

**Virginia Soil and Water Conservation Board  
Stormwater Water Quantity Workgroup  
Richmond, Virginia  
July 8, 2008**

**Water Quantity Workgroup Members Present**

Sarah Lawson, Rainwater Management Systems  
Roy Mills, Virginia Department of Transportation  
Jon Matusik, The Engineering Group and ESI  
Keith White, Henrico County  
Glenn Custis, Draper Aden & ASCE  
Ridge Schuyler, The Nature Conservancy  
Pete Rigby, Pacculli Simmons and NVBIA  
Mike Gerel, Chesapeake Bay Foundation  
Steve Kindy, Virginia Department of Transportation  
Doug Beisch, Williamsburg Environmental Group  
Joe Battiata, Contech Stormwater Solutions  
Daryl Cook, James City County  
Scott Crafton, Department of Conservation and Recreation  
Michael Rolband, Wetland Studies and Solutions

**Water Quantity Workgroup Members Not Present**

Randy Bartlett, Fairfax County  
Glen Brooks, Albemarle County  
Joanna Curran, University of Virginia  
Lee Hill, Department of Conservation and Recreation  
Ved Malhotra, P.E.  
Joe Modica, Kimley-Horn & TBA  
Pasquel Fernando, Baker Engineering  
Dan Sweet, VHB  
John Tippet, Friends of the Rappahannock

**DCR Staff**

Ryan J. Brown	Eric R. Capps
Chuck Dietz	Michael R. Fletcher
David C. Dowling	John McCutcheon
Christine Watlington	

**Others Present**

Ted Miller, Kimley-Horn and Associates  
David Hirschman, Center for Watershed Protection  
Michelle Brickner, Fairfax County

Mr. Crafton called the meeting to order. He reviewed the documents sent to members since the last meeting.

Mr. Crafton noted that following the last meeting, a strawman proposal was developed and distributed to members. Following the receipt of comments, DCR staff had developed a document that is a compilation of the comments received. Suggested edits that were straightforward were incorporated into the compilation document. Where DCR had questions, those are noted in the discussion document.

Mr. Crafton said that at the last meeting the offer for members to work independently had been extended. He said that Joe Battiata and Keith White developed a more compact version of the strawman that reflected the position of the local implementer as well as the consultants.

Mr. Crafton began a review of the document. A copy of the July 2, 2008 version is included as Attachment #1.

Mr. Crafton said that comments from this meeting would be reflected in the draft presented to the full Technical Advisory Committee on July 16<sup>th</sup>.

Mr. Crafton said that the document presented by Mr. Battiata and Mr. White contained a separate section addressing sheet flow. He said that DCR felt that was already addressed in the introductory statement.

Mr. Crafton said that the draft addressed the exemptions in Part B. He said that if the exemptions are not met, the document outlines the necessary actions.

Part B read as follows:

- A. Notwithstanding the requirements of subsection A, for each point of discharge at the land disturbing activity, if any one of the following conditions is met, then no additional stormwater quantity controls are required:
  1. a. Prior to any land disturbance, the site's contributing drainage area to a point of discharge from the site is less than or equal to one (1) percent of the total watershed area draining to that point of discharge; and
  - b. Based on the post-development land cover conditions prior to the implementation of any stormwater quantity control measures, the development results in an increase in the peak discharge of stormwater runoff from the site that is less than one (1) percent of the existing peak discharge of stormwater runoff generated by the total watershed area draining to that point of discharge.
  2. The point of discharge releases stormwater into a man-made stormwater conveyance system that, following the land disturbing activity, (i) is not eroding, (ii) conveys the post-development 2-year 24-hour storm runoff without causing erosion of the system, and (iii) confines the post-development 10-year 24-hour storm runoff within the banks of the channel

