

**Vermont Agency of Natural Resources
Department of Environmental Conservation
Watershed Management Division**

**Response Summary for Public Comments Received on the
Draft Vermont Stormwater Management Manual (VSMM – 3/1/2016)**

September 23, 2016

Commenters: Table 1, below, shows the abbreviation and affiliation of each entity that provided comment during the informal public comment period from March 1, 2016 to April 22, 2016. Comments are organized by topic, with responses provided for each comment immediately below the comment. The entity that provided the comment is indicated in parenthesis following the comment. In addition, the Department requested feedback on the Department’s draft STP Selection Tool and Runoff Reduction Spreadsheet developed in support of the draft VSMM. Comments received on those tools and other comments that were received that were not specific to, but related to the VSMM update have been included.

Table 1: Commenter Affiliation and Abbreviations.

Abbreviation	Affiliation
ACEC	American Council of Engineering Companies of Vermont
Burlington	City of Burlington Stormwater Program
CAV	Composting Association of Vermont, Pat Sagui
VERMONT ENVIRONMENTAL CONSERVATION ORGANIZATIONS	Joint Comments from Conservation Law Foundation, Sierra Club, Trout Unlimited, Lake Champlain Committee, and the Lintilhac Foundation
Essex Junction	Village of Essex Junction
External Stakeholder meeting	Denotes a comment or question received during the public stakeholder meeting held March 15 th , 2016 at the Pavilion Auditorium. DEC was unable to capture the affiliation of each commenter during the meeting.
Krebs & Lansing	Krebs & Lansing Consulting Engineers
South Burlington	City of South Burlington Stormwater Utility
Stevens & Associates	Stevens & Associates Engineers
VHB	Vanasse Hangen Brustlin, Consultants
VNRC	Vermont Natural Resources Council
VTrans	Vermont Agency of Transportation
Williston	Town of Williston

General Comments

Site Planning

1. **Comment:** It is unlikely that developers will choose to build costly parking structures in order to minimize impervious cover. Upon asking the designer of a proposed commercial development if a parking structure had been considered in lieu of a proposed 250 spot parking lot, the designer indicated that “land is cheap and building a parking garage would cost 10 times more than a parking lot.” Has the Agency considered any further incentives/requirements/credits that would encourage developers to “go vertical”? **(South Burlington)**

Response: Aside from potentially remaining below jurisdictional thresholds for operational and construction stormwater permitting, there aren’t any additional incentives provided by the State Stormwater Program for developers to design sites with smaller impervious footprints. A multi-level parking garage would constitute a smaller impervious footprint than a comparable sized conventional parking lot, and the benefit would be that the developer would be subject to treatment and control for a smaller amount of impervious surface. The Department considers that local zoning and other land use regulation is more apt to dictate development details and patterns, in consideration of many factors.

2. **Comment:** The second bullet under Natural Drainage, Buffer and Floodplain Protection should indicate that buffers must remain in an undisturbed condition, i.e. mowing and brush hogging is not acceptable. **(South Burlington)**

Response: Upon additional consideration, the second bullet is expected to be revised to note that “buffers are most effective when maintained in an undisturbed condition; mowing and brush hogging should not take place within a buffer.” In the proposed VSMM, guidance has been removed for purposes of rulemaking.

3. **Comment:** How will DEC evaluate whether appropriate site planning and design strategies have been implemented? **(South Burlington)**

Response: The Department will not dictate development details and patterns typically regulated by local zoning and other land use regulation. The proposed VSMM requires that designers propose the use of practices that achieve runoff reduction when possible. This strategy will allow designers to continue to configure their sites in consideration of other factors, while allowing for an objective framework for reviewing site planning and treatment considerations.

Standards

Post-Construction Soil Depth and Quality Standard

4. **Comment:** The depth of topsoil required seems excessive. Many existing sites in Vermont have less than 8 inches of naturally occurring topsoil. We feel there should be a less stringent requirement if it can be shown the existing site has less topsoil? **(Krebs & Lansing)**

Response: In response to public comment, the Department conducted further analysis of common and commonly developed upon soils in Vermont. The topsoil depth in the Post-Construction Soil Depth and Quality Standard has been decreased from 8 inches to 4 inches,

which the Department considers to be more representative of the mean depth of O and A soil horizons for the variable soils found throughout the State. Sites with mapped soils that naturally have less than 4 inches of topsoil will have the option to meet the depth of topsoil indicated by the sum of the O and A horizons on the NRCS Official Soil Series Description for the mapped on-site soils. Information that the Department relied upon to make this change is available upon request.

5. **Comment:** Consider two tiers with regard to the depth of the topsoil layer. Perhaps set some minimum depth (4" or 6" and know you will get 4" – which will be an improvement over existing amendment that has to be met on all sites. Then for sites that pursue enhanced soil restoration (through deeper top soil layer), perhaps they get an additional credit – or are able to use an even lower CN (particularly for C/D soils sites)? **(Burlington)**

Response: With the reduction in topsoil depth from 8 inches to 4 inches required in the standard the Department does not consider a tiered approach to be necessary.

6. **Comment:** This Post-Construction 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. **(VHB)**

Response: Act 64 and the revisions to 10 V.S.A. § 1264 require the Department to “establish best management practices for improving healthy soils in order to improve the capacity of soil to retain water, improve flood resiliency, reduce sedimentation, and prevent stormwater runoff.” 10 V.S.A. § 1264(f)(12). Healthy soils are further defined in 10 V.S.A. § 1264(b)(5) as “soil that has a well-developed, porous structure, is chemically balanced, supports diverse microbial communities, and has abundant organic matter.” As such, the Department has included this new standard and approach to soil restoration to meet the goals established under Act 64. Soil restoration methods were discussed during the prior stakeholder process and this information was considered and subsequently incorporated into the proposed VSMM.

The standard establishes waivers for certain site areas (e.g. steep slopes, structural fill). Furthermore, in response to public comment, areas that cannot be reasonably expected to remain uncompacted due to significant foot or vehicle traffic or other forms of compaction will not be subject to the standard, but shall be addressed through modeling the compacted area as “open space in poor condition” rather than as “open space in good condition.”

The site requirements for meeting the Post-Construction Soil Depth and Quality Standard will be identified by the designer in the plans submitted as part of the stormwater permit

application materials, including example test locations for contractor's use in verifying compliance. As such the earthwork contractor will be responsible for ensuring a project adheres to the plans.

7. **Comment:** 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. **(VHB)**

Response: In response to public comment, and after further consideration by the Department, the requirement to mulch planting beds with 2 inches of organic material has been removed from the Post-Construction Soil Depth and Quality Standard. Although this requirement was removed, the Department still considers the stabilization of planting beds with organic material to be a good practice that will improve the capacity of the soil to retain water and prevent stormwater runoff.

8. **Comment:** 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 compost as its replacement after construction as this does not represent 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. **(VHB)**

Response: The Department does not consider the replacement of amended stockpiled topsoil after construction to necessarily represent a return to the pre-development soil condition. The Post-Construction Soil Depth and Quality Standard aims to improve healthy soils where possible, not only replace in-kind. The topsoil depth has nonetheless been decreased from 8 inches to 4 inches for sites with greater than 4 inches of topsoil, and has been adjusted to match the depth of topsoil indicated by the sum of the O and A horizons in the NRCS Official Soil Series Descriptions for the on-site soils for sites with less than 4 inches of naturally occurring topsoil as mapped.

9. **Comment:** Minimum 8 inches of topsoil depth seems excessive... designs typically call for 6 inches. **(ACEC)**

Response: The Post-Construction Soil Depth and Quality Standard has been revised from 8 inches to 4 inches of topsoil.

10. **Comment:** Are these requirements applicable to type D soils? It seems like D soils should be exempt. Additionally, it seems like there should be an alternative standard to meet the existing conditions on the site. **(Stevens & Associates)**

Response: The Standard is required on Hydrologic Soil Group “D” soils. Sites with mapped soil that naturally have less than 4 inches of topsoil will be required to meet the depth of topsoil indicated by the sum of the O and A horizons on the NRCS Official Soil Series Description for the mapped on-site soils.

11. **Comment:** Does the Soil Depth and Quality Standard apply to D soils? **(External stakeholder meeting, ACEC)**

Response: Yes, the Post-Construction Soil Depth and Quality Standard does apply on Hydrologic Soil Group “D” soils. See the response to Comment #16.

12. **Comment:** The Post-Construction Soil Depth and Quality Standard language was adopted from the Stormwater Management Manual for Western Washington (BMP T5.13). However, in the Summary Table and Design Guidance, the Agency has modified the language to omit biosolids from the list of sources of organic material. Why has VTDEC removed biosolids from the organic matter list? Inclusion of Class A Biosolids would provide a consistent, low cost, and safe source of organic content while reducing the burden of disposal fees on the municipalities that produce it. Due to the currently low market demands for Class A Biosolids, these nutrient rich materials must be landfilled, while manufacturers introduce new sources of phosphorus into the ecosystem through the production of fertilizer.

An engineered topsoil used for reclamation of a disturbed site (e.g. a construction site) requires adequate plant nutrients. Use of an organic form of nitrogen, rather than chemical fertilizer, is preferable, because the latter will immediately leach and/or runoff in large amounts if a significant rain event happens before vegetation is well-established. In contrast, most of the nitrogen (and much of the phosphorous) in biosolids (even more than manures) is in organic form and will only become available over time, as microbial action in the soil releases it for plant uptake. Thus, biosolids as the nitrogen source is the preferred choice environmentally.

