP's requirements within six months of completing testing. CUD certification expires 30 months from the time when testing begins.** This timeframe allows for 24 months of monitoring and 6 months for writing the TER.

15. The TER is reviewed for completeness – Within 45 calendar days
16. If TER is complete, DCR's evaluators review the TER – Within 60 calendar days
17. If recommended by DCR's evaluators, interim TER is included on the Clearinghouse for peer review – 15 business days
18. DCR's evaluators review peer comments – 15 business days
19. Clearinghouse Committee reviews TER and recommendations -- The Clearinghouse Committee meets quarterly and will review applications in the order they were received. Depending on the number of applications and TERs to be reviewed, the submitted TER will be assessed at the earliest possible Clearinghouse Committee meeting.
20. DCR reviews TER and recommendations – Within 60 calendar days
21. The DCR issues a GUD, revokes the CUD, or allows for an extension.

Failure to submit the product-specific QAPP within 6 months of receiving a CUD results in a cancellation of the CUD and removal from the Clearinghouse. The proponent must reapply for the CUD. Proponents with a CUD have a maximum of 12 months to begin implementation of the product-specific QAPP or communicate why. Failure to submit progress reports, failure to demonstrate satisfactory progress during the testing period, or failure to submit a TER within 6 months of completion of testing risks suspension or cancellation of the CUD on the Clearinghouse. A suspension limits the additional installations to one in Virginia during the suspension period. The DCR will remove the suspension when the proponent demonstrates satisfactory progress in completing the required component. A cancellation requires the proponent to resubmit an application for the desired use level designation.

If proponents of CUD technologies require extensions on use level designation components (QAPPs, TER), they must submit a request to the DCR at least 2 weeks before the due date. The DCR will grant extensions only if the proponent shows that progress is being made. The DCR reserves the right to allow or disallow for the continuation of marketing during the extension period.

4.3.3 -- GUD Assessment Timeline

1. GUD application package, including the TER, is reviewed for completeness -- Within 45 calendar days
2. If application is complete, GUD application is reviewed by DCR's evaluators (contracted and/or internal staff) – Within 60 calendar days
3. If recommended by DCR's evaluators, interim TER is listed on the Clearinghouse for peer review – 15 business days
4. DCR's evaluators review peer comments – 15 business days
5. Clearinghouse Committee reviews application and recommendations -- The Clearinghouse Committee meets quarterly and will review applications in the order they were received. Depending on the number of applications and TERs to be reviewed, the submitted application will be assessed at the earliest possible Clearinghouse Committee meeting.
6. DCR evaluates application package and all recommendations and issues a GUD or CUD or denies the GUD. – Within 60 calendar days
7. Proponents of technologies not granted a GUD must request to have their device immediately considered at the PUD or CUD level (PUD or CUD review fees waived, respectively) or resubmit an updated application at a later date at the GUD level (and pay all associated GUD review fees). If approved by DCR, a MTD granted a GUD is listed on the Clearinghouse – Within 7 calendar days

4.4 -- Approving Quality Assurance Project Plan (QAPP)

A product-specific quality assurance project plan (QAPP) *must be submitted to DCR within six months of* obtaining a PUD or CUD and *before* initiating performance testing (review fees apply). In addition, a site-specific QAPP is needed for each field testing site (review fees apply). Development of the QAPPs should be a collaborative effort between the proponent of the device and the proponent's technical advisor. **Section 6 -- QAPP** outlines the requirements of the QAPP.

The DCR will identify evaluators to review and provide recommendations concerning approval of QAPPs, and the members of the Clearinghouse Committee will have the opportunity to review and comment on the QAPPs. DCR will make the final decision concerning QAPP approval. The proponent should not begin performance testing until both the product-specific and site-specific QAPPs are approved. Even if testing sites are located outside the state of Virginia, QAPPs are required for Virginia certification. If either the product-specific or site-specific QAPP is disapproved by DCR, the proponent must modify and resubmit the plan (re-review fees apply). Once the QAPPs are approved by DCR, field performance testing in Virginia may begin.