- or pipe system. The applicant must demonstrate, using accepted hydrologic and hydraulic design methodologies, that the runoff from the site, in combination with other existing and proposed stormwater discharges does not exceed these criteria and does not cause instability of the system.
3. The point of discharge releases stormwater into a stormwater conveyance system that has been restored or will be restored using natural channel design concepts and, following the land disturbing activity, (i) is not eroding, and (ii) can be demonstrated, using accepted hydrologic and hydraulic design methodologies and in combination with other existing and proposed stormwater discharges, to not exceed the design criteria of the restored conveyance system and to not cause instability of the system.
  4. The point of discharge releases stormwater into a natural stormwater conveyance system that, following the land disturbing activity, (i) is not eroding, (ii) confines the post-development 10-year 24-hour storm runoff within the banks of the stormwater conveyance system, (iii) does not cause instability of the system, and (iv) replicates the site pre-development runoff characteristics and site hydrology for the 1-year 24 hour storm utilizing the following equation:

$$Q_{\text{Developed}} = Q_{\text{Pre-Developed}} * (RV_{\text{Pre-Developed}} / RV_{\text{Developed}}), \text{ where}$$

$Q_{\text{Developed}}$  = The allowable peak flow rate of runoff from the developed site

$Q_{\text{Pre-Developed}}$  = The peak flow rate of runoff from the site in the pre-developed condition

$RV_{\text{Pre-Developed}}$  = The volume of runoff from the site in the pre-developed condition

$RV_{\text{Developed}}$  = The volume of runoff from the site in the developed site

Mr. Crafton said that essentially the document required the use of the energy balance method. That requires taking the post-development peak flow rate of the 1-year 24-hour storm back to the pre-development rate for the site in a forested condition. However, if any of the other conditions listed in subsections A1 – A3 are met, then the energy balance equation in subsection A4 is not required.

Mr. Crafton said that several comments were received regarding the use of a watershed or regional scale plan that would govern compliance. He said that was removed from this draft because it is already addressed in the regulations. He noted that the regulations provide that a local government can have a regional plan approved by the Board.

Mr. Crafton said that DCR encourages development of such plans because they will achieve more effective results. Regional plans give flexibility to achieve the goals. He noted that Henrico County, James City County, and a few other localities have pursued this option.

Mr. Crafton said that the other concern about the comprehensive and regional plans was that communities are trying to promote smart growth through their regulations. Some committee members had expressed concern that the specific quantity control criteria being proposed might create a conflict with smart growth goals. He said that staff would like to include a provision that allows for regional planning in order to be able to build smart growth in the local planning process. He said DCR does not perceive any such conflict, but that allowing local watershed and regional plans to be approved would provide the opportunity for localities to customize their approaches to stormwater management, including building smart growth into the local stormwater management planning process.

Mr. Crafton said that the aim of the meeting was to reach as much consensus as possible. He said that the resulting language would be forwarded to the full Technical Advisory Committee. He said that there would still be opportunities for comments.

Mr. Crafton said that Mr. Battiata and Mr. White did identify definitions and terms that need to be defined in the regulations. He said that he reviewed the regulations to see if those definitions were already included. He said that most terms were already defined either in the new regulations or in the Erosion and Sediment Control regulations. Those definitions have been included and the sources cited. Staff attempted to provide definitions for those not included.

A member asked if the term damage needed to be defined with regard to flooding.

A member referenced the term "peak flow rate" on line 43 and compared that to "prescribed storm event" on line 61. The member asked if the terms should be the same.

Mr. Crafton said that peak flow rate is a specific runoff characteristic that is consistently specified in the regulations as the basis for control. However, the more general reference to "prescribed storm event" allows for different storm events to be prescribed as design storms for different purposes addressed in the regulations. For example, the 1-year 24-hour storm event is the prescribed control storm event for channel protection purposes, whereas the 10-year 24-hour storm event is the prescribed control storm event for channel localized flood protection.

A member asked if the term "man made stormwater conveyance" included not only open channels but also enclosed storm sewer systems and pipes.

Mr. Battiata said that the attempt was to capture all of the components of any conveyance.

It was suggested that the term “manmade channel or pipe” be used to communicate the closed nature of the man-made system.

A member asked if the wetlands definition matched that of the Corps of Engineers.

Mr. Crafton said that staff would review to be certain that this was consistent. He said that the tendency is to use the Corps definition.

A member asked about the definition of stormwater conveyance system.

Mr. White said that as it is defined in the Erosion and Sediment Control regulations there are terms for natural stormwater conveyance system, natural channel and natural stream.