While some biosolids or manure is important in post-construction soil, in order to provide plant nutrients to boost rapid and sustained plant growth to reduce erosion, too much may provide too much nitrogen and thus leaching. Therefore, the Agency should adopt Western Washington’s guidance and permit compost to contain up to 35 percent Class A Biosolids or manure. **(Burlington, South Burlington)**

Response: Upon additional review and discussion with the Department’s Waste Management and Prevention Division, Residual Waste and Emerging Contaminants Program, the Department has now included Class A biosolids as an amendment option for the Post-Construction Soil Depth and Quality Standard. Topsoil found to require amending will be allowed to contain up to 35 percent Class A biosolids to reach the required organic matter content.

13. **Comment:** We believe the standard on a whole goes overboard versus what was discussed in the stakeholder meetings. In those meetings the standard was presented as a much more qualitative standard to ensure that on-site soils were not overly compacted during construction. Ideas such as “fluffing” compacted soils, and setting tighter construction limits to limit compaction were discussed. The manual instead goes to extremely specific standards that

are going to add very significant construction costs, while also presenting an enforcement nightmare for engineers and stormwater section employees. **(Krebs & Lansing)**

Response: The Post-Construction Soil Depth and Quality Standard, like some of the other standards and practices, has evolved since the last external stakeholder meeting in response to Act 64 and revisions to 10 V.S.A. § 1264. The Department considers the revised standard, of 4-inches topsoil, to be a reasonable standard for restoring healthy soils. Also see the response to Comment #12.

14. **Comment:** The specific requirements for organic matter (5 percent) and pH are excessive. Who's responsible for measuring the pH of every square foot of topsoil? We already have a client who has a 4 percent organic matter requirement and get feedback from Contractors saying this is difficult to achieve and adds significant costs. **(Krebs & Lansing)**

Response: Based on review of the organic matter content of Vermont soils, the organic matter requirement for the Post-Construction Soil Depth and Quality Standard has been decreased to 4 percent. Review of the available soil information indicates that an organic matter content of at least 4 percent is common and widespread in Vermont soils. Neither soil pH nor organic matter content will be required to be verified for "every square foot of topsoil." Site plans included with permit application materials, as prepared by designers, are expected to identify example test pit locations at a density of 9 tests/acre of land area subject to the standard that contractors will use in verifying compliance with the standard. These tests will be qualitative in nature and their purpose is to verify that the subsoil was adequately scarified and that the appropriate amount of topsoil was returned to the site or amended as required.

15. **Comment:** Is tilling the same as scarification? **(Burlington)**

Response: For the purposes of the soil scarification requirement in the Post-Construction Soil Depth and Quality Standard, tilling, soil ripping, and discing will all be considered equivalent and acceptable practices.

16. **Comment:** Expand requirement to steeper slopes, greater than 3:1. **(CAV)**

Response: The Department does not consider the need to expand the Post-Construction Soil Depth and Quality Standard to slopes greater than 3:1 at this time. Steeper slopes often require different stabilization techniques, particularly under the Department's construction stormwater permitting requirements. The exclusion does not preclude designers or contractors from restoring healthy soils elsewhere on a project site, where feasible.

17. **Comment:** Require the practice on solar array sites. **(CAV)**

Response: A solar array development project that meets the jurisdictional threshold for an operational state stormwater discharge permit would be subject to the Post-Construction Soil Depth and Quality Standard.

18. **Comment:** Provide Post Construction Soil Quality Guidelines per WA Soil BMP Manual. **(CAV)**

Response: The Post-Construction Soil Depth and Quality Standard was based off of an analogous standard in the Stormwater Management Manual for Western Washington. The

Department has modified the standard in response to public comments and in consideration of implementing the standard in Vermont and the operational state stormwater discharge permitting framework.

19. **Comment:** The last sentence of the second paragraph (of page 2-1) indicates that undisturbed soil is presumed to comply with the Post-Construction Soil Depth and Quality Standard. How does this standard apply to sites where the existing soils are fill material? **(South Burlington)**

Response: Undisturbed fill soils will not be subject to the standard and will not be required to be restored, unless disturbed. Disturbed fill soils will be required to comply with the standard and be subject to 4 inches of topsoil, regardless of the amount of topsoil indicated on the NRCS Official Soil Series Description for the mapped soils on the site.

20. **Comment:** 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. **(VHB)**

Response: Hydrologic soil group is based on the texture and saturated hydraulic conductivity of the most restrictive layer in a soil. This will generally not be the topsoil layer, and a distinction should be made that the standard does not require that topsoil be imported. Many sites may be able to stockpile, amend, and reapply the existing topsoil to meet the standard rather than import topsoil. The Department expects designers to rely upon NRCS soil mapping and documentation of existing/proposed groundcover by the designer for characterizing runoff conditions.

21. **Comment:** Biosolids should be considered as an allowable soil amendment under this requirement. The Western Washington guide, which served as a reference for this portion of the manual, allows the use of Class A exception quality biosolids up to 35 percent of the soil mixture. The Village supports this practice and believes the DEC should strongly consider adding it as an option to the Post Construction Soil Depth and Quality requirement. Several Water Quality Treatment Facilities in Vermont already produce Class A biosolids making it a product available for public use. Biosolids contain readily available nutrients including nitrogen and phosphorus in forms that are easily taken up by plants and released in a control manner unlike commercial fertilizers that leach nutrients quickly. Post construction soils require more persistent nutrients to boost rapid and sustained plant growth allowing the soils to stabilize, reducing erosion potential. Biosolids can provide this valuable nutrient need. It is important to provide a cap in the amount of biosolids used to avoid leaching of nutrients from the soil. We recommend the same in the Western Washington guide (35 percent biosolids cap). **(Essex Junction)**

Response: See response to Comment #18.

22. **Comment:** Clear definition is needed for "engineered as structural fill or slope". VTrans researched the Washington DOT stormwater manual and the Western Washington manual, but no definition is available in those references. **(VTrans)**

Response: Structural fill or slope would be areas of the site that require a minimum compaction such that the Post-Construction Soil Depth and Quality Standard could not be

achieved to support building foundations or prevent slope failure. These areas would generally be identified using the designer's best professional judgement, and such certification would be accepted by the Department as adequate justification for omitting these areas from the standard.

23. **Comment:** It is not clear whether the Post-Construction Soil Depth and Quality Standard applies for slopes that are 33 percent. The design table indicates that it is required on slopes less than 33 percent, and waived for slopes greater than 33 percent. **(VTrans)**

Response: The Post-Construction Soil Depth and Quality Standard shall apply to slopes less than or equal to 33 percent (3:1). This has been clarified in the VSMM.

Certification/Inspection (Post-Construction Soil Depth & Quality)

24. **Comment:** For "Post-Construction Soils Testing", who will be the "inspector" (It seems logical for this to be the construction firm, who retains a materials testing firm)? **(ACEC, Stevens & Associates)**

Response: See the response to Comment #12.

25. **Comment:** Who is expected to do the certification and when? No one is going to be happy to have to dig holes once hydro-seeding has been done or plants established. **(External stakeholder meeting)**

Response: See the response to Comment #12.

26. **Comment:** The draft manual requires inspection after two storms of 1" or greater. Does this just apply to the first year, or is it ongoing? Will there be annual inspections? **(External stakeholder meeting)**

Response: The inspection requirements have been removed from the VSMM. Permitted sites will be subject to annual inspection requirements pursuant to applicable permits.

27. **Comment:** Consider a certification procedure (with the threat of compliance checks) for assuring compliance with the standard. While we agree with the intent behind the standard and specifications themselves, the current inspection procedures are fairly onerous. **(Burlington)**

Response: The Standard requires 9 test pits be dug per acre of land subject to the standard. Test pits can be dug by an individual with a shovel and the Department does not believe that these tests will be overly burdensome on the contractor, consultant, or permittee.

28. **Comment:** What is the recommended modified proctor range for "uncompacted soils" that will prevent sinkholes? If this is going to be tested, we need to give the contractor guidance on what the appropriate range is. We also want to prevent failures due to soils not being compacted enough, so having a range that they have to meet would be ideal. **(Stevens & Associates)**

Response: The standard does not recommend or require a modified proctor range for uncompacted soils but the draft VSMM had referenced uncompacted soils. This statement has

since been removed and compliance with the standard will rely on a qualitative review by the contractor. Please also see the response to Comment #12.

29. **Comment:** The post construction inspection requirements are very excessive and will be counterproductive in that “digging up” the topsoil will be required right when we’re trying to get seed to grow. If a testing requirement is necessary, we would like to propose a testing standard similar to the New York Stormwater Manual that requires pushing a 3/8" bar into the soil using only body weight. **(Krebs & Lansing)**

Response: See response to Comment #12 and Comment #33.

30. **Comment:** The verification and confirmation process outlined for collecting amendment delivery tickets and performing volume checks is unreasonable. The Construction Stormwater Permit requires staging areas and construction roads to be stabilized through the use of crushed stone. If the native soils are unstable then the contractor needs to install more stone until the site is stable. An Engineer cannot predict how a Site Contractor will plan the use of the site during construction or how much stabilization stone will be needed. These unknowns do not allow for accurate topsoil volume calculations. Without accurate knowledge of the topsoil volume, amendment calculations cannot be completed. **(Krebs & Lansing)**

Response: Exact topsoil and amendment volumes will not be required at the time of application. Rather, the designer will be responsible to identify areas of the site that are subject to the standard and provide construction details and notes for the various methods that may be used to meet the standard. Further, instructions for the contractor regarding the inspection shall be included in the notes or detail sheet.

31. **Comment:** The above concerns strongly suggest that a “Contractor’s Certification” (such as a signed affidavit) for this standard be required versus a designer’s certification. It is impossible for designers to be on site during all of the topsoil installation and finish grading of a site. Furthermore, many clients do not want to, or in some cases, simply will not pay construction administration services for an Engineer to observe topsoil installation. This is also extended to the year 1 post construction inspection requirements for the first two precipitation events of a 1 inch or greater rainfall. **(Krebs & Lansing)**

Response: Either the contractor or the consultant would be able to certify the proper execution of the Post-Construction Soil Depth and Quality Standard, dependent on the level of involvement during construction. The remaining inspection requirements have since been removed from the revised draft VSMM.