When a substantive change to the QAPP is warranted, the author of the plan must revise it to document the change and submit the revised plan to the DCR for approval.

4.5 -- Requirements of Performance Testing

A QAPP must be approved by the DCR before initiating any performance testing. Performance testing must follow the procedures outlined in the approved QAPP. Performance testing should be designed to meet all requirements of the VTAP, with the goal of obtaining the **General Use Designation**. Data used in the assessment must be derived from field test sites of typical urban stormwater conditions in Virginia.

4.6 -- Granting a Use Level Designation

The DCR grants a use level designation based on the information submitted and best professional judgment. Submitting the appropriate amount of data does not guarantee that the DCR will grant a use level designation. The DCR bases decisions on the system performance and factors that influence the performance (e.g., sizing, maintenance).

Certain restrictions apply to technologies granted a PUD or CUD (refer to **Section 3.1 – Pilot Use Designation** and **Section 3.2 – Conditional Use Designation**). The DCR may place restrictions on the use of the technologies granted a GUD.

Proponents of technologies not granted a CUD must request to have their device immediately considered at the PUD level (PUD review fees waived) or resubmit the application at a later date at the CUD level (and pay all associated CUD review fees). Likewise, proponents of technologies not granted a GUD must specify to have their device immediately considered

either at the PUD or CUD level (PUD or CUD review fees waived, respectively) or resubmit the application at a later date at the GUD level (and pay all associated GUD review fees).

For approved technologies, the manufacturer shall provide design standards and specifications and operation/maintenance specifications for the technology that are consistent with the accepted research findings. This information and other qualifying information shall be provided to DCR by the proponent's technical advisor for listing on the Clearinghouse.

5 -- Use Level Designation Application

For efficient review of the application for a pilot use designation (PUD), conditional use designation (CUD), or general use designation (GUD), complete all required components before submitting the application to DCR. In addition to providing the information requested in this document, DCR, the Clearinghouse Committee, and/or other evaluators contracted by DCR may request additional information on a case-by-case basis.

At a minimum, an application *must* include:

- Use Designation Application Form
- Performance Claim
- Theory/Technology Description
- Remediation Action Plan
- Technical Evaluation Report
- Certification Statement

5.1 -- Use Designation Application Form

Complete the use designation application form in Appendix A.

- Develop a title for the technology assessment project and use this title in all submittals associated with the project (e.g., QAPP, Status Reports, Technical Evaluation Report).
- Be sure to check the desired designation level for which the technology is to be evaluated: Pilot Use Designation, Conditional Use Designation, or General Use Designation (See **Section 3 -- BMP Certification Designations**).
- If either the Pilot Use Designation or the Conditional Use Designation has been certified previously by Virginia DCR or certification has been granted in another state, the applicant shall indicate that this designation has been achieved, along with the date certification number of approval.

5.2 -- Performance Claim

The performance claim will be used to evaluate the use designation. Performance claims should be objective, quantifiable, replicable, and defensible. Wherever possible, include information about anticipated performance in relation to climate, design storm and/or site conditions. Claims that are overstated should be avoided, as they may not be achievable.

Because the Virginia stormwater management (SWM) regulations focus water quality compliance criteria on reduction of total phosphorus (TP), water quality certification in Virginia is awarded only for TP removal at this time (refer to **Section 2.2 – Stormwater Runoff Quality Control**). Thus proponents of MTDs seeking certification for runoff quality control in Virginia must include total phosphorus reduction claims.

The performance claim should include the following descriptions:

- List of pollutant constituents that will be used to evaluate performance.
- Reduction of pollutants from stormwater runoff and what those reductions are based upon (i.e., reduction of the event mean concentration (EMC) through the device's

treatment processes, reduction of runoff volume, a combination of both, etc.). See Appendix B.

- The conditions under which those reductions were achieved; e.g., the specific influent and effluent concentrations of pollutants in tests (mean/median/range), the particle size distribution of sediments in tests (entire distribution, specify D_{50}), the flow volumes treated versus volumes that by-passed the device, etc.
- Application limitations of technology if known to exist.
- The basis for sizing of the technology (e.g., hydraulic loading at a specific head, concentration of influent, etc.).