Mr. Crafton said that the definition for “natural stream” used here is the one from the Erosion and Sediment Control law. He said that staff would check that against the federal definition.

A member noted that on line 139 the draft said that a 10-year storm had to stay within the stream banks. He said that would not typically happen as the stream would overflow its banks at around or slightly more than the 2-year storm.

It was noted that there was a definition of a “restored stormwater conveyance system,” but it was not clear if that was a natural system. The member asked if natural stream could be used interchangeably with natural channel.

It was suggested that there be two definitions.

A member said that line 17 should include tidal as well as non-tidal water.

Mr. Crafton said that as the definitions are refined, references are being included.

A member said that the use of the term natural stream acknowledges that the Erosion and Sediment Control regulations would be changed.

Mr. Capps said that the term “restored stormwater conveyance system” refers to a natural or manmade waterway.

Mr. Crafton said that it should be the Corps of Engineers definition for natural stream. He said that channel refers to a natural stream or a manmade water course.

A member said that on line 90 the reference to sheet flow would not be measurable. The flow at the point of discharge would be measurable.

A member said that the word “concentrated” could not arbitrarily be removed from the definition and have everything applied to sheet flow.

A member said that in the previous version, the term “point of discharge” was used. If sheet flow collects at a point, there is still a point of discharge. While the channel may not be on the site, the cumulative sheet flow can still have a significant impact.

A member said he assumed that the point of analysis means where the discharge is located.

A member said that perhaps it would be better to determine the process and then rewrite the definitions to fit.

A member noted that the previous version said the physical spreading of concentrated flow must be identified and evaluated for potential impacts. He said there was an obvious need for policy guidance.

A member said that sheet flow did not need a full blown analysis, but that the policy could address how far the analysis should go.

Mr. Crafton said that his inclination would be to put Mr. Battiata and Mr. White’s sheet flow language back in the draft. Then the group could work through the criteria and come back to the definitions.

Mr. Capps said that putting the language back in just meant that the operator needed to identify and evaluate, it did not force the operator to do anything else.

Mr. Capps asked Mr. White how this was addressed in Henrico County.

Mr. White said that Henrico analyzes the channel the runoff goes into, usually at the bottom. He said that Henrico would apply conditions 2, 3, and 4. He said that he was aware that guidance needed to be developed.

A member said that regarding sheet flow, there should be a limit on allowing or creating additional sheet flow, or if an increase is allowed it should not cause any downstream problems.

A member said that would be difficult to analyze.

Mr. Dietz said that is addressed in the MS-19 requirements.

Mr. Crafton said that it appeared that the best suggestion was to use items 2, 3 and 4 as long as they are not limited to the point of discharge.

Mr. Hirschman said much of this could be addressed in the guidance.

Mr. Crafton asked if any members were aware of language that would help address that issue.

A member suggested that the wording say that “a sufficient number of points of analysis shall be provided”. He said that would also apply to section A.

A member said that in the new definition of “stormwater conveyance system” the concept of “restored channel” was not defined. He suggested adding “or restored channel.”

Mr. Rolband suggested also including the flood plain.

Mr. White said that Henrico County has a flood plain that is not FEMA regulated, but County regulated.

A member asked if the line 63 reference to “facility or activity” referred to a land disturbance or a development activity.

Mr. Capps said that the reference here to the term “facility” came from federal regulations pertaining to industrial sites subject to EPA industrial discharge permits.

Mr. Crafton said staff would review that definition.

A member said that on line 94 it might be better to use a different phrase than “outfall.” Otherwise outfall should be defined.

A member said that outfall was not the best term for this issue.

It was suggested on line 72 that the term “restored or improved stormwater conveyance system” be substituted for “restored channel.”

It was noted that the terms “new development” and “prior developed lands” are already defined elsewhere.

Mr. Rolband said that the term “prescribed design storm” should be substituted for “design storm” and that this term should be used consistently throughout the document.

Mr. Crafton said that the group would return to definitions but, for the sake of time and to be sure the group understood the context within which terms are being applied, he moved the discussion on to section 4VAC 50-60-66 -- Water Quantity.