32. **Comment:** Please change language to clarify that soil depth and quality inspection is not required in annual inspections after initial designer certification of compliance. **(VTrans)**

Response: See the response to Comment #12 and #37.

Groundwater Recharge Standard

33. **Comment:** Please include more detail about the groundwater recharge volume (Re_v) being credited toward the water quality volume and other treatment standards in this section. **(South Burlington)**

Response: The draft VSMM has been revised in response to the comment to more clearly articulate the runoff reduction framework, including the Hydrologic Condition Method and how compliance with the Water Quality Treatment Standard and the Groundwater Recharge Standard, will provide credit towards the other standards, when utilizing certain runoff reduction STPs, such as disconnection and infiltration, that are now identified as Tier 1 Practices. Since Re_v can only be satisfied by use of practices that provide some level of infiltration, including through disconnection; when the Groundwater Recharge Standard is met (not waived), that volume will be credited towards satisfying other standards.

34. **Comment:** Please provide documentation supporting how the 500-foot setback was determined for infiltration adjacent to water supplies. **(South Burlington)**

Response: The required horizontal separation distances that were identified in the draft VSMM have been updated to be consistent with the Department's Groundwater Protection Rule and Strategy, the existing and proposed Water Supply Rules, and the Underground Injection Control Regulations. The 500-foot separation distance previously identified in the draft VSMM was the distance required in the 2002 VSMM. The revised draft of the VSMM identifies these distances under Section 4.3.3.

35. **Comment:** 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. **(VHB)**

Response: The prior stakeholder process considered a review of other national stormwater manuals, including other state manuals applicable to northeastern states, that require greater recharge based on prevailing hydrologic soil groups (HSGs). Stormwater runoff water quality and increases in stormwater runoff volume are both known to have impacts on water quality. Thus a reduction in volume through infiltration and disconnection, and water quality treatment, will result in a dual benefit to the restoration and protection of waters. Since the Re_v is nested within the overall total water quality volume (WQ_v), the change aims to further dictate the use of higher performing practices such as infiltration that not only provide higher water quality treatment, but that also result in a reduction in overall stormwater runoff volume reaching surface waters by direct conveyance. The Department does not consider a feasibility evaluation or further more detailed technical basis is necessary in support of this change. The VSMM takes into consideration sites with limited ability to meet the revised Groundwater Recharge Standard, including through both a modification to design specifications for certain STPs capable of meeting the standard and a STP selection framework that will take into consideration soils and other site and project characteristics. The revised draft VSMM specifically provides greater opportunities for meeting the increased Groundwater Recharge Standard through allowance for disconnections on steeper slopes and relaxed separation to the seasonal high groundwater table (SHGWT) under certain conditions.

36. **Comment:** We have reviewed Recharge Factors in other states to evaluate the validity of the increased Recharge Factors in Table 2-4. In our limited review of other states that calculate Groundwater Recharge Volume in a manner similar to Vermont, we are finding that the proposed values are arbitrary and the increase is seemingly unwarranted. We feel any increase in the recharge factor needs to be justified with clear supporting documentation. From a

design standpoint the increase will likely be a non-factor in “A” soils as most sites will be 100 percent infiltration sites to meet the other requirements, however in “B” and “C” soils the additional recharge requirements will be quite burdensome. In addition, the previous manual allowed recharge to be met on a “site wide” basis, rather than a watershed basis, as long it is in the same receiving water. This should continue to be allowed and should be more clearly stated. **(Krebs & Lansing)**

Response: See response to Comment #41. In addition, although the new runoff reduction framework established in the proposed VSMM is best applied on a drainage area basis, the Groundwater Recharge Standard compliance is able to be applied on a “site wide” basis in consideration of multiple receiving waters for larger site. The restriction requiring recharge to be calculated for each drainage area has been removed from the VSMM.

37. **Comment:** 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. **(VHB)**

Response: See response to Comment #42.

38. **Comment:** The Area method for groundwater recharge has provided needed flexibility to meet recharge standards for public linear transportation projects. VTrans wishes to be able to use Area method to meet recharge standards, and is concerned that vegetated areas aren't included. Why has this method removed from the manual? **(VTrans)**

Response: The recharge area (Re_a) method for calculating the Groundwater Recharge Standard requirement is unnecessary under the runoff reduction framework of the draft VSMM and for that reason that method had been removed in the draft VSMM. Designers will still be able to identify on an area basis the stormwater runoff that will be directed to STPs for recharge. However, the treatment provided to meet the standard will be tracked by volume as opposed to by area.

39. **Comment:** When site conditions dictate, VTrans uses underdrains to minimize roadways from heaving during freeze/thaw cycles, this is an important consideration for the safety of roadway users and for the long term integrity of the State's largest physical asset. Providing groundwater recharge along roadways with underdrains effectively defeats the purpose of the standard, since the underdrains would collect the infiltrated runoff and convey it to a concentrated discharge point.

For these reasons, VTrans requests that DEC consider a groundwater recharge standard waiver for public linear transportation projects on sites where dewatering is necessary (i.e., where underdrains are required). VTrans would work with DEC to more closely define these waiver conditions so that underdrain isn't installed haphazardly just to achieve the waiver. This waiver could be included in the anticipated linear transportation projects section of the manual. Please advise if DEC is amenable to this idea. **(VTrans)**

Response: The Department recognizes that certain transportation projects require underdrains for addressing seasonal high groundwater, just as building construction similarly may require footing drains. The Department considers the benefits of the Groundwater Recharge Standard to outweigh potentially seasonal groundwater dewatering that may occur by use of underdrains or footing drains. The revised VSMM does allow designers to characterize soils based on NRCS soil mapping and in consideration of site specific soils information that may better detail on site soils and groundwater conditions to determine Groundwater Recharge Standard applicability. Projects that have utilized underdrains in their design may still have some functional infiltration and thus provide groundwater recharge during seasonally dry conditions. Therefore, the Department has not proposed adding an additional waiver to the standard.

40. **Comment:** What was the basis for selecting the new recharge factors? It appears that the recharge factor 'F' was not uniformly increased for all soil types (i.e. 50 percent increase for 'A' soils, 40 percent increase for 'B' soils and 250 percent increase for 'C' soils). **(ACEC)**

Response: Correct. The basis for the change is explained in the Department's responses to Comments #41 and #42. In addition, the increases are not uniform and are scaled to account for lower ability to provide recharge on less permeable soils. The revised Groundwater Recharge Standard was proposed in consideration of other northeastern state stormwater management manuals, including both New York and Rhode Island, which both set overall higher recharge requirements. The draft VSMM incorporated higher recharge factors for HSG A, B, and C soils comparable to the Rhode Island stormwater manual, however retained the waiver for HSG D soils. In addition, the Rhode Island manual recharge factors on both HSG B and C soils were lesser than those required by New York, and the Department considered the overall increase to be a reasonable change in consideration of other changes to STP design requirements that will allow for less restricted use of runoff reduction practices commonly used for meeting the Groundwater Recharge Standard.

41. **Comment:** With the new focus on runoff reduction and infiltrating practices is the state double dipping by also increasing the recharge factors 'F'? **(ACEC)**

Response: In addition to the water quality benefits received from both stormwater treatment and stormwater runoff reduction, the increase in recharge factors ensures that more sites will meet the goal of maintaining the average annual recharge rate for the prevailing hydrologic soils groups. In response to the comment, the Department considered removal of a specific Groundwater Recharge Standard from the draft VSMM, to simply rely upon the new runoff reduction framework and runoff reduction STP prioritization for the Water Quality Treatment Standard to achieve the overall groundwater recharge goal. This approach would have been similar to the New York state stormwater manual where the groundwater recharge component is contained within the design for water quality and framed within runoff reduction. However, the Department was inclined to keep the established standard as is, to ensure there are clearly identified goals for maintaining groundwater recharge. Since the recharge volume (Re_v) is nested within the water quality volume (WQ_v), the Department did not see the framework as redundant or duplicative, and in many cases satisfying the Water Quality Treatment Standard will in turn also satisfy the requirements of the Groundwater Recharge Standard when Tier 1 Practices are implemented.

42. **Comment:** The requirement for the site to be inspected following the first two precipitation events of at least 1.0 inch HAS to be more flexible. Engineers and Designers do not have the flexibility to drop whatever they are doing, cancel meetings, miss deadlines etc., so they can run out to their sites because it's the first rainfall of 1 inch or more. Can it be "inspect within 1 week of a 1-inch rainfall"? This comment also applies to many other sections where it is noted that sites shall be inspected following the first two precipitation events of at least 1.0 inch. **(Krebs & Lansing)**

Response: In response to comments and further consideration, the Department has revised the draft VSMM such that STP inspection and maintenance requirements shall be dictated solely by applicable issued permits and authorizations. Designers are expected to address design requirements related to maintenance access and other design requirements that ensure for long-term STP functionality and effectiveness, which remain in the VSMM. The VSMM will also continue to provide some limited information related to STP maintenance.

43. **Comment:** The new and very stringent requirements prohibiting the use of structural infiltration practices in drinking water source / GWSPA proximity is one example of an instance where the flexibility of site balancing or watershed balancing approaches will be needed when permitting linear projects with substantial redevelopment components. **(VTrans)**

Response: The draft VSMM now incorporates a site balancing approach for meeting the applicable standards, in line with the previously established procedure implemented by the Department for allowing more flexibility when presented with site constraints or other project limitations. The VSMM also incorporates an additional chapter specific to public highway transportation projects as a result of a collaborative effort with VTrans and in response to comments from the Vermont Agency of Transportation. Furthermore, horizontal setback restrictions in consideration of potable groundwater sources or groundwater source water protection areas will be a consideration when evaluating the ability to use structural infiltration practices, as set forth by existing and proposed Drinking Water and Groundwater Protection rules and regulations.