An example of a stormwater treatment BMP performance claim could be:

The Model X system can be used in the treatment of stormwater runoff from commercial sites. It can capture and treat the first half-inch of a 24-hour storm from a 10-acre contributing drainage area. During testing, flow rates of 100 gpm to 400 gpm were observed, with no flow being bypassed. Inflow TP concentrations ranged between 0.15 mg/L and 0.50 mg/L (mean: 0.38 mg/L, median: 0.34 mg/L). Table 1 illustrates the range of particle size distributions for the test sites. Under these conditions, an event mean concentration removal rate for total phosphorus (TP) of 60%+ 5% (at a 95% confidence level) can be achieved.

Table 1. The mean percentages for given particle sizes from stormwater influent and effluent for test site.

Particle Size Range (μm)	Influent Percent by Mass (%)	Effluent Percent by Mass (%)
0-10	0-30	10-28
10-30	21-37	2-5
30-60	14-29	0-5
60-100	0-10	10-30
100+	0-8	38-58

5.3 -- Theory/Technology Description

Begin this section by listing the title of the practice and include a photograph of the BMP. Then provide a detailed description of the MTD. The description should ensure that the reader can understand completely how the technology works.

This section is to be organized in such a way that the information can be lifted from the application and included on the Clearinghouse. Thus, the application should contain as many of the elements from the list below as applicable. At a minimum, all topic headings should be addressed. The standard and specifications information for non-proprietary, post-construction BMPs listed on the Clearinghouse can be used as examples for the types of information to provide and the format to use in presenting the information (www.vwrrc.vt.edu/swc).

5.3.1 -- Description of Practice

Provide a detailed description of how the device works and include the purpose of the BMP:

- Summarize the underlying scientific and engineering principles for the technology. Describe the physical, chemical, or biological treatment processes.

- Describe significant modifications and technical advancements in the technology design.
- Include details on the relevant treatment mechanisms such as those in Table 6:

Table 6. Measurements to describe for various BMP mechanisms.

Mechanism	Measurement
Exchange Capacity / Sorption Capacity (dissolved pollutants)	Each medium's anion or cation exchange capacity and target pollutant's overall removal capacity indicated by isotherms (mass/mass) and breakthrough (pollutant load per volume) analyses (capturing typical range of stormwater pollutant concentrations and hydraulic loading rates).
Hydrocarbon Sorption	Capacity -- Pollutant mass absorbed or adsorbed per mass (mass/mass). Absorbent type -- Each medium's percent organic matter or organic carbon.
Gravity Separation	Detention time, length to width ratio, hydraulic loading rate for design flow, removal efficiency versus flow rate, particle size distribution, and specific gravity for each system type or size.
Filtration	Filter media grain size distribution, clean media hydraulic conductivity, hydraulic conductivity versus sediment loading (provide sediment grain size distribution and dry density used in analysis), provide typical and maximum operational hydraulic gradient.
Biological	Describe target pollutant's specific degradation mechanisms and estimated half-life versus temperature, provide estimated stormwater contact time (or detention time) for design flow, and provide target pollutant's estimated treatment efficiency versus flow rate.

5.3.2 -- Performance Criteria

List the expected treatment performance capabilities. Describe the advantages of the technology compared to conventional stormwater systems providing comparable stormwater control.

5.3.3 -- Site Installation Requirements and Impacts

Address any and all site installation requirements and likely impacts resulting from the installation of the technology. As a guide, be sure to consider at least the following:

- Siting location -- Contributing drainage area, upstream controls (non-structural and structural), available space needed, soil characteristics, hydraulic grade requirements, hydraulic capacity, depth to water table.
- Land use – Report any utility requirements. List restrictions to installations within proximity of underground utilities, overhead wires, and hotspot land uses. Provide needed setbacks from buildings and vehicle loading allowances.
- Limitations – Consider the physical constraints to installing the BMP within karst terrain, steep terrain, flat terrain, cold climates, sites with shallow groundwater tables, linear highway sites, etc. Also include limitations associated with the BMP's weight and buoyancy, transportability, durability, energy requirements, consumable materials, etc.
- Environmental impacts – Describe likely impacts resulting from the construction,

operation, and maintenance of the technology. Address community and environmental concerns, including safety risks and liability issues, local codes, winter operation, mosquitoes, aesthetics, etc.

