From: Nelson, Jeffrey <JNelson@VHB.com>
Sent: Thursday, April 21, 2016 11:39 AM
To: Burke, Kevin
Cc: Keene, Marla; Smiar, Peter
Subject: VHB Comments on VSMM Vol. 1
Attachments: VHB Comments on Draft VSMM 4-21-16_Final.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Kevin –

Attached are our comments on the draft manual. We appreciate the additional time to get these in, and would be interested in meeting with you and other department staff to discuss our thoughts about moving the revision process forward. Thanks for the opportunity.

Jeffrey A. Nelson
Director, Energy & Environmental Services

40 IDX Drive
Building 100, Suite 200
South Burlington, VT 05403
P 802.497.6150 **| M** 802.989.3393 **| F** 802.495.5130
jnelson@vhb.com

Engineers | Scientists | Planners | Designers
www.vhb.com

Memorandum

To: ACEC VT, ANR/DEC Stormwater Program

Date: April 21, 2016

Project #: 99901.86

From: Marla Keene, Peter Smiar, Jeff Nelson

Re: Draft Stormwater Management Manual – VHB Comments

VHB has prepared this memorandum to provide the following comments on the Vermont Agency of Naturals Resources ("ANR") Draft Vermont Stormwater Management Manual ("VSMM"), Volume 1 revisions.

General Comments:

1. There are many instances within the proposed VSMM revision where the existing criteria included in the 2002 manual have been made more stringent, without what we believe is sufficient supporting scientific evidence or analysis of why a design compliant with the 2002 VSMM would not ensure protection of receiving water quality conditions. Further documentation should be provided as to why each specific change to the 2002 criteria is necessary, and the feasibility of specific stormwater treatment practices in achieving the stated performance criteria.

2. Given the current discussion regarding reducing the jurisdictional threshold from 1 acre to ½ acre of impervious surface, the proposed VSMM revisions should be reexamined to add additional stormwater treatment practices and strategies appropriate to smaller sites. We wonder if there is an example manual from another state where this has been done successfully.

3. Clarification is needed as to whether components included in the figures and details represent required items or are provided for guidance.

4. Certain engineered components depicted in details and described in the text are not directly related to achieving stormwater treatment goals. These engineered components should be moved from the "required elements" section to the "design guidance" sections. Examples of this are the liner under the stone diaphragm of Figure 4-4, and the 3:1 slopes in Figure 4-5. Methods for keeping subgrade well drained should be left to the discretion of the engineer.

5. We believe that there are many proposed VSMM changes that may be impractical, unsupported, or will result in unintended consequences. We have attempted to catalog a number of these below, but would like to reserve the opportunity to provide additional comment as additional revisions to the draft manual are made.

Specific Comments:

Section 2.2: We appreciate the explicit provision for variance from exact numerical criterion outlined in the last paragraph on Page 2-3. This has been a de-facto procedure for a number of years and inclusion in the manual clarifies the procedure and allows designers new to Vermont standards to understand ANR's approach.

Section 2.2.1: See comments below under Section 3.2

40 IDX Drive, Building 100
Suite 200
South Burlington, Vermont 05403

Memorandum

Section 2.2.3: Recharge factor requirements have been increased substantially; from 0.40 to 0.60 for Group A soils, from 0.25 to 0.35 for Group B soils, and from 0.10 to 0.25 for Group C soils. No technical support is provided for these proposed increases. Please explain the technical basis and evaluation of feasibility of attaining these increased recharge requirements.

Section 2.2.3: Recharge has historically been calculated on a project-wide basis, not separately for each drainage area. The requirement to calculate separately for each drainage area is only appropriate if strict adherence is kept to the definition of two receiving waters as one discharge point if their total tributary area at their confluence is less than 10 square miles as defined in Section 2.2.5. Otherwise, recharge opportunities in higher quality soils, which will have a more impactful benefit to the watershed, will be lost.