Water Quality Treatment Standard

44. **Comment:** 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. **(VHB)**

Response: VHB correctly points out that many alternative treatment practice verification protocols use a TSS standard of 80 percent. In consideration of accepting other treatment practices, the program has decided to change the total suspended solid (TSS) minimum removal efficiency for water quality practices to 80 percent.

Phosphorus standards are more variable throughout jurisdictions, as reflective of phosphorus TMDLs and designation of nutrient sensitive waters throughout the country. The Department considers that a minimum 50 percent TP removal efficiency is consistent with the practices presented in the draft VSMM as acceptable for meeting the Water Quality Treatment Standard. The VSMM will provide a range of STPs sufficient for sites to meet the Water Quality Treatment Standard. The majority of practices that have been available to designers for meeting the Water Quality Treatment Standard since the adoption of the 2002 Manual are still available for use and additional practices and more flexibility in design requirements have been added.

45. **Comment:** The VSMM should set the water quality treatment standard at removing 80 percent of the total phosphorus load. **(Vermont Environmental Conservation Organizations)**

Response: In consideration of performance goals for the Water Quality Treatment Standard, the Department aims to establish requirements that are both protective and achievable on Vermont sites. The Department agrees that there is significant reason to reduce the phosphorus load from sites subject to a state operational stormwater permit, as the Vermont Environmental Conservation Organizations explained more fully in their [comment letter dated April 15, 2016](#). The Department also agrees with the Vermont Environmental Conservation Organizations that infiltration based practices (including infiltration basins, trenches, chambers, and filtering devices that are designed to infiltrate) can achieve in excess of 80 percent total phosphorus reduction. The VSMM has been revised to require the use of infiltrating practices where soil properties allow and where they will not pose a risk to groundwater. The Department must also acknowledge that certain constraints and conditions will exist on a significant number of sites, thus limiting the use of infiltrating practices (Tier 1 Practices). Based on analyses by the Department of the NRCS soil survey¹, approximately 19 percent of sites currently covered by an operational stormwater permit are classified as hydrologic soil group D, clay soils which will typically not meet the minimum infiltration rate requirements of the highest performing practices. Another 23 percent of permitted sites have a dual hydrologic soil group classification (A/D, B/D, or C/D). These soils are coarser in texture with higher hydraulic conductivity, but have a seasonal high water table of less than 24 inches from the surface, so the use of infiltration is limited under the feasibility criteria of the infiltrating practices in the Manual. Combined, these factors suggest that over 40 percent of permitted sites are likely to have significant barriers to providing water quality treatment through use of infiltrating practices. The VSMM must accommodate for development projects that cannot infiltrate due to site or project characteristics, which is reflected in the revised draft VSMM.

One proposed treatment is the amendment of bioretention or filter media with materials such as water treatment residuals or iron to improve dissolved phosphorus treatment. While there have been several column studies showing promising results, in field performance data is limited for these systems. The Department is not aware of any studies that have documented total phosphorus (TP) removal efficiency at or near 80 percent under field conditions. One study performed by the University of New Hampshire (UNH) Stormwater Center showed a mix with 10 percent water treatment residuals achieved 86-99 percent TP removal in column

¹ Based on an intersection of the NRCS soil survey layer (obtained May 5, 2016 from the Vermont Center for Geographic information) with the Vermont Stormwater Permits Layer.

studies (Stone, 2013). The same mix only exhibited 55 percent TP removal under field testing. Additional research is needed into the design specifications, installation, maintenance, and performance under variable climate conditions to confirm that this practice can be used to meet a higher TP standard with confidence. A designer may propose these types of amendments under the Alternative STP design requirements included within the VSMM, which requires supporting information and Department approval.

Gravel wetlands are another practice cited by the Vermont Environmental Conservation Organizations as a higher performing practice that could be applicable on sites with poor infiltration capacity. The UNH Stormwater Center (2012) reported a 58 percent TP removal efficiency for their submerged gravel wetland. The National Stormwater Database (Winer, 2000) cites an TP removal efficiency of 63 percent, based on two studies. Both are significantly below the Vermont Environmental Conservation Organizations' proposed standard. It is unclear to the Department what additional design variations for gravel wetlands would provide significant performance improvement. The VSMM now identifies submerged gravel wetlands as Tier 2 Practices.

The final strategy proposed in the comment letter is the use of BMPs in series, also sometimes referred to as a "treatment train" approach. Once again, there is lack of evidence that the treatment train could provide reliable treatment to the level the Vermont Environmental Conservation Organizations has proposed for sites that are unable to utilize infiltration based practices. As explained by Schueler (2000), STPs that rely on sedimentation or filtration exhibit irreducible pollutant concentrations. Whether due to internal loading of the practice or limitations on the pollutant removal pathway, pollutant concentrations cannot be reduced below a certain point. Schueler further postulated that adding a second or third practice wouldn't provide additional water quality benefit where the first practice reduces pollutant concentrations to this irreducible point. The Department will not seek to require the widespread use of treatment trains for meeting the Water Quality Treatment Standard given the uncertainty surrounding their benefit. Again, a designer may propose a treatment train approach under the Alternative STP design requirements included within the VSMM, which requires supporting information and Department approval.

In summary, the Department cannot justify a single total phosphorus (TP) removal standard of 80% based on the range of site conditions subject to operational stormwater permitting in Vermont.

In consideration of public comment following the release of the draft manual in March 2016, the program released a draft "STP Selection Tool" which introduced the concept of three tiers of practices to the stakeholders for comment (Available on the Stormwater Manual Update page: http://dec.vermont.gov/watershed/stormwater/manual_update). The Tier 1 Practices, which designers must first consider when choosing treatment for their sites, is comprised of infiltration based practices which are expected to exceed 80 percent TP removal. The STP Selection Matrix poses a series of questions so that the user may determine the feasibility and safety of using these practices on a site. Tier 2 Practices, available for use only if Tier 1 Practices cannot be used, contain filtration based practices that can be expected to achieve between 60 and 80 percent TP removal and include lined bioretention systems and submerged gravel wetlands. If site specific analysis indicates Tier 2 practices cannot be used, a Tier 3 Practice expected to remove between 50-60 percent TP may be used. This approach will

ensure that each site will use the highest performing practices appropriate to that sites' conditions. This approach is also expected to result in the improvement of existing stormwater infrastructure where no other alternative exists.

While the VSMM does not set an across-the-board 80% TP removal requirement, the Department expects the overall total phosphorus treatment efficiency of the revised draft VSMM to greatly exceed 50 percent under the tiered approach. Appendix A of the "Phosphorus TMDLs for Vermont Segments of Lake Champlain" details the analysis performed by the Department in support of the future growth analysis for developed lands. That analysis estimated an average removal efficiency of 71 percent would occur in the Lake Champlain basin for projects subject to new development standards, assuming infiltrating practices would be used on hydrologic soil groups A and B and wet ponds are used on C and D soils. The use of Tier 2 Practices was not incorporated into that analysis, so with the improved VSMM the average removal efficiency could be even higher. The future growth analysis also did not include any reductions in phosphorus loading from the redevelopment standard, which will be expected to lower the phosphorus loading to Lake Champlain and state-wide.

46. **Comment:** For challenging sites, the Agency should consider looking at the TSS 85 percent and TP 50 percent removal rates on a site basis not a per practice basis. For instance, there could be sites where some portion of the site could be directed towards infiltration and thus achieve very high removal rates, but then another portion of the site can't be directed towards infiltration but might be directed towards a proprietary practice that doesn't get 85 percent TSS/50 percent TP. In this case, the site might be able to meet an overall TSS 85 percent and TP 50 percent standard, even if not all impervious is draining to a VSMM approved practice. This may be similar to the allowances covered under redevelopment on page 2-17. **(Burlington)**

Response: See response to Comment #51. The revised draft VSMM provides some added flexibility for redevelopment projects to utilize STPs that may have a lower removal efficiency, when there is the ability to capture a larger area of impervious surface, similar to the site balancing design option, also incorporated into the revised draft. The added flexibility however will require a designer to provide the Agency with information related to the practice supporting this approach. This approach will not allow for higher performing practices, such as infiltration, to be used to "offset" treatment not provided elsewhere on site.

47. **Comment:** Please consider whether or not a TSS removal efficiency of 85 percent and TP removal efficiency of 50 percent are necessary for roof runoff which has generally low TSS and TP loading rates. Burlington has situations in which substantially sized roofs could be disconnected from the combined sewer, but if these are considered "new" separate stormwater discharges and the roof water has to receive full treatment – separation is greatly dis-incentivized. This may also be helpful with tight urban developed sites. **(Burlington)**

Response: Although the VSMM broadly states that the minimum performance standards for acceptable STPs are based on the removal of TSS and TP, stormwater runoff can contain other pollutants, such as metals, bacteria, and hydrocarbons. Practices that address TSS and TP typically have the highest removal rates for other pollutants so separate performance standards for each pollutant are not necessary. Loading of some pollutants, particularly trace metals, can be significant from roofing materials (Clark et al, 2008). Additionally, depending on how it is conveyed, roof runoff can mobilize pollutants from other surfaces. Since TSS

concentrations in roof runoff are typically low, pretreatment requirements are significantly relaxed compared to other impervious surfaces. Existing rooftop runoff separated from a combined sewer may be considered redevelopment under Chapter 18 and 22 of the Environmental Protection Rules, thereby requiring 50 percent water quality volume treatment.