5.3.4 – Design and Sizing

Divide this section into specific subsections that adequately describe design and sizing. The use of tables can be helpful to convey information.

Show standard drawings, including a schematic of the technology and a process flow diagram. Photographs may also be useful. Describe any alternative technology configurations.

Describe the following information --

- Siting and design specifications to achieve stated performance, include:
  - Pollutants that should and could be addressed;
  - Pollutants that will not be addressed;
  - Pollutants that may be increased;
  - Range of operating conditions for the technology, including minimal, maximal, and optimal influent conditions to achieve the performance goals and standards, and for reliability of the technology;
  - Description of bypass process; and
  - Description of pretreatment and preconditioning of stormwater, if appropriate to achieve stated performance of the BMP.
- Physical description of each treatment system component:
  - Engineering plans/diagrams showing each of the functional components;
  - Equipment dimensions; and
  - Description of each component's capacity.

Provide a detailed description of the overall sizing methodology. Include a discussion of technology hydraulics and system sizing to meet performance standards and goals (e.g., to handle the water quality volume, rate of runoff, type of storm, or recharge requirements). When applicable, include the structural design, hydraulic design, soil infiltration rate testing, etc.

5.3.5 -- Material Specifications

When applicable, include a table that lists each construction material. For non-proprietary and patented materials, include specifications. Include raw material specifications for all non-proprietary treatment media.

5.3.6 -- Construction Sequence and Inspection

List the steps to construction in chronological order. Begin with protection during site construction.

5.3.7 -- Operation and Maintenance

Describe special operation instructions and maintenance needed to sustain performance, include:

- Preventative maintenance procedures to be implemented during the course of the field test as well as long-term maintenance;
- Personnel, supplies, replacement materials and/or parts availability (e.g., filter media) and equipment needed to operate and maintain the facility;
- Recommended maintenance schedule;
- Maintenance checklist;
- Access ports and dimensions provided to facilitate maintenance;
- Generation, handling, removal, and disposal of discharges, emissions, and waste byproducts in terms of mass balance, maintenance requirements, and cost;
- Special licensing or hauling requirements, safety issues, and access requirements associated with operation or maintenance of the technology; and
- Projected operational and maintenance (O&M) costs.

5.3.8 – System Longevity

Assuming the device is designed, installed, and maintained correctly, what is the expected life of the BMP? In addition list factors that cause it to not perform as designed:

- Describe circumstances where the technology can add, transform, or release accumulated pollutants?
- If applicable, does the filter medium decompose or is it subject to slime/bacteria growth?
- How is underperformance diagnosed and treated?
- What is the warranty?
- What initial/ongoing user support is provided?
- Does the vendor charge for support?

5.3.9 -- References

List any sources of published information, including Websites, cited in the theory/technology description section. List sources alphabetically. Follow the formatting used for the following citation examples:

ASTM International. 2006. Standard Guide for Selection, Installation and Maintenance of Plants for Green Roof Systems. Standard E2400-06. ASTM International, West Conshohocken, PA. Available online: http://www.astm.org/Standards/E2400.htm (accessed August 7, 2009).

Gowland, D. and T. Younos. 2008. Feasibility of Rainwater Harvesting BMP for Stormwater Management. Special Report SR38-2008. Virginia Water Resources Research Center, Blacksburg, VA. Available online: http://www.vwrrc.vt.edu/special_reports.html (accessed August 7, 2009).

Schueler, T. 2008. Technical Support for the Baywide Runoff Reduction Method. Chesapeake Stormwater Network, Baltimore, MD. Available online: www.chesapeakestormwater.net (accessed August 7, 2009).