Mr. Crafton said that there had already been questions about whether this section was too general. He said that the intention was to have a general performance expectation. He said that is why the overriding general language was included.

A member asked if this section was straight from the law.

Mr. Rolband said that the law states the requirements and that the regulations are intended to show how the requirements of the law should be implemented.

A member said that the introductory language should be kept in this section. She noted that localities may adopt more stringent rules. She suggested the term “In accordance with, but not limited to.”

Mr. Crafton said that staff would take another look at this introductory language.

On line 93, Section A, Mr. Crafton said that the explanation for having this section first was that it establishes the fundamental requirement so it’s clear that, if nothing else is done, the operator must use the energy balance method.

Mr. Rolband noted that the “equal” sign should be replaced with the “less than or equal to” sign.

A member said that this method has been used in Fairfax based on a one-year storm event. He designed a redevelopment project where, because the downstream channel was inadequate, the site had to be taken back to forested conditions. This resulted in very expensive underground detention structures being required. He said that was too onerous.

Mr. Crafton asked if the member was discharging into an existing man-made stormwater system.

The member said that the operator had to fix the half-acre site and could not improve the channel. He said it was too burdensome.

Mr. White said that if a receiving channel is already degraded when the project starts, going back to the 1-year storm based on the forested condition does nothing to repair the problem or make it better – it simply doesn’t make it worse – even though the operator would be complying with the regulations.

Mr. Crafton noted that reducing the discharge and volume in that manner would improve upon the drainage situation, allowing the channel time to adjust itself to the new flow conditions.

A member said that whatever the reason was that an operator couldn’t comply with 2, 3 and 4 dictates what the operator does in A.

Mr. Crafton asked members that, assuming an A2 was added to address flooding issues, what should be required.

A member said that if the flooding criteria falls back to the 10-year storm, then that establishes the 10-year storm as the one you have to control.

A member said that in the event there is downstream flooding, there are instances where it would be better to improve the infrastructure than to simply detain the flow.

A member said that on items B2, B3, and B4 the only caveat is that there is no erosion. He said this may be creating an opportunity for an operator to say there was no need to control flooding.

Mr. Capps said that the intent was to merge two situations. If the runoff is going into this type of system and it is not eroding the requirements have been met. He said the intent was to say that if there is currently not a problem, that what is added will not create a problem. Otherwise the channel must be improved to meet that condition. That would mean not having to do the requirements of Section A except for adding the flooding provision.

Mr. Capps said that the rationale was to say that this was okay for an existing condition and that it would be okay if someone could develop it to this same point.

Mr. Crafton said that in the Maryland Stormwater Regulations, if the outfall drained into a tidal tributary there was no requirement to do channel protection.

Mr. Hirschman said that Delaware has the same provision but has not been happy with the implementation results. Delaware is also now redoing their regulations. He said that the main need is to accomplish more resource protection.

A member asked about local flexibility. He asked if a locality will have the flexibility to dictate what must be done to comply. He said that the last thing he wanted a developer to do was to create a detention basin. He asked if the locality could deny that option.

Mr. Crafton said that if the criteria of the regional plan would require something different then the developer would have to do that.

Mr. Capps said that the locality has the option to be more stringent.

A member said that the concept was good, but that he was concerned about the way the exemptions were written. He asked how the statement could be made that "following land disturbing activity the channel is not eroding."

Mr. Hirschman said that the intent was to address two different conditions. He suggested switching the order of 3 and 4, with 4 saying that the operator may discharge if the existing condition is not eroding.

A member asked what would happen if there was an unrestored natural channel currently eroding. He said that the predevelopment claim would be that it was not eroding.

Mr. Hirschman suggested removing "following land disturbing activity" in number 4.

A member said that there was no discussion regarding whether the channel was currently eroding.

Mr. Rolband said that the bigger problem was that natural stable streams erode – that is part of the natural stream formation process, even under normal flow conditions.

Mr. Capps said that the stream needs to be stable.

A member noted that the law requires that the situation be improved if stream channel erosion or flooding is an existing condition.