Section 2.2.3: TSS and TP removal requirements have been increased by 5-percent and 10-percent, respectively. No evaluation of feasibility is provided to support these increases. Industry standard for design of practices and testing is 80-percent TSS removal. The increase to 85-percent would hinder the ability to use some alternative systems since their design targeted (and achieved) is 80-percent TSS removal. Other states, including Massachusetts (Volume 1 Chapter 1) and New York (Section 3.3) apply an 80-percent TSS removal standard, and New York applies a 40-percent TP standard. While we believe that certain practices may enable higher removals, this is not universally true, nor is it known whether such practices may be feasible for implementation on a given site.

Section 2.2.5: The waiver for channel protection for less than 1 acre of new impervious has been removed. Please explain the basis for this proposed revision.

Section 2.2.5: The receiving water definition should be moved to the definitions section of the report and applied to all treatment standards.

Section 2.2.5.1: We recommend changing the word "summed" to "hydraulically summed" or "routed together" in the final sentence on page 2-9: "When a site area is composed of multiple land uses, the runoff from each curve number shall be calculated separately and *summed*"

Section 2.2.5.2: The purpose of the channel protection standard is to manage the 1-year 24-hour storm event for timing, runoff volume and peak flow rate from expanded impervious surfaces only; it does not apply to existing or redeveloped impervious. Therefore extended detention should not be required for on- and off-site runoff; runoff from and other existing impervious surfaces should be allowed to match existing conditions.

Section 2.2.5.5: The watershed lag method of time of concentration computation does not allow for time of concentration variations due to the existence of significant pipe network infrastructure, such as is common in developed watersheds. The use of other methods should be allowed. Sheet flow lengths should be allowed to represent the total anticipated length of sheet flow without arbitrary maximum lengths. A computation method for sheet flow such as the McCuen-Spiess limitation criteria, as presented in the NRCS National Engineering Handbook Part 630, should be allowed.

Memorandum

Section 2.2.7: The concept of a "common plan of development" has been introduced with no definition, basis, or technical justification. Although this term is widely used in the federally-delegated NPDES permit program, the apparent attempt here to consider any impervious surface constructed after 2002 as part of a common plan is unreasonable and unsupported.

Section 2.3: Some consideration should be given to defining specific areas of "hotspots" within an overall project site, perhaps on a discharge point basis, meaning that infiltration could be allowed to occur within portions of a site that were not designated as a hotspot.

Section 2.4: The standards to be applied to redevelopment are proposed to be raised with no basis provided as to why this is needed or appropriate, and will serve to disincentivize redevelopment of existing sites.

Section 3.1: The curve number for modeling restored areas should be allowed to be modeled as open space in good condition for the soil group of the imported topsoil layer, not the underlying soil. The runoff characteristics will, and are intended to, reflect the characteristics of the amended section of the soil.

Section 3.2: This soil depth and quality standard is a new standard, that could be very challenging and extremely costly to achieve. ANR has made no demonstration that this criterion is necessary or feasible for implementation. This standard should be eliminated as a mandatory requirement, but rather be offered as an optional measure that could be used to offset (in part) required runoff treatment volumes.

Under this standard, projects that involve public green spaces intended for foot traffic such as parks and athletic fields will be challenged to provide a finished product that will be free of deep footprints and rutting for an extended period of time after construction. Maintenance and mowing equipment travel across these surfaces will be problematic in the season after construction.

ANR should provide more guidance as to if there is any ongoing maintenance and inspection requirement to ensure that soils retain the loosened condition and how this loosened soil condition would be practicably maintained or restored years after the project has been constructed.

Section 3.3 & 3.4: The requirement to mulch planting beds with 2-inches of organic material will create significant limitations for viable ground cover options for sites subject to a DEC stormwater permit. This standard will be unenforceable on sites such as multi-lot residential subdivisions where homeowners will each have their own preferred landscape aesthetic. It is unrealistic to expect designers performing certifications to assure that each home has a mulch cover on all planting beds. Also mulch may not be appropriate ground cover on high density urban sites with intensive landscape treatments.