Schueler, T., D. Hirschman, M. Novotney and J. Zielinski. 2007. Urban Stormwater Retrofit Practices Manual 3: Urban Subwatershed Restoration Manual Series. Center for Watershed Protection, Ellicott City, MD. Available online: http://www.cwp.org/Store/usrm.htm (accessed August 7, 2009).

5.3.10 -- Appendices

Include any additional information requested by the evaluators in appendices.

5.4 -- Remediation Action Plan

Include a generic remediation action plan that specifies what actions will be taken by the proponent if the device is found to perform at a substandard level.

5.5 -- Technical Evaluation Report

A Technical Evaluation Report (TER) should be submitted as part of the application once laboratory and/or field testing have been completed. A TER is required for technologies seeking a PUD, CUD or GUD certification. Information about developing the TER is described in **Section 8 -- Technical Evaluation Report.**

5.6 -- Certification

Include both the signature of a company representative and date of certification. Use the following certification statement:

> "I certify that all information submitted is true and correct. The information was accumulated using approved methods specified in the Virginia Technology Assessment Protocol, unless otherwise noted. I understand that any misrepresentation or misuse of information will result in immediate denial of the technology being demonstrated and may prohibit me or the company I represent from seeking future approvals."

Appendix A

Use Designation Application Form
For Manufactured Treatment Devices

Complete the following form for each technology seeking a use designation certification in Virginia and submit an electronic version and two paper copies of the completed form as part of the application package. Insert additional columns and rows as needed.

Project Title:

MTD Name: Today's Date:

1 Basic Product Information

Proponent
Company name:
Address: Street City State Zip

Proponent Contact
Name (to whom questions should be addressed):
Address: Street City State Zip
Phone number:
Fax number:
E-mail address:

Technical Advisor
Name:
Address: Street City State Zip
Phone number:
Fax number:
E-mail address:

Manufactured Treatment Device
MTD model serial #:
MTD common (marketing) name:
Specific size/capacity of MTD model:

2 Use Designation Currently Sought (check only one)

☐ Pilot Use (PUD)
☐ Conditional Use (CUD)
☐ General Use (GUD)

3 Certification Request (check all that apply)

☐ Stormwater Runoff Volume Reduction
☐ Stormwater Runoff Peak Rate Control
☐ Stormwater Runoff Quality Control (Total Phosphorus)

4 Pollutants the Device is Designed to Treat (check all that apply)

☐ Total Phosphorous (TP)
*Check all pollutants for which MTD is designed to treat. Certification in Virginia is only granted for TP at this time.
☐ Floatables/trash
☐ Sediment
☐ Nitrogen
☐ Bacteria
☐ Oil & grease
☐ Heavy metals
☐ Organic toxicants
☐ Other (describe):

Project Title:

MTD Name: Today's Date:

5 Warranty Information (describe or attach details)

6 BMP History

How long has this specific model been on the market?

List other applications of this exact model/size and location (provide latitude and longitude) of this application:

7 Device Intended Application (check all that apply)

☐ Pre-treatment for downgradient BMP
☐ Water quality treatment
☐ Flood control
☐ Channel protection
☐ Other:

8 Basis for Treatment (check one and fill in blanks)

☐ **Volume-based** (captures & treats Water Quality Volume [WQV]) – Specify WQV: cubic feet
☐ **Flow rate-based** (provides treatment up to a set rate of flow) – Specify treatment flow rates and hydrologic methods used. Specify the flow rates that are treated and provide documentation:
- ☐ i. All flows up to the year, 24-hour storm event.
- ☐ ii. Peak flows associated with water quality storm event (inches of rainfall; cfs)
- ☐ iii. Other (specify):

If flow rate-based system, can MTD treat without flush-out/resuspension/scouring.
- ☐ Yes (Provide validating documentation); specify design features to prevent resuspension of captured particles/pollutants:
- ☐ No. If no, explain why:

☐ **Other** (describe):