A member asked what happens if, when discharging into a natural channel, the channel was already eroding. He said in that case item 4 did not apply. The pre-existing condition was causing the erosion.

Mr. Hirschman said that the assumption was that the stream was stable, but it was noted that item 4 did not say that.

Mr. Crafton suggested leaving the term eroding in and that a definition of eroding be provided.

A member asked on lines 93 and 94 why new development and prior-developed lands were addressed. He said that the application of sections A and B have no bearing on whether the land is new or prior developed land.

A member said that everything is predicated on “land disturbing activity.”

At this time the work group recessed for lunch.

Following lunch, Mr. Crafton suggested addressing the draft regulations by section. He began with Section B on line 109.

Mr. Crafton said that the intention was that these criteria could be applied to represent either the pre-development condition or post-development condition, and that achieving compliance with any of these would allow the developer to avoid the requirements of Section A.

Mr. Crafton said that language was originally drafted to address what happens to the 10-year flood, which had to be contained with the “system.” This was changed to say that the 10-year flood had to be contained within the “banks.” Mr. Crafton said that the concern was that if the 10-year flow goes out of the banks and that the landowner is not aware, their property will be flooded. The option to address that was to mandate a channel, a natural system, or a storage system. He said that the struggle was how to word that so that property owners will not be unexpectedly flooded.

A member said that the language needed to be clarified. He pointed out that 10-year flows will always go outside the banks of any natural channel. Only man-made channels are designed to contain the 10-year flow within the banks.

A member said that in Section B1 the draft said “from the site” and noted that if the analysis is at the point of discharge that was not the right wording.

The group agreed to strike the phrase “from the site.”

Mr. Crafton noted that B2 was a man-made conveyance system and that the criteria apply following land disturbing activity. He asked if members had suggested changes.

A member said that it was not correct to say that the channel is not eroding.

A member said that the intent was to say that the channel is not eroded now and will not be eroded following development.

A member asked about the definition of peak flow rate.

A member said that conveyance system should be defined.

A member noted that in a situation where there are pipe systems, the flow doesn't stay in the pipe but stays in a roadside ditch. In that case it is in the channel and the pipe, which is still adequately containing the flow.

Mr. Crafton suggested using the term “man-made channel or pipe system.”

A member said there needed to be a good definition of “system.”

A member said that in the natural channel design concepts definition the restored channel actually included the floodplain.

It was suggested that separating the definition of “channel” and “conveyance system” might address these issues.

Mr. Capps said that staff had an understanding of what the group wanted to say. He said that the process should be to make the definitions fit the criteria language.

A member said that he didn't understand the phrase “cause instability of the system.”

Mr. Crafton said that the intention was to get the system in balance.

In Section B3 a member said that the runoff can discharge into a manmade conveyance such as a pipe or culvert or could discharge into a restored channel.

It was noted that a restored man-made channel is still a man-made channel.

A member said there should be a distinct difference between “improved” and “restored.”

A member said there should be a definition for “restored.”

A member said that there was a distinction between “natural” and “restored.”

A member suggested that in item 2, subsection (i), the words “is not eroding” should be removed. He noted that erosion will be occurring; the intent is to reach a balance.

Mr. Crafton said the intent is to not cause instability of the system.

It was suggested that the phrase “is functioning as designed” be inserted to replace “does not cause instability of the system,” in Item 2B.

A member said that functioning as designed should be a standard requirement.

Mr. Hirschman said that the exemptions may be confusing and suggested that each one be titled to clarify their differences.

A member said that his concern was that this would be putting something on paper that would never be applied. He said the requirement is to fall within the design criteria, but that the municipality must also be comfortable with the solution.

Mr. Crafton said that the point remained that options 3 and 4 provide a choice.

Mr. Crafton said that earlier draft language said that one of the options was to do some combination on the site. He said that was not included in the current draft. He asked if members thought this should be included.

Mr. Crafton said that staff would clean up the language and move this forward to the full TAC.

On Section B4, Mr. Crafton said that this was basically for discharging into a natural stream that has not been restored. He said that the language said that the 10-year flow must be contained within the banks. He said the concern was the potential for flooding.

A member said that there should be a definition for “tolerance.”