48. **Comment:** Has ANR attempted to quantify the pollutant loading reductions that that will result from implementing the new standards? Has ANR made a determination of what additional costs will be incurred by applicants under the new rules and weighed those costs against the anticipated benefits? **(ACEC)**

Response: In considering cost, the Department must consider both its current and anticipated regulatory obligations. Under the recently adopted Lake Champlain Phosphorus TMDL, a reduction in load is required of developed lands. Any increase in phosphorus loading from new development will need to be offset by the application of additional controls elsewhere on developed land. It is generally much more expensive and less efficient to implement stormwater retrofits on already developed sites than to include stormwater treatment at the time of development. For this reason, the Department is seeking to maximize stormwater treatment in the revised draft VSMM where feasible, as explained in the response to Comment #51.

49. **Comment:** For the purposes of reviewing/accepting alternative treatment practices, the manual should not only list removal efficiencies (which are greatly dependent on the concentrations in the influent) but also some target maximum effluent concentration. **(Burlington)**

Response: In accepting third party testing or approval of alternative treatment practices, the Department will consider the methodology used in the testing, which may include the influent and effluent concentrations observed during the testing.

50. **Comment:** Why were the removal rates of TSS and TP increased to 85 percent and 50 percent respectively? The Agency should consider the achievable removal rates of approved treatment practices when increasing removal rate requirements. If an Engineering Feasibility Analysis precludes infiltration of the WQ_v on a specific site, there should remain options available that would still meet the WQTS requirements. Additionally, the proposed WQTS should apply to the site as a whole, rather than for individual STPs. **(South Burlington)**

Response: The practices that are currently allowable under the revised draft VSMM have been determined to provide treatment of at least 80 percent TSS and 50 percent TP on site and include infiltrating and non-infiltrating practices. The Department's response to the feasibility of site-wide pollutant removal efficiencies for the WQTS are explained in the response to Comment #51.

51. **Comment:** Is the anticipated increase in TSS and TP removal efficiency due to the adjustment in the WQ_v storm from 0.9" to 1.0" or improved STP design? **(ACEC)**

Response: The anticipated increase is related to the removal of some low performing practices and improvement in design elements of some of the remaining practices. Many jurisdictions throughout the country define the water quality volume as the volume that will capture 90 percent of the annual storm events. Analysis of recent precipitation data in

Vermont suggests that to achieve that goal, the target storm should be increased from 0.9” to 1.0”.

52. **Comment:** The paragraph beginning “In association with the 90 percent rule”, consider providing further background detail for new individuals not familiar with the 2002 VSMM. **(South Burlington)**

Response: The Department has removed the reference to the “90 percent rule” and has instead explained how the majority of pollution occurs during small, frequent storms.

53. **Comment:** Should the WQv be "treated by reducing the first inch of runoff", or by treating/reducing the first inch of rainfall? **(VTrans)**

Response: The revised draft VSMM clarifies that the target is to treat the stormwater runoff from the first inch of rainfall. The revised draft VSMM requires this to be achieved through runoff reduction where possible, but the Department recognizes that this will depend on site conditions.

54. **Comment:** Following a presentation by State staff it became clear that clarification is required as to whether the WQTS were to apply to an individual STP or to the site as a whole. In other words, does each individual STP need to meet 50 percent TP and 85 percent TSS or is that the goal site wide regardless of what combination of STP practices one uses. If the requirement is based on individual STPs then there is an inherent flaw in this approach. It should not matter if you use multiple BMPs which individually achieve less than 50 percent TP reduction if, as a whole, they achieve the WQTS standard. The following comment “Increased Phosphorus Removal Standard” is based on the assumption that the WQTS apply to the site as a whole and not individual systems. **(Williston)**

Response: The minimum removal efficiencies cited in the manual apply to individual practices, not to the site as a whole. See response to Comment #51.

55. **Comment:** Increased Phosphorus Removal Standard: Phosphorus removal has been increased from 40 – 50 percent between the 2002 and the pending stormwater manual update. In that time frame it has become clear that phosphorus removal is the primary contaminant of concern for the Lake Champlain Basin. The need to reduce phosphorus is uncontested and supported through the ongoing efforts to finalize the Lake Champlain TMDL and the increase in agricultural standards authorized through the newly passed Vermont Water Quality Act. However, the percent removal proposed in the draft manual does not reflect the seriousness of the problem we face.

According to the 2002 VSMM, Volume 2, wet ponds remove 49 or 51 percent of TP (pages 165 and 31, respectively). As wet ponds are the prevailing method of stormwater management the proposed increase from 40-50 percent does not change the way development will need to address phosphorus. Perhaps that is why the manual is attempting to reduce the use of wet ponds through a drainage area restriction of 10 acres or greater.

While this is not a direct quote, I have heard the following answer from State Staff with regards to why 50 percent TP removal was chosen, the 50 percent TP removal is not what the State expects to be the standard but what they have chosen to set as the floor for TP removal.

On a whole, we anticipate that the majority of sites will exceed this value. This seems disingenuous to me. If the State believes standard practice to far exceed the minimum, why not set the minimum higher and allow a specialized waiver or monetary offset for those sites which, after rigorous review, cannot meet the standard? Additionally, it is my understanding that engineering firms do not design far above set standards. Engineers will design for what is legal, ethical and in their client's best interest. This often entails the most affordable approach which meets minimum regulatory thresholds.

As our current method of regulating stormwater is not adequately addressing the contaminants of concern, the new TP requirement should require a shift away from our current approach to phosphorus removal. Along with increasing agricultural standards, development and redevelopment must do their part to address the issue of phosphorus in Lake Champlain. As such, a more rigorous TP removal above the proposed 50 percent is suggested. **(Williston)**

Response: See the response to Comment #51.

Draft STP Selection Tool (Water Quality)

62. **Comment:** As it currently reads the decision matrix and associated guidance direct the user to the next stage in a fairly black and white manner. For example, it simply asks if Tier I Practices can be used or not. There are likely to be projects where Tier I or Tier II Practices can be used for a portion of a project but Tier 3 Practices are needed for other portions. It may be beneficial to acknowledge this in the preface or elsewhere in the guidance. **(Contech)**

Response: The Department agrees with the comment. The draft STP Selection Tool is expected to be used in support of the VSMM as part of the stormwater permit application process, on a discharge point by discharge point basis. It is acknowledged that some sites will have drainage areas that can utilize higher performing practices, while other drainage areas within the same site will not. The draft STP Selection Tool and other application materials may be further developed to support a final VSMM, once adopted.

63. **Comment:** It would be helpful to provide some examples of common constraints that would justify the use of Tier 3 Practices, i.e. limited space, utility conflicts, etc. **(Contech)**

Response: Site constraints are dictated by many factors, and as such it would be difficult to characterize an example condition that warrants the use of a Tier 3 Practice in all situations. The Department therefore has not included specific examples in the draft STP Selection Tool introduced to support the revised draft VSMM. The Department however does recognize that space constraints and existing utilities may be considerations for justification for the use of Tier 3 Practices, in addition to other site- or project-specific considerations.

64. **Comment:** Is it fair to assume that any alternative practice that can demonstrate the ability to exceed 60 percent total phosphorus (TP) removal and 80 percent total suspended solids (TSS) can be utilized in place of one of the listed Tier 2 Practices? I believe it's important to have a pathway to approve practices for Tier 2 given that there are only 2 options currently, both of which tend to be land intensive. **(Contech)**

Response: Yes, an Alternative STP for which sufficient documentation exists to support a 60-80 percent total phosphorus reduction may be acceptable upon approval by the Agency as

outlined in the Alternative STP section of the revised draft VSMM. However, a designer will not be required to utilize an Alternative STP before considering use of a lower tier practice, when otherwise justified. A list of approved Alternative STPs is expected to be maintained by the Agency.

65. **Comment:** Tier 1 and Tier 2 Practices are noted as generally meeting 60 to 80 percent and greater TP removal. These high removal efficiencies demonstrate the feasibility of setting a more stringent TP removal standard than 50 percent. Where a single practice alone is insufficient, applicants should be required to implement multiple STPs in series or add soil amendments to enhance phosphorus sorption. **(Vermont Environmental Conservation Organizations)**

Response: The Department considers the prioritization of STPs through a tiered approach to be an appropriate and reasonable approach to selection of STPs within the operational permitting framework. Evaluating and assigning an overall pollutant removal efficiency for multiple STPs in series is complex, and would be difficult to administer consistently without known pollutant removals for established paired STPs. The tiered approach established in the revised draft of the VSMM will ensure sites use the highest performing runoff reduction STPs when possible. A designer still may propose a treatment train approach under the Alternative STP approval protocol in the VSMM. Regardless of the ability to use the highest performing STPs, soils disturbed during construction will be subject to the Post-Construction Soil Depth and Quality Standard.

66. **Comment:** In the flowchart, it is unclear how applicants are supposed to analyze whether an existing STP “can be modified to meet the 2016 Vermont Stormwater Management Manual (VSMM) standards.” What factors should be used for this analysis? This unguided inquiry grants a disconcerting amount of discretion to the applicant to determine when a practice can or cannot be modified based upon whatever factors she or he may decide, including factors such as cost. Similarly, it is unclear what “modify the existing STP to the extent practicable” means. Some form of modification is almost always practicable, however the extent of modification required is not clear. Under what circumstances could an applicant claim that further modification is not “practicable?” Could high financial costs be enough? More clarity is needed here. **(Vermont Environmental Conservation Organizations)**

Response: The comment makes reference to the flowchart contained within the draft STP Selection Tool, designed to support the draft VSMM and relatedly, the preparation of stormwater permit applications. The Department must rely on qualified designers to assess the ability of an existing stormwater system to be retrofitted to meet the revised draft VSMM design requirements. The discretion is provided not to the applicant but the qualified designer, who must then certify as part of a stormwater permit application, that the application is true and accurate and in conformance with the requirements. The Department also has the ability to review a designer’s justification and request additional information or clarification on any given component of a stormwater permit application, when deemed necessary. The public is also able to provide public comment on stormwater permit applications during the required public notice. The Department has not made any changes to the draft VSMM in response to the comment, however may consider providing designers further guidance in regards to the application process subsequent to the adoption of a revised VSMM.