9 Water Quality Treatment Mechanisms (check all that apply and provide brief description)

☐ Sedimentation/settling:
☐ Infiltration:
☐ Filtration (specify filter media):
☐ Adsorption/cation exchange:
☐ Chelation/precipitation:
☐ Chemical treatment:
☐ Biological uptake:
☐ Other (describe):

Project Title:

MTD Name: Today's Date:

10 Design Features of Interest (answer each of the following questions.)

Pre-treatment/removal of larger particles achieved via which of the following?
☐ No pre-treatment
☐ Internal settling/sedimentation chamber
☐ Upgradient (separate) settling/sedimentation device
☐ Other (describe):

By-pass/diversion of larger flows (not designed for treatment) via which of the following?
☐ Internal by-pass for larger flows
☐ Upgradient flow splitter used to divert water quality storm to device
☐ Other (describe):

11 Independent Performance Certification (check all that apply)

Has the device been "certified or performance verified" by any of the organizations below?
☐ **No** (skip to next question)
☐ **Yes**; Continue below and include date of certification and certification number.

- ☐ **Virginia DCR**
  - ☐ PUD (date awarded: , Certification #:)
  - ☐ CUD (date awarded: , Certification #:)
- ☐ **State Agency** (list):
  - ☐ Approved (date awarded: , Certification #:)
  - ☐ Performance certified (date certified: , Certification #:)
  - ☐ Status pending
  - ☐ Other (explain):
- ☐ **TARP** (NJ only)
  - ☐ Approved:
    - ☐ Tier I (date awarded: ; Certification #:)
    - ☐ Tier II (date awarded: ; Certification #:)
    - ☐ Tier III (date awarded: ; Certification #:)
  - ☐ Performance verified
  - ☐ Other (explain):
- ☐ **TAPE** (WA State only)
  - ☐ Approved:
    - ☐ PLD - Pilot Level Designation (date awarded: , Certification #:)
    - ☐ CUD - Conditional Use Designation (date awarded: , Certification #:)
    - ☐ GULD - General Use Level Designation (date awarded: , Certification #:)
  - ☐ Performance Certified (date certified:)
  - ☐ Status pending
  - ☐ Other (explain):
- ☐ **NJCAT** (NJ)
  - ☐ Interim Certification (date awarded: , Certification #:)
  - ☐ Final Certification (date awarded: , Certification #:)
- ☐ **Other** (provide documentation of testing protocol, status of device and results of testing):

Project Title:

MTD Name: Today's Date:

12 Vendor-initiated Performance Testing (check all that apply):

Has the device been tested and its performance reported?

☐ **Laboratory Tested**
- ☐ Manufacturer (directly tested)
- ☐ Contractor retained by manufacturer
- ☐ Tested by third party (e.g., not associated or tied financially to manufacturer)

☐ **Field Tested**
- ☐ Manufacturer (directly tested)
- ☐ Contractor retained by manufacturer
- ☐ Tested by third party (e.g., not associated or tied financially to manufacturer)

13 Results of Vendor-initiated Performance Testing

Has the MTD been tested for pollutants of concern? (Check all that apply)

☐ **Phosphorous**; please provide lab or field results in the TER. Removal rates for phosphorus based upon measured:
- ☐ Total Phosphorus (TP)
- ☐ Particulate Phosphorus (PP)
- ☐ Soluble Phosphorus (SP)
  - ☐ Soluble Reactive Phosphorus (SRP)
  - ☐ Soluble Unreactive Phosphorus (SUP)
- ☐ Check here if reported % removal, load reduction, and/or effluent concentrations are provided over a range of influent concentrations, and list the range of influent concentrations

Although certification in Virginia is only granted for total phosphorus at this time, check all pollutants for which MTD has been tested.

☐ **Sediment**; please provide lab or field results in TER.