A member suggested that the locality could approve the floodway if they have the requisite easements from downstream neighbors and approval of the local government. There should also be a determination of whether a 10-year flood will be problematic.

A member said that the section should just say “within the stormwater conveyance system.”

A member said that the locality may deem the flood area to be part of the system.

Mr. White said that Henrico County considers wetlands a part of a conveyance system.

Mr. Crafton suggested removing “the banks” and using the term “stormwater conveyance system” and noted that was where the language “as locally defined” had also been added.

Mr. Hirschman said that peak flow rate and velocity were what caused erosion. He said that the MS19 regulations use the term “natural channels.”

A member said that if it is a stability issue, velocity did not need to be included as that does not cause the instability of the system.

A member said that erosion is a natural occurrence and noted that he was not comfortable with moving away from the phrase erosion within the law.

Mr. Crafton said that one of the purposes of the regulation was to more specifically interpret the intention of the law.

A member asked what was DCR’s goal and intent.

Mr. Capps said that it was to establish the basic requirements and have localities address whether or not applicants could meet them.

Mr. Crafton addressed Section C.

A member said there should be an exception for sheet flow.

Another member said that Sections 1-4 do not exclude sheet flow.

It was suggested that a Section 5 be added to address sheet flow.

Mr. Dietz said that the MS19 regulations address sheet flow.

Mr. Crafton moved to Section D. He noted that this was not a new concept.

Mr. Crafton moved to Section E.

A member asked the intent of “verified by a physical survey.”

Mr. Crafton said that meant that someone had actually walked the site.

Mr. Rolband suggested removing the word “physical.”

It was suggested that the term “site observation” be used.

Mr. Crafton said that if there was a provision to allow for a combination of methods, that would give the locality greater discretion. He said that there is current guidance in the handbook.

Mr. Crafton moved to section 4VAC50-60-73 and said that the definition of design storm is largely drawn from the existing Code. He said that it basically points to NRCS established standards.

A member said that consulting engineers will ask what happened to the rational method.

A member said that there should be a requirement to use good engineering methodologies.

Mr. Crafton asked that members send additional comments to his attention and noted that he may approach other members for assistance in editing this section.

Mr. Crafton said that Section 96 dealing with the comprehensive watershed plan had already been vetted by the TAC.

A member asked how this related to the Chesapeake Bay Preservation Act Program.

Mr. Crafton said that when this process is complete, the Bay Act Stormwater Requirements will no longer be separate. These stormwater requirements will be the only ones for Virginia.

Mr. Crafton asked if channel analysis criteria should be in the regulations or guidance. He said that in the last strawman drafted by DCR, staff had included the channel analysis criteria from Fairfax County for consideration and discussion.

A member said that it would be good to have at least a general statement of intent or objective.

A member said that since this was subject to change over time it might be preferable to have it in the guidance as long as there is a statement of intent.

Mr. Crafton said that to the degree the handbook is incorporated into a regulation, then it is part of the regulations.

A member said that if this was articulating a new policy, it should be part of the regulations.

Mr. Crafton thanked the members of the workgroup for their patience and guidance. He expressed appreciation to Mr. White and Mr. Battiata for their work in presenting a draft document.

Mr. Crafton noted that the revised document would move forward to the full TAC at their meeting the next week.

The meeting was adjourned.



Attachment #1

**CHAPTER 60**  
**VIRGINIA STORMWATER MANAGEMENT PROGRAM**  
**(VSMP) PERMIT REGULATIONS**  
**July 2, 2008**

**Part I Definitions (definitions relevant to water quantity criteria that are contained/proposed to be added to Part I of the regulations)**

"Best management practice" or "BMP" means schedules of activities, prohibitions of practices, including both a structural or nonstructural practice, maintenance procedures, and other management practices to prevent or reduce the pollution of surface waters and groundwater systems from the impacts of land-disturbing activities. BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. *(as found in current Part I draft)*

"Channel" means a natural or man-made watercourse with defined bed and banks that conducts continuously or periodically flowing water. *(as found in current Part I draft)*

"Development" means land disturbance and the resulting landform associated with the construction of residential, commercial, industrial, institutional, recreation, transportation or utility facilities or structures. *(as found in current Part I draft)*