67. **Comment:** Designs that cannot meet the 2016 VSMM should not be permitted. Permitting designs that only meet the 2002 manual should not be permissible and is harmful to water quality. What is considered an adequate “site specific justification” for an applicant to use Tier 3 practices? We assume site constraints are the only adequate justification, but this could be made more explicit. **(Vermont Environmental Conservation Organizations)**

Response: For stormwater treatment practice selection, the Department must accommodate for the presence of existing utility infrastructure and other site constraints on development activities, such as water resources and soils with low permeability. This may be particularly applicable to proposed redevelopment projects, where extensive improvements to existing stormwater infrastructure cannot be made because space is limited. Minor expansions and redevelopment are often proposed at previously permitted sites where significant stormwater infrastructure already exists. The VSMM directs the designer to first consider use of the higher performing practices and then consider modifications of existing practices before considering the use of existing infrastructure. This will always still require that the existing infrastructure be at a minimum, modified to accommodate for treatment and control requirements for both new and redevelopment, as applicable.

68. **Comment:** For greater clarification, why not create a matrix similar to the one created for Tier 1 Practices for Tier 2 Practices? Rather than writing in a justification, applicants would answer another set of questions. **(Vermont Environmental Conservation Organizations)**

Response: The justification criteria in the Tier 1 matrix were taken directly from the feasibility requirements for those practices established in Subchapter 4.0 of the draft VSMM. A clear distinction in feasibility between Tier 2 and Tier 3 Practices does not exist like it does for Tier 1 Practices. However, since the Tier 2 Practices have not been widely used to meet the treatment standards, the Department must allow for and rely upon designer justification of site constraints that are site- and project-specific. The Department anticipates the development of additional application materials that designers may use in support of a justification as part of the permit application process.

69. **Comment:** Under “slope” in the matrix, the first two questions are identical. **(Vermont Environmental Conservation Organizations)**

Response: In response to the comment, the draft STP Selection Tool will be corrected, once finalized.

70. **Comment:** The flowchart and matrix evaluate single STPs. This misses the opportunity to encourage STP trains that would allow for greater TP removal. **(Vermont Environmental Conservation Organizations)**

Response: See the response to Comment #65.

Channel Protection Standard

71. **Comment:** The waiver for channel protection for less than 1 acre of new impervious has been removed. Please explain the basis for this proposed revision. **(VHB)**

Response: The Department removed the “less than 1-acre expansion” of impervious surface waiver for the Channel Protection Standard in consideration of the revised runoff reduction

framework of the draft VSMM, which allows for more flexibility to meet the standard under the Hydrologic Condition Method. The Department also proposed this change for improved protection and restoration of streams. The channel protection volume (CP_v) that is associated with an expansion with a contributing discharge of less than 2 cfs, typically less than 1 acre, or discharge to a drainage area of >10 square miles, will still be waived from the requirement.

72. **Comment:** Instead of eliminating the CP_v 1-acre expansion waiver, consider a reduction to a 0.5-acre threshold... or a procedure similar to the 10 percent rule which considers the contribution from the site compared to the receiving water. **(ACEC)**

Response: The Department did not modify the draft VSMM because sites with expansions of less than 1 acre are still able to waive the Channel Protection Standard for contributing discharges of less than 2 cfs and for discharges to drainage areas of >10 square miles. Designers may also choose to safely bypass off-site contributing runoff to limit contributing drainage in consideration of the remaining waiver. See the response to Comment #71.

73. **Comment:** The receiving water definition should be moved to the definitions section of the report and applied to all treatment standards. **(VHB)**

Response: The Department does not consider that the definition of receiving water is warranted for inclusion in the VSMM.

74. **Comment:** Did you consider using NRCC for precipitation? **(External stakeholder meeting)**

Response: Yes. The Northeast Regional Climate Center (NRCC) released extreme precipitation values prior to the release of NOAA Atlas 14, 2015. The two sources largely rely on the same sources of raw precipitation data in developing storm depths. The primary difference between the two sources is how that raw data was interpolated spatially. NOAA Atlas 14 utilizes the Parameter-elevation Relationships of Independent Slopes model (PRISM) to interpolate based on location, elevation, and coastal proximity among other factors. The NRCC interpolation relied primarily on location. The resulting NOAA Atlas 14 precipitation values better reflect higher precipitation values commonly experienced at higher elevations, which was a goal cited during the stakeholder development process.

75. **Comment:** "Sites that = do not/fully meet Channel Protection Standard using the Hydrologic Condition Method in Section 2.2.5.1 will be required to submit a feasibility analysis justifying the use of practices that are not credited under the Hydrologic Condition Method." We recommend that this potentially substantial requirement be included in the Channel Protection Standard itself. We also request that guidance be provided regarding the requirements for or level of detail required in this feasibility analysis. **(VTrans)**

Response: The framework that prioritizes runoff reduction practices has been modified in the revised draft VSMM. Sites must now prioritize use of these higher performing practices for meeting the Water Quality Treatment Standard, and will receive treatment volume (T_v) credit for the volume infiltrated towards the other applicable treatment standards, including the Channel Protection Standard. Additional information has also been included in regards to the justification, through a draft STP Selection Tool which is expected to be available to support the VSMM and the permit application process.

Hydrologic Condition Method

76. **Comment:** Why is the pre-development condition woods in good condition? What about agricultural fields? **(External stakeholder meeting)**

Response: The purpose of the Channel Protection Standard is to prevent channel erosion and geomorphic instability in streams. According to the Vermont Surface Water Management Strategy, channel erosion is a major stressor to surface waters, and stream geomorphic data shows that two-thirds of assessed stream miles in the State are in major vertical adjustment. The Strategy further cites alteration of hydrologic regimes by pastureland and cropland as a source of channel erosion. "Woods in good condition" was selected as the pre-development condition most likely to mimic natural hydrology and prevent channel erosion. Selection of a single reference condition is also anticipated to add efficiency to the permit application process for designers.

77. **Comment:** Consider using the Overbank Flood Protection Standard's characterization of pervious pre-development land use for on-site areas (woods, meadow, or pasture in good condition) for Channel Protection as well, instead of forcing the use only of "woods in good condition". **(VTrans)**

Response: See the response to Comment #76.

78. **Comment:** In the opening paragraph of Section 2.2.5.1 of the draft VSMM, consider explaining to readers that "woods in good condition" was selected as representing the pre-development condition. **(South Burlington)**

Response: In response to the comment, the Department has added text describing the purpose of using "woods in good condition" to be representative of the pre-development condition for existing pervious areas.

79. **Comment:** The proposed Hydrologic Condition Method should include an exemption for sites with D soils, otherwise it would allow those who develop on D soils to have systems that provide water quality treatment with minimal additional detention. Detention practices on D soils can achieve major flow reductions with 12 to 24-hour detention. Allowing designers to meet the pre-development condition will result in little or no reduction in velocities, with no infiltration on these sites. **(South Burlington)**

Response: The Channel Protection Standard is only met via the Hydrological Condition Method if a site can reduce its post-development runoff volume to pre-development conditions, and is not a comparison of pre- and post-development peak rates, which seems to have been a source of confusion. The standard is only achievable through practices that infiltrate or otherwise retain stormwater runoff volume. Most treatment practices which can achieve this are infeasible on sites with HSG D soils, so the Department anticipate that these sites will tend to use the extended detention standard in part or for full compliance with the Channel Protection Standard, which is another option for meeting the standard. A site or particular discharge point may contain a variety of soils, so it may still be possible to use the Hydrologic Condition Method on a site for stormwater runoff volume retention, even if soils classified as HSG D are present.

80. **Comment:** Consider introducing how T_v is calculated at this point (first paragraph of the page) or earlier in the manual. **(South Burlington)**

Response: The runoff reduction framework and the related concept of the treatment volume (T_v) is first introduced in Section 2.2.2 (Runoff Reduction Framework) of the draft VSMM, which is contained in the treatment standards section. The Department has expanded this section to include more details on this new framework and the various methods for meeting the applicable standards.

81. **Comment:** 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” **(VHB)**

Response: Application of the Hydrologic Condition Method (HCM) to calculate the hydrologic condition volume (HC_v) is meant to be calculated without the use of a hydrologic model, such that hydraulics and routing are not considered. The sentence in question is meant to highlight the requirement that area-weighting of composite curve numbers should not be used, but that total site stormwater runoff volume should be based on the summation of stormwater runoff volumes from individual land uses. The Department did not consider that a modification to this section was necessary to clarify the issue in response to comment.

82. **Comment:** At the last stakeholder meeting [prior to March 2016], an example was attempted using the Hydrologic Condition Method (HCM) and it was a disaster. The example fell apart under very light scrutiny and it was decided that better examples were needed and we would try again. Unfortunately, no additional meetings were held with new, better examples. We strongly encourage the Agency to vet some new examples through the design community prior to adopting the manual and implementing the HCM. Related to this, is the idea of the “feasibility analysis” for sites that cannot fully meet the CP_v standard using the HCM. What will the feasibility analysis entail? Will there be worksheets? Sliding scales? Case by case analysis? Multiple submissions showing different designs and progress? Again, this should be well vetted PRIOR to adopting the new manual. **(Krebs & Lansing)**

Response: The Department released two draft workbooks for public review following the introduction of the draft VSMM. The draft Runoff Reduction Spreadsheet is designed to guide designers through the calculation of treatment volume (T_v) credit under the Hydrologic Condition Method. In addition, the draft STP Selection Tool presents a process for evaluating the use of the established Tier 1 through Tier 3 Practices, included in the revised draft VSMM, although the focus is on design for the Water Quality Treatment Standard, rather than the Channel Protection Standard in the revised draft. The Department has also included comments received on the draft STP Selection Tool in this response to comments (see Comments #62-70).