Section 3.5: The 8-inch topsoil depth requirement is unrealistic in much of Vermont, and will result in a large cost increase for this component of the earthwork on a site. This requirement should be altered to, at minimum, allow the lower portion of the loosened soil to be the native soil material or "B-horizon" and not necessarily be composed of a topsoil mix. Since the option to stockpile and replace existing topsoil is offered, the topsoil depth requirement should be to match existing topsoil depth prior to the Project. Stockpiled topsoil should not be required to be amended with

Memorandum

compost as its replacement after construction represents a return to existing conditions. Requiring soil amendment or additional thickness beyond what exists prior to development would represent an excessive expense and no basis has been provided for this requirement.

Section 4.1.1: Pre-treatment swales are intended for pretreatment of roadway runoff. However, their minimum length requirement cannot be met by including portions in a roadside ditch. If they are intended to manage roadway runoff, the portion of the swale in a roadside ditch should be allowed to be included towards the minimum length requirement. Except in rare circumstances, it is unlikely to be feasible to construct a sharp-crested check dam with a center weir and weep holes in a two to eight foot wide swale. Check dam stability is better achieved through stone or compacted low permeability fill with erosion resistant materials, which are not amenable to inclusion of a center weir or weep holes. If draining is desired, in lieu of weep holes, check dams should be specified to be constructed of high permeability material such as choke stone.

Section 4.1.2.2: Provide clarification as to allowed slopes within filter strips at a roadway shoulder. The requirements of this section are inconsistent with the dimensions of the example of Figure 4-4 (5:1 max in figure, two-percent max in text).

Section 4.1.2.3: Provide additional background as to how the stone diaphragm is maintained and cleaned to be free of sediment. Maintenance of this feature will be problematic. The 2-foot required width effectively adds 4 feet of gravel/stone surface to a typical crowned roadway. This may be out of step with local requirements. This stone diaphragm will be problematic for a gravel road and the delineation between roadway gravel surface and stone diaphragm will not be able to be maintained during the operational phase of the roadway. This will lead to immediate "creep" of the impervious travel way edge immediately after construction.

Define "pavement drop" and how this differs from the edge of a bituminous asphalt surface.

What is the purpose of the filter fabric between the stone and underlying soil? Filter fabric is prone to clogging and will over time preclude infiltration. If fine migration is a concern, a layer of intermediate-sized material would provide the same benefit as filter fabric with lower clogging potential.

Section 4.1.2.4: If flow cannot be directed to the filter strip until grass is established, it is difficult to understand how the contractor will provide adequate and safe drainage during the time period until vegetation is established. Diversion of runoff around filter strips could result in creation of concentrated flows which could also cause erosion problems. Sites that are designed to provide sheet flow would not be easily manipulated to allow drainage by other means even during this interim period.

Section 4.1.3.1: Define "peak design storm depth" for a forebay. Does this include temporary storage? In figure 4-5, the 3:1 slopes requirement would preclude the ability of a designer to use a weir wall or other such structure to divide the forebay from the downstream treatment practice.

Memorandum

The reduced minimum depth of 2 feet will allow forebays to be better sized for 10 percent of the WQv. The prior minimum requirement of 4 feet often required forebays to be oversized simply in order to achieve stable geometry at the minimum depth.

Section 4.1.3.2: Provide basis for why the 100-year event is relevant to the forebay sizing criterion. Clarify the definition of "design flow" in bullet No. 5.

Section 4.1.3.3: The sediment depth marker requirement conflicts with a designer ability to incorporate stormwater treatment practices into certain sites due to aesthetics and provides little additional benefit when compared with a measuring tape or measuring stick.

Section 4.1.4.2: A catch basin inlet grate, depending on slope, can typically capture approximately 0.5 acres of impervious tributary area during a 10 to 25-year event. Deep sump catch basins should be allowed for pretreatment for up to 0.5 acres otherwise their required spacing would become prohibitive.