"Flooding" means a volume of water that is too great to be confined within the banks or walls of the stream, water body, or conveyance system and that overflows onto adjacent lands, thereby causing or threatening damage. *(as found in §10.1-603.2 of the Code of Virginia (SWM law))*

"Man-made" means constructed by man. *(as found in current Part I draft)*

"Natural channel design concepts" means the utilization of engineering analysis and fluvial geomorphic processes to create, rehabilitate, restore, or stabilize an open conveyance system for the purpose of creating or recreating a stream that conveys its bankfull storm event within its banks and allows larger flows to access its bankfull bench and its floodplain. *(as found in §10.1-560 of the Code of Virginia (E&S law))*

"Natural stormwater conveyance system", "natural channel" or "natural stream" *(from ESC Regs)* means a nontidal waterway (watercourse?) that is part of the natural topography. It usually maintains a continuous or seasonal flow during the year and is characterized as being irregular in cross-section with a meandering course. Constructed

channels such as drainage ditches or swales shall not be considered natural streams. *(to include the main channel, floodway, and flood fringe?)*

"Peak flow rate" means the maximum instantaneous flow from a given storm condition at a particular location. *(as found in §10.1-603.2 of the Code of Virginia (SWM law))*

"Point of discharge" means a location at which concentrated stormwater runoff is released from a site. *(new definition)*

"Restored stormwater conveyance system" means a stormwater conveyance system that has been designed and constructed using natural channel design concepts. *(new definition)*

"Runoff" or "stormwater runoff" means that portion of precipitation that is discharged across the land surface or through conveyances to one or more waterways. *(as found in current Part I draft)*

"Runoff characteristics" include, but are not limited to velocity, peak flow rate, volume, and time of concentration, and their influence on channel morphology including sinuosity, channel cross-sectional area, and channel slope. *(as found in current Part I draft)*

"Runoff volume" means the volume of water that runs off the land development project from a prescribed storm event. *(as found in §10.1-603.2 of the Code of Virginia (SWM law))*

"Site" means the land or water area where any facility or activity is physically located or conducted, a parcel of land being developed, or a designated planning area in which the land development project is located. *(as found in current Part I draft)*

"Site hydrology" means the movement of water on and off the site as determined by parameters including, but not limited to, soil types, soil permeability, vegetative cover, seasonal water tables, slopes, and impervious cover. *(as found in current Part I draft)*

"Stormwater conveyance system" means any of the following, either within or downstream of the land disturbing activity: (1) a channel; (2) a man-made channel; (3) a restored channel; or (4) a natural stream. *(new definition)*

"Watershed" means a defined land area drained by a river or stream, karst system, or system of connecting rivers or streams such that all surface water within the area flows through a single outlet. In karst areas, the karst feature to which the water drains may be considered the single outlet for the watershed. *(as found in current Part I draft)*

"Wetlands" means those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do

support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. *(as found in current Part I draft)*

## Part II Stormwater Management Program Technical Criteria

### 4VAC 50-60-66 Water Quantity

Properties, state waters, and stormwater conveyances within or downstream of a land disturbing activity shall be protected from sediment deposition, erosion and flood damage due to increased runoff, either in concentrated or sheet flow, and changes in runoff characteristics in accordance with the minimum standards set out in this section.

- B. Stormwater runoff from new development projects or projects occurring on prior developed lands shall be released from each outfall into a channel at or below a peak flow rate ( $Q_{\text{Developed}}$ ) based on the one year 24-hour storm, calculated as follows or in accordance with another methodology that is demonstrated to achieve equivalent results and is approved by the board:

$$Q_{\text{Developed}} = Q_{\text{Forested}} * (RV_{\text{Forested}} / RV_{\text{Developed}}), \text{ where}$$

$Q_{\text{Developed}}$  = The allowable peak flow rate from the developed site

$Q_{\text{Forested}}$  = The peak flow rate from the site in a forested condition

$RV_{\text{Forested}}$  = The volume of runoff from the site in a forested condition