83. **Comment:** Table 2-1, Hydrologic Condition Method – Match the post-development runoff volume to the pre-development stormwater runoff volume from the 1-year 24-hour storm. **(VTrans)**

Response: In response to the comment, Table 2-1 has been modified to clarify that the method refers to volumes.

84. **Comment:** In Table 2-5, update the row title to "Woods in Good Condition" (CNs are correct). (VTrans)

Response: The table heading has been updated in response to the comment.

Extended Detention Method

85. **Comment:** Consider adding a hyperlink to the cold and warm water fish habitat designations listed in the Vermont Water Quality Standards. (South Burlington)

Response: Since the Vermont Water Quality Standards are currently proposed for revision, the Department will consider providing a link as part of guidance information in the future. A link can also be added to supporting application materials.

86. **Comment:** For clarification, consider revising second bullet to read, "Extended detention shall be provided for all water, whether on site or off site, that flows to the detention structure". (South Burlington)

Response: The Department does not see any functional difference between the language as currently written in the draft VSMM and as proposed, and as such, the Department has not modified the wording.

87. **Comment:** The fourth bullet states that off-site areas shall be modeled as "present condition" for the one-year storm event. This is acceptable for water going to an STP, but what about water that is being bypassed? Looking at present condition invites installation of undersized infrastructure. Consider requiring the evaluation under a full build out scenario. (South Burlington)

Response: The Department agrees that off-site development can affect stormwater runoff routed to a site as a result of site grading, rerouting of stormwater runoff, and a change in land use. Such changes cannot be predicted at the time of a permit application; however, designers may consider anticipated off-site development in the sizing of infrastructure. When bypassed, designers are required to safely convey off-site contributing drainage. The Department has since removed language in the revised draft VSMM related to evaluating off-site areas under "ultimate condition" which was determined to be unpredictable and difficult to administer under applicable permitting.

88. **Comment:** Rather than requiring Agency review, discussion and approval for use of an alternative time of concentration calculation method, the Agency should consider listing conditions (including a maximum sheet flow path length of 100 feet) that would permit the applicant to use an alternative method. (South Burlington)

Response: The Department will consider different time of concentration calculation methods on a case by case basis. Sites that can justify the use of a method other than the Watershed Lag Method and use an explicit flow path length shall not include more than 100 feet of sheet flow per subcatchment. The Watershed Lag Method was chosen as the default time of concentration calculation method because it is more objective than the Velocity Method in that it does not require a designer to identify the Tc flow path, and because it is sensitive to average catchment slope and utilizes a single curve number to account for land cover. Establishing a consistent method will also result in a more efficient permit application process.

89. **Comment:** The switch to the Watershed Lag Method as the standard time of concentration calculator was surprising to us, as it was never discussed in any of the stakeholder meetings. It may be that this switch makes sense, but it's disappointing to have such a major change enacted without any vetting or discussion. Please consider an exemption for existing large stormwater models for major developments (campuses, airports, etc.) that have been compiling models for years. **(Krebs & Lansing)**

Response: The draft VSMM as released includes the statement "Other time of concentration calculation methods may be considered on a case by case basis, but will require pre-application discussion and subsequent Agency approval. Any spatially explicit time of concentration methods proposed under this framework (TR-55/Velocity Method) shall include no more than 100 feet of sheet flow in the total flow path length." This statement allows the use of existing models as described. In finalizing the draft VSMM, the Department proposed this change in consideration of the runoff reduction framework of the draft VSMM, and expects this change to result in a more efficient permit application process. The Department is further aware of designers that have developed explicit and complex models, based on the TR-55 Velocity Method, for existing and long-term development plans that would likely be given consideration for approval under the draft VSMM.

90. **Comment:** The use of "adjusted" curve numbers that are dependent on the storm event being modeled, makes the modeling process considerably more cumbersome. Distinct models will need to be compiled and calculated for each storm event. This will lead to very large application packages and longer review times. **(Krebs & Lansing)**

Response: The purpose of the adjusted curve number is meant to account for the runoff reduction provided by small scale distributed practices. Absent such an approach, these practices would need to be modelled more explicitly, which would increase the complexity of modeling. In many instances, it appears that while there is a slight difference in curve number between storms, the difference is below the limits of precision allowed by commonly used hydrologic modeling software, so in some cases the same curve number may be able to be used for all storms. If a site is able to meet the standard for a particular storm event by runoff reduction, such as the 1-year 24-hour storm event applicable to the Channel Protection Standard, then that storm event would not need to be modeled.

91. **Comment:** 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. **(VHB)**

Response: The Department in part disagrees with the comment. The Channel Protection Standard does apply to both on-site and off-site contributing stormwater runoff. The draft manual states that "Extended detention shall be provided for ***the on-site and off-site runoff that drains to the detention structure.***" Redeveloped and off-site areas need not be directed to stormwater detention practices and may match existing conditions when safely conveyed. The Department did not modify the draft VSMM in response to the comment.

92. **Comment:** Are sites that use Alternative Extended Detention Method (2.2.5.4) considered to "fully comply" with Channel Protection using the Hydrologic Condition Method (HCM)? (VTrans)

Response: Sites that use the Alternative Extended Detention Method are considered to fully comply with the Channel Protection Standard, which in part could include the use of practices that receive credit under the HCM.

Overbank and Extreme Flood Protection Standards (Q_{P10} and Q_{P100})

93. **Comment:** For ultimate condition, can the modeling take into account areas that are in conservation but aren't included in the zoning as such? (External stakeholder meeting, ACEC)

Response: Reference to "ultimate condition" has been removed from both the Overbank and Extreme Flood Protection Standards, and the Manual now requires designers to model at a minimum existing conditions that contribute to the proposed STP. Designers therefore would be able to take into account areas identified for conservation, and include those areas and their respective land cover in the hydrologic modeling.

94. **Comment:** For Q_{P100} , do we need to recalculate Q_{Rem} , or do we only need to plug the 100-yr storm into the CN_{adj} equation as it is? (South Burlington)

Response: If runoff reduction practices are used on a site, the treatment volume credit can be subtracted from the volume of runoff from the 100-year, 24-hour storm event, which will result in a reduction in peak flow that must be managed under the Extreme Flood Protection Standard. If no runoff reduction practices are employed, then the curve number need not be adjusted. The Manual has been revised to clarify this issue.

95. **Comment:** The "Alternative Extended Detention Method" is not included in the earlier table. (South Burlington)

Response: In response to the comment, reference to the Alternative Extended Detention Method has been added within the Channel Protection Standard, ahead of Section 2.2.5.4, such that designers are aware that this is an option upon introduction to the standard.

96. **Comment:** Allowing designers to meet the pre-development condition for sites with D soils may result in little reduction in velocities. (South Burlington)

Response: The revised draft VSMM requires designers to characterize the pre-development condition as "woods in good condition," taking into consideration soil classification, with the exception of existing impervious areas, that may be characterized as impervious. In conjunction with the new Post-Construction Soil Depth and Quality Standard and runoff reduction framework, including prioritization of runoff reduction practices, the Department considers these requirements to be sufficient to address anticipated stormwater runoff from sites with D soils.

97. **Comment:** How was the maximum storage depth of 8 feet selected? (South Burlington)

Response: Eight feet was selected as it is the maximum depth of a dry basin the Department typically would see included in a stormwater permit application and therefore is considered to be a reasonable design expectation for a dry detention basin evaluated under the Alternative

Extended Detention Method of the Channel Protection Standard. Design parameters were determined to be necessary to avoid hypothetical dry basins from being designed outside of realistic conditions.

98. **Comment:** What qualifies as a "large" project, as noted in the first sentence of the page (2-18)? **(South Burlington)**

Response: The Department reevaluated the need to specifically call out "large projects," and has since removed this term from the revised draft VSMM in these sections.

99. **Comment:** If a project is required to install a detention practice in order to comply with the 10 percent rule and that practice alone satisfies the T_v , is the designer permitted to remove any other infiltration/LID practices from the site design? **(South Burlington)**

Response: STPs that only provide detention, and no infiltration, do not provide runoff reduction and therefore do not qualify for T_v credit. The runoff reduction framework of the draft VSMM requires designers to utilize practices that provide infiltration either structurally or non-structurally to meet the applicable Water Quality Treatment Standard. If a stormwater design was able to meet the Channel Protection Standard, and any additional applicable flood protection standards by other methods, including through completion of a downstream analysis, which may or may not include some detention, the design would still be required to maintain other STPs such that the site retains the requisite treatment, including for meeting the Water Quality Treatment Standard and the Groundwater Recharge Standard, if applicable.

100. **Comment:** 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. **(VHB)**

Response: The Department disagrees with the comment, and considers the addition of "common plan of development" to the draft VSMM necessary and well supported. The term is widely used for characterizing phased projects and projects that are generally related in some way, including by common infrastructure. While the term is newly introduced into the draft VSMM, "common plan of development" is currently defined in the Department's General Permit 3-9015 for stormwater discharges from impervious surfaces, reissued back on March 30, 2013. The term also relates closely to other language already established in applicable Stormwater Management Rules, Chapters 18 and 22, administered under 10 V.S.A. § 1264, that describes related and often contiguous phased development, that is and has been subject to state stormwater permit requirements for more than 10 years. The incorporation of this term into the draft VSMM will therefore bring the VSMM up to date with current regulatory requirements, to ensure that all standards are met, including the Extreme Flood Protection Standard that is often applicable to larger development projects.