Section 4.1.4.3: Regarding the inlet grate sizing requirements for deep sump catch basins, there are only a few grate castings type available to designers and grates must also meet standards of the municipality and VTrans. Grates must have additional open area to account for clogging by leaves and debris. Therefore specifying a grate for a specific flow rate is not likely to be achieved. Restricting flow to the catch basin structure at the grate during the 10-year event could result in flow bypass during larger or more intense rain events which may expose designers to liability of flooding issues at sites.

Section 4.1.4.4: It is recommended that the twice annual inspection frequency for the deep sump catch basin be consistent with the annual inspection requirement of the permit. This should be the case for all stormwater treatment practices. The cleaning frequency should be on an as needed basis when the sump is half full. Requiring annual cleaning regardless of depth of sediment accumulation may result in an unenforceable condition. Designers would be forced to defend an impractical standard where system operators are required to annual pump only a few inches of sediment from a 4-foot deep sump.

Section 4.1.5.1: Proprietary devices are manufactured for many different flow rates. The 1 acre impervious contributing area guidance should be removed.

Section 4.1.5.2: Bullet No. 3 – clarify to allow internal bypass of the device to be used, provided the designer submits supporting information regarding sizing and potential for sediment resuspension.

Section 4.1.5.3: Align inspection frequency with that established by the permit and make the same for all stormwater treatment practices.

Section 4.2.3 and Section 4.2.4: The vegetated treatment flow path length should be required to be equal to the contributing flow path not a pre-determined proscribed length. Partial credit should be allowed for partially meeting the length of the contributing flow path. Developed areas to not have adequate space to provide a minimum of 35 feet of disconnection.

Memorandum

Disconnection is most feasible within areas of a site not developable for other reasons, such as property line setbacks. The requirement to disconnect greater than 25 feet from property boundaries should be removed.

Section 4.2.4.3: Stone level spreaders should be allowed. They have been installed in past projects and have been observed to be functional.

Section 4.2.5: The soil depth and quality standard should not be required in this section. It is rare that eight inches of topsoil would be found at high elevation settings in Vermont.

Section 4.2.5.1 and 4.2.5.2: The stream buffer or "protective strip" requirements are unclear, and should be clarified to apply only to perennial streams and only for instances where runoff occurs directly from an impervious surface towards the stream.

Section 4.2.5.1 and 4.2.5.2: The requirement that the "contributing watershed shall be maintained at a minimum of 90-percent forested land" essentially renders this entire approach unusable, since an applicant will either not have control of an entire watershed, or will be unable to guarantee to ANR's satisfaction, that such conditions would be maintained for the duration of the project. This requirement should be deleted.

Section 4.2.5.3: The requirements in Table 4-4 for spacing of drainage conveyance structures is too prescriptive and should not be a required element. Rather, this should be provided as guidance, with specific design to be left to the discretion of the designer.

What is the justification for a minimum 150-foot disconnection flow path? Table 4.3 requires a maximum 110-foot disconnection flow path, and Section 2.2.5.5 specifies a maximum sheet flow length of 100 feet.

Section 4.2.5.6: Revise "the first two" to "*at least* two…at least 1.0 inch *in the first year*" (italicized text to be inserted), as this is more logistically feasible.

Figure 4-21: Remove maximum depth requirements which appear to be carried over from manufacturer information. These are engineering considerations related to structural integrity and should be left to the designer.

Section 4.3.1: Guidance for mounding analysis must be provided. As has been demonstrated in Massachusetts, an absence of specific guidance becomes prohibitive for performing the analysis. The guidance provided in Section 4.3.6 and Appndix C1, VSMM, Vol 2 is not adequate. Recommended guidance will include methodology for estimating groundwater depth, what flow rate to apply over what time period, and at what time after to evaluate the residual mound depth. Mounding into the system should not preclude its construction. Rather mounding should be required to evaluate the drawdown and ability of a system to handle subsequent storm events.