Removal rates for sediment based upon:
- ☐ Total Suspended Solids (TSS)
- ☐ Suspended Sediment Concentration (SSC)
- ☐ Check here if reported % removal, load reduction, and/or effluent concentrations are provided over a range of influent concentrations, and list the range of influent concentrations

☐ **Nitrogen**; please briefly describe.
- ☐ Check here if reported % removal, load reduction, and/or effluent concentrations are provided over a range of influent concentrations, and list the range of influent concentrations

☐ **Oil/Grease**; please briefly describe.
- ☐ Check here if reported % removal, load reduction, and/or effluent concentrations are provided over a range of influent concentrations, and list the range of influent concentrations

☐ **Heavy metals**; please briefly describe.
- ☐ Check here if reported % removal, load reduction, and/or effluent concentrations are provided over a range of influent concentrations, and list the range of influent concentrations

☐ **Bacteria**; please briefly describe.
- ☐ Check here if reported % removal, load reduction, and/or effluent concentrations are provided over a range of influent concentrations, and list the range of influent concentrations

☐ **Organic toxicants**; please briefly describe.
- ☐ Check here if reported % removal, load reduction, and/or effluent concentrations are provided over a range of influent concentrations, and list the range of influent concentrations

☐ **Other**; please briefly describe.
- ☐ Check here if reported % removal, load reduction, and/or effluent concentrations are provided over a range of influent concentrations, and list the range of influent concentrations

Project Title:

MTD Name: Today's Date:

14 Particle Size Distribution (PSD)

If laboratory test results are included in the TER and TSS/SSC results are reported, was Sil-Co-Sil 106 used in the test runs?
☐ Yes
☐ No -- If no, explain what was used instead:

What method and equipment were used to determine PSD?
If the method or equipment used to determine PSD differed for any lab test/storm where PSD was measured, provide the date of the test/storm and describe the change.

If laboratory test results are included in the TER, were the influent and effluent analyzed for PSD and reported for at least 5 test runs?
☐ Yes
☐ No -- If no, explain why not:

If field test results are included in the TER, were the influent and effluent analyzed for PSD and reported for at least five storms?
☐ Yes
☐ No -- If no, explain why not:

If field test results are included in the TER, did the PSD measurements that were reported include at least one storm that had 10 or more consecutive dry days before the storm?
☐ Yes
☐ No -- If no, explain why not:

If field test results are included in the TER, did the PSD measurements that were reported include at least one storm that had only 1-dry day before the storm?
☐ Yes
☐ No -- If no, explain why not:

Describe/document how and why the PSD used for testing deviates from the PSD presented below:

Table 1. The range of targeted percentages for given particle sizes from stormwater influent and effluent for laboratory tests and field test sites.

Particle Size Range (μm)	Influent Percent by Mass (%)	Effluent Percent by Mass (%)
0-10	0-30	0-40
10-30	15-40	0-5
30-60	10-35	0-5
60-100	0-10	0-30
100+	0-10	0-100

Project Title:

MTD Name: Today's Date:

Did the influent contain at least 50% of its particles in the 10-60 µm size range for lab tests/storms where PSD was measured?
☐ Yes
☐ No -- Provide date(s) and characteristics of lab test/storms not meeting this target and list the percentage of particles in the 10-60 µm size range for the influent

Did the effluent contain less than 10% of its particles between 10-60 µm in size for any lab tests/storms where PSD was measured?
☐ Yes
☐ No -- Provide date(s) and characteristics of storms not meeting this target and list the percentage of particles in the 10-60 µm size range for the effluent

15 Maintenance Considerations (check all that apply and briefly explain maintenance procedures/standards)

What is the generic inspection and maintenance plan/procedure? (attach necessary documents):

Is there a maintenance track record/history that can be documented?
☐ No, no track record.
☐ Yes, track record exists; (provide list of local or regional devices currently in use and maintenance track record info)

What is the expected maintenance frequency, per year?
i . Total life expectancy of device and/or media (if relevant):
ii . For media or amendments functioning based on cation exchange or adsorption, how long will the media last before breakthrough (indicator capacity is nearly reached) occurs?:

Maintenance contract offered by:
☐ Vendor
☐ Other commercial entities (Provide names and contact info):

Is the maintenance procedure and/or are materials/components proprietary?
☐ Yes, proprietary;
- ☐ Device lends itself to competitive bidding for maintenance
- ☐ Recourse / options exist if the vendor goes out of business

☐ No, not proprietary;
- Are local certified contractors available?
  - ☐ Yes; provide a list with contact information.
  - ☐ No; local contactors are not available
- Does the device lend itself to competitive bidding for maintenance?
  - ☐ Yes; provide a list of local, certified, maintenance companies and their contact information.
  - ☐ No; local competitive bidding not possible because only one maintenance company certified locally.