$RV_{\text{Developed}}$  = The volume of runoff from the developed site

- C. Notwithstanding the requirements of subsection A, for each point of discharge at the land disturbing activity, if any one of the following conditions is met, then no additional stormwater quantity controls are required:
1. a. Prior to any land disturbance, the site's contributing drainage area to a point of discharge from the site is less than or equal to one (1) percent of the total watershed area draining to that point of discharge; and  
b. Based on the post-development land cover conditions prior to the implementation of any stormwater quantity control measures, the development results in an increase in the peak discharge of stormwater runoff from the site that is less than one (1) percent of the existing peak discharge of stormwater runoff generated by the total watershed area draining to that point of discharge.
  2. The point of discharge releases stormwater into a man-made stormwater conveyance system that, following the land disturbing activity, (i) is not eroding, (ii) conveys the post-development 2-year 24-hour storm runoff without causing erosion of the system, and (iii) confines the post-

development 10-year 24-hour storm runoff within the banks of the channel or pipe system. The applicant must demonstrate, using accepted hydrologic and hydraulic design methodologies, that the runoff from the site, in combination with other existing and proposed stormwater discharges does not exceed these criteria and does not cause instability of the system.

3. The point of discharge releases stormwater into a stormwater conveyance system that has been restored or will be restored using natural channel design concepts and, following the land disturbing activity, (i) is not eroding, and (ii) can be demonstrated, using accepted hydrologic and hydraulic design methodologies and in combination with other existing and proposed stormwater discharges, to not exceed the design criteria of the restored conveyance system and to not cause instability of the system.
4. The point of discharge releases stormwater into a natural stormwater conveyance system that, following the land disturbing activity, (i) is not eroding, (ii) confines the post-development 10-year 24-hour storm runoff within the banks of the stormwater conveyance system, (iii) does not cause instability of the system, and (iv) replicates the site pre-development runoff characteristics and site hydrology for the 1-year 24 hour storm utilizing the following equation:

$$Q_{\text{Developed}} = Q_{\text{Pre-Developed}} * (RV_{\text{Pre-Developed}} / RV_{\text{Developed}}), \text{ where}$$

$Q_{\text{Developed}}$  = The allowable peak flow rate of runoff from the developed site

$Q_{\text{Pre-Developed}}$  = The peak flow rate of runoff from the site in the pre-developed condition

$RV_{\text{Pre-Developed}}$  = The volume of runoff from the site in the pre-developed condition

$RV_{\text{Developed}}$  = The volume of runoff from the site in the developed site

D. For purposes of computing predevelopment runoff from prior developed sites, all pervious lands on the site shall be assumed to be in good hydrologic condition in accordance with NRCS standards, regardless of conditions existing at the time of computation. Predevelopment runoff calculations utilizing other hydrologic conditions may be utilized where stream channel erosion or localized flooding at the site does not exist provided that it is demonstrated to and approved by the local program authority that actual site conditions warrant such considerations.

E. Pre-development runoff characteristics and site hydrology shall be verified by physical surveys, available soil mapping or studies, and calculations consistent with good engineering practices in accordance with guidance provided in the

Virginia Stormwater Management Handbook and by the qualifying local program.

- F. Flooding and channel erosion impacts to stormwater conveyance systems shall be calculated for each point of discharge from the site and such calculations shall include estimates of runoff from the developed site and the entire upstream watershed which contributes to that point of discharge. Good engineering practices and calculations in accordance with DCR guidance shall be used to evaluate post development runoff characteristics and site hydrology, and flooding and channel erosion impacts.

#### **4VAC50-60-73. Design Storms**

For the purposes of this chapter, unless otherwise specified, the design storms are the 1-year, 1.5-year, 2-year, and 10-year 24-hour storms using the site-specific rainfall precipitation frequency data recommended by the U.S. National Oceanic and Atmospheric Administration (NOAA) Atlas 14. Partial duration time series shall be used for the precipitation data. Unless otherwise specified, the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) synthetic 24-hour rainfall distribution or hydrologic and hydraulic methods developed by the U.S. Army Corps of Engineers, or both, shall be used to conduct the analysis described in this section. ~~The local program may allow for the use of the Modified Rational (critical storm duration) Method.~~