Section 4.3.1.3: The maximum flow rate of 1.0 foot per second into a bioretention facility should be tied to a specific storm event. Higher flow rates during very large storm events may be unavoidable and does not necessarily represent a poor design.

Memorandum

Section 4.3.1.4: Pretreatment options should be listed as "or" rather than "and." Grass filter strips are often infeasible in developed areas, and we understand that bioretention is intended to be the preferred option for developed area treatment practices. For instance, a requirement to have either a grass channel or filter strip within a bioretention parking lot island would preclude bioretention use on urban sites due to space limitations.

Section 4.3.2.4: The assigned value of 1.0 feet/day for permeability of dry sand soils is arbitrary. A range of permeability should be allowed, as supported by acceptable references.

Section 4.3.3.1: Provide basis for CDA limitations on infiltration practices. Provide basis for why the impervious cover percentage would be significant in sizing infiltration practices. It is not apparent why these restrictions are proposed.

Section 4.3.3.2: Suitable fill for infiltration should not be required to be field-confirmed after placement. Material analysis and supplier certification should be allowed. Requiring field geotechnical tests would result in an unnecessary delay to system construction and an undue burden on system designers.

Clarify groundwater separation requirements for practices located in fill on non-residential sites and designed as filtering systems. If these facilities are designed as exfiltration systems, what is the groundwater separation requirement for filtered, cleaned runoff when exfiltrating from the bottom of the facility?

Section 4.3.3.5: As described in reference to section 4.3.1 above, explicit guidance for mounding analyses including estimating groundwater, loading rate and duration, must be provided. The absence of clear guidance will act as a barrier to construction of this type of system.

Bullet No. 4 under required elements – The requirement that no impervious cover be installed over a stone reservoir or perforated pipe should not be applied to arch chamber systems bedded in stone or other storage products. These products are specifically designed to be used under parking lots in urban environments with well drained soils where volume reduction is critical and sites are often zoned high density to promote transit use and mitigate sprawl. It should not be assumed that placement of an impervious surface would preclude proper maintenance. Pervious urban land surface treatments are generally more expensive than conventional asphalt. In addition, the requirement that land cover must be pervious would be incompatible with urban land uses since no trees could be planted over the system and intensive urban landscaping would not be possible. No basis has been provided for this restriction, and we strongly recommended that it be removed. Instead, focus on ensuring maintenance programs are in place and maintenance equipment access is incorporated into the design.

Section 4.3.6: The rationale for the reduced applicability of wet ponds for stormwater treatment has not been explained or justified, and we recommend deleting the additional restrictions, such as the 10 acre threshold. In addition, the blanket prohibition against siting of wet ponds in jurisdictional waters is also problematic. There are already well-established permitting programs for regulating impacts to all manners of jurisdictional waters in Vermont, the foundation of which is avoiding impacts where feasible, and an applicant for a stormwater permit should not be foreclosed from "making the case" that the proposed location of an STP is meet the applicable permitting criteria.

Memorandum

Section 4.3.6.2: Provide scientific rationale for limiting wet pond contributing drainage area to 10 acres or greater. The relationship between contributing impervious area and treatment volume, and therefore pond surface area, is linear. It is not understood how large drainage areas result in more successful ponds. Provide basis or rationale for 25-foot setback from maximum water elevation.

Section 4.3.6.3: The requirement for gravel trench outlet configuration is problematic since it will be subject to clogging by organic material and sediment and will involve significant ongoing maintenance and reconstruction using earth moving equipment. Please provide clarification as to why the underdrain is shown as a second outlet. This configuration should not be a requirement of this section.

Spillways should be sized by the designer. The 8 foot minimum spillway width requirement is arbitrary and should be removed.

Figure 4-33: Note that the outlet structure shown is not located within the embankment and is therefore not accessible by land. This is not recommended.

Section 4.3.6.6: Clarify use of the 25 foot "setback" vs. "buffer" and define "permanent structures". A justification should be given for how permanent feature within the 25 foot zone impact water quality.