Project Title:

MTD Name: Today's Date:

Maintenance complexity (Check all that apply):

☐ Confined space training required for maintenance
☐ Liquid pumping and transportation
Specify method:
Specify certified disposal locations:
☐ Solids removal and disposal
Specify method:
Specify certified disposal locations:
☐ Hazardous waste disposal
Specify method:
Specify certified disposal locations:

Other noteworthy maintenance parameter? (describe):

Appendix B

Treatment Efficiency Calculation Methods

Slightly modified from Center for Watershed Protection's

Tool 8: BMP Performance Verification Checklist Appendices

www.cwp.org/postconstruction (Accessed August 7, 2009)

Treatment Efficiency Calculation Methods

The pollutant removal efficiency of a BMP refers to the pollutant reduction that is achieved by comparing the influent and effluent of a BMP or treatment train. Pollutant reduction can be determined on either a concentration or load/mass basis and is typically expressed as a percentage.

Concentration-based methods use the ratio of pollutant concentrations or event mean concentrations (EMCs) at the outflow to pollutant concentrations or EMCs at the inflow as the basis for calculating BMP efficiency. As a general rule, concentration-based methods often result in slightly lower performance efficiencies than mass-based methods. This may be attributed to the fact that BMPs that reduce runoff volume are also reducing pollutant loads, but a concentration-in versus concentration-out study does not account for water losses that occur through infiltration and evapotranspiration, or storage within the BMP. For this reason, the pollutant removal efficiency of these types of BMPs may be under-reported using concentration-based methods.

Mass-based methods use pollutant loads as the basis for calculating BMP efficiency. Pollutant load is the total amount of a pollutant conveyed over a specified duration. The pollutant loading from a given storm can be estimated using pollutant EMCs and flow data. Mass-based methods are influenced by the volume of water entering the BMP and water losses within the BMP (e.g., evapotranspiration and infiltration), so they are more accurate for BMPs that reduce runoff volume (Winer 2000).

The Efficiency Ratio method and the Summation of Loads methods are recommended for use by ASCE and EPA (2002) and DCR. Use of either method should be supplemented with an appropriate statistical test indicating if the differences in mean EMCs between the outflow and inflow are statistically significant.

Methods to Estimate BMP Efficiency (from Center for Watershed Protection 2008; compiled from ASCE and USEPA 2002)			
Method	**Type of Method**	**Formula**	**Comments**
Efficiency Ratio (ER)	**Concentration**	$ER = 1 - \frac{Average\ outlet\ EMC}{Average\ inlet\ EMC}$ Where the EMC = $\frac{\sum_{j=1}^{n} CiVi}{\sum_{j=1}^{n} Vi}$ Where: *Ci* = event inflow concentration; *Vi* = event inflow volume	• Most useful when loads are directly proportional to the storm volume. • Weights EMCs from all storms equally. • The accuracy varies with BMP type. • Minimizes impacts of smaller/cleaner storms on performance calculations. • Can apply log normalization to avoid equal weighting of events.
Summation of Loads (SOL)	**Mass**	$SOL = \frac{sum\ of\ outlet\ loads}{sum\ of\ inlet\ loads}$ Where the Load = C*i*V*i* *Ci = average concentration within period i; Vi = volume of flow during period i*	• Loads are calculated using concentration and flow volume and are summed for the number of events measured. • A small number of large storms can significantly influence results. • Removal of material is most relevant over entire period of analysis • Uses a mass balance approach. • Effluent concentration may still be high despite high removal efficiency