101. **Comment:** VTrans wants to be clear that by complying with this standard for projects that involve the replacement of an undersized bridge or culvert with a larger structure, VTrans would not be liable for the effects of restoring natural flows on undersized downstream bridges or culverts. Further, it is not appropriate for DEC to require a developer (including

VTrans) to modify or replace a downstream structure as a condition of stormwater permitting.
(VTrans)

Response: The VSMM, including the Overbank Flood Protection Standard, Extreme Flood Protection Standard, and related downstream analysis, when applicable, does not regulate bridge or culvert sizing or downstream impacts resulting from bridge or culvert replacement. The standards established by the VSMM aim to manage discharges of stormwater runoff from impervious surfaces to ensure that the expansion or redevelopment of those surfaces does not result in additional flooding during larger storm events, typically up through the 10-year 24-hour storm event, or 100-year storm event for larger projects. Undersized culverts located downstream of a project may however be a consideration as part of a complete Downstream Analysis. No change to the draft VSMM was determined to be necessary in response to the comment.

Redevelopment (Water Quality and Design)

102. **Comment:** What consideration will be given to tight zoning requirements? **(External stakeholder meeting)**

Response: Redevelopment of impervious surfaces requires treatment of 50 percent of the Water Quality Volume, a 25 percent reduction in impervious surface, or some combination of these two methods. The revised Manual includes added flexibility when proposing Alternative STPs which may be more feasible where zoning requirements may add additional project or site constraints. In addition, the revised draft VSMM provides a framework for evaluating STP selection in consideration of site and project characteristics and now incorporates two additional site design strategies for these types of project, including *Site Balancing* and *Net Reduction*.

103. **Comment:** The VSMM should set the water quality treatment standard at capturing and treating 100 percent of the water quality volume from redeveloped impervious areas.
(Vermont Environmental Conservation Organizations)

Response: Most existing impervious surfaces are not currently subject to stormwater treatment requirements. The requirement for treating 50 percent Water Quality Volume for redeveloped impervious surfaces represents an improvement to the existing condition and a significant improvement over the current VSMM requirements. The 2002 VSMM required 20 percent Water Quality Volume treatment, thus the 50 percent Water Quality Volume Treatment requirement is a 125 percent increase over the 2002 VSMM. The 50 percent Water Quality Volume treatment requirement was proposed because redevelopment projects generally have constraints that new development sites do not, and the Department believes added flexibility is needed to achieve improvements to stormwater treatment at existing developed sites.

104. **Comment:** Existing sites with outdated and inadequate stormwater controls are a significant contributor of water pollution. It is crucial to update stormwater controls at these sites when they are redeveloped. In addition to increasing the percentage of stormwater that is captured and treated from the redeveloped area as suggested by the Vermont Environmental Conservation Organizations, DEC should require additional steps be taken to reduce stormwater runoff from the existing developed portion of previously developed sites for DEC

to consider. At this time, VNRC request that DEC indicate whether it has considered additional steps be taken to reduce stormwater runoff from the existing portion of developed sites, what requirements DEC has considered and why DEC decided not to move forward with these recommendations (**VNRC**).

Response: The Department considers the increase in water quality treatment established in the draft VSMM for the redevelopment of impervious surfaces to be adequate to update stormwater treatment and control for existing development. In addition, Act 64 established permitting authority for projects with greater than or equal to 3 acres of impervious surfaces not currently subject to a stormwater discharge permit, or that have coverage under a stormwater discharge permit subject to the pre-2002 VSMM requirements. Additionally, the Department has what is known as “residual designation authority” (RDA) under 10 V.S.A. § 1264(e), under which the Department may designate existing unpermitted impervious under 3 acres as requiring permit coverage. Impervious that is 3-acres or greater and RDA’d sites will require stormwater treatment upgrades through a feasibility analysis to be included in the applicable permit. The feasibility analysis will be used in conjunction with the requirements of the draft VSMM. The Department further notes the draft VSMM now requires STPs be sized to provide treatment for all contributing stormwater runoff to a practice, which had not been required in the 2002 VSMM. The Channel Protection Standard has also always required sizing based on the on-site and off-site contributing drainage to a STP. The Department has not made any further revisions in response to the comment. See the response to Comment #103.

105. **Comment:** What about a redevelopment situation where someone is converting a gravel parking lot (high TSS and TP)? Can the elimination of a high loading source (compacted gravel) be considered a water quality improvement? (**Burlington**)

Response: Although the scenario described in the comment may result in a decrease of the annual TSS and total phosphorus (TP) loads from the parking lot all other things held constant, there are other land use considerations, such as increased use or change in loading rates due to changes in use, that are difficult to generalize across sites. The inability to consistently predict these changes requires a standardized approach to handling redevelopment projects. The redevelopment standard requires treatment of a specified volume by an acceptable treatment practice, and does not specifically speak to site specific loading reductions. The Department has included *Site Balancing* and *Net Reduction* design strategies available for designers to use for meeting the applicable treatment standards on these types of projects. Through the Alternative STP requirements, a designer may propose alternatives on a redevelopment project that would achieve equivalent pollutant loading reductions when the standard approach to redevelopment is technically infeasible, subject to Agency approval.

106. **Comment:** Currently, the draft manual states for redevelopment that “A STP shall be designed to capture and treat 50 percent of the WQ_v from the redeveloped impervious area...” While this is an improvement over previous standards it is important to note that this statement may be interpreted in two separate ways as described below (**Burlington**):
- a. Redevelopment may capture and treat half of the contributing impervious area to the full 1” WQ_v event or,
 - b. Redevelopment may treat the entire contributing impervious area to a 0.5” event.

In recognition that the majority of pollutants are transported at the start of a rain event, otherwise known as the “first flush”, and knowing that the majority of events are less than 0.5” annually it is suggested that redevelopment be required to treat the entire contributing impervious to a 0.5” event unless shown to be otherwise impractical. **(Burlington, Williston)**

Response: The Department believes that a certain degree of flexibility is needed for redevelopment projects. Although the comment raises a valid point regarding the equality of the two treatment scenarios, the Department will continue to allow the options for meeting the redevelopment treatment requirements, which could also include the removal of impervious surfaces and restoration per the Post-Construction Soil Depth and Quality Standard.

107. **Comment:** 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 as a disincentive for the redevelopment of existing sites. **(VHB)**

Response: The Department is not aware of any data supporting the notion that stormwater treatment requirements have been a disincentive for the redevelopment of existing development, particularly when the stormwater treatment requirements are substantially less than what is required of new development. In an effort to decrease the amount of stormwater retrofits needed to meet the goals established in Act 64, the Lake Champlain Phosphorus TMDL, and stormwater-impaired waters, the Department considers that the increase in water quality treatment for redevelopment in the draft VSMM is necessary and in-line with the State water quality goals and ensuring compliance with the Vermont Water Quality Standards.

108. **Comment:** The Agency should consider requiring redevelopment to treat 100 percent of the WQ_v and implement an alternative fee for redevelopment lots where STPs are infeasible, if the Agency is able to leverage such fees. **(South Burlington)**

Response: See the response to Comment #103 regarding increasing redevelopment treatment requirements to 100 percent of the Water Quality Volume. The Department does not support a fee schedule as an alternative to meeting redevelopment treatment requirements. The revised draft VSMM provides added flexibility through optional design strategies that will improve feasibility on difficult sites.

109. **Comment:** What is the basis for increasing the WQ_v for redevelopment projects from 20 percent to 50 percent? Did ANR consider lowering the threshold from 1 ac of redevelopment in lieu of adjusting the treatment percentage? **(ACEC)**

Response: The Department supported a decrease in the jurisdictional threshold for operational stormwater permitting from 1 acre of impervious surface to 0.5 acre of impervious during the 2016 legislative session, however this was not to be a substitute for improving stormwater treatment requirements for redevelopment projects. The legislature chose not to adopt a lower threshold during the 2016 session. The Department nonetheless considers that an increase in treatment for redevelopment is necessary to meet state-wide water quality goals for management of stormwater runoff from impervious surfaces. Implementing stormwater treatment and control during redevelopment is also less costly and more effective than retrofitting for stormwater treatment after redevelopment has been completed.

110. **Comment:** Alternative STPs can be proposed that achieve equivalent pollutant reduction – so, for instance, a greater percentage of the site could be treated with STPs not in manual and/or with “lesser pollutant removal efficiency than stipulated in Chapter 4.0” (STP design standards). However, there are no pollutant removal efficiencies explicitly stipulated in Chapter 4.0. The only statement in the draft manual regarding pollutant removal efficiency is in the WQTS, page 2-7. VTrans is concerned that the absence of specific pollutant removal efficiencies for STPs in the manual may hamper efforts to propose substantially equivalent alternative STPs. **(VTrans)**

Response: Pollutant removal efficiency has been assigned to the tiers that the practices have been classified into in the revised draft VSMM. At a later date, the Department may consider assigning more specific assigned pollutant removal efficiencies by practice as further guidance.

Stormwater Hotspots

111. **Comment:** Add ‘wind and solar energy generation sites’ to list of examples. **(CAV)**

Response: The Department does not believe there is adequate justification to designate wind and solar energy generation sites as stormwater hotspots. If a proposed wind or solar energy site or if project specific information indicates that the land use or activity will generate a higher concentration of hydrocarbons, trace metals, or toxicants than are found in typical stormwater runoff, based on monitoring studies, the site may be considered to be a hotspot. The revised draft of the VSMM no longer includes a list of stormwater hotspots but provides some specific examples and may elaborate on what sites may be considered hotspots as part of guidance materials.

112. **Comment:** Allow or require use of compost based BMPs for brownfield restoration. **(CAV)**

Response: The VSMM seeks to prevent comingling of stormwater runoff with hotspot land use, activity, or site contamination. Oversight of brownfield restoration is under the control of the Sites Management Section under the Department’s Waste Management and Prevention Division.

113. **Comment:** 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 **(unspecified)**.

Response: Under the VSMM, infiltration is allowed within portions of a site in which stormwater does not come into contact with hotspot pollutants, “The infiltration prohibition at hotspots applies ONLY to stormwater discharges that come into contact with the area or activity on the site that may generate the higher potential pollutant load.”

114. **Comment:** There should be flexibility in addressing stormwater runoff from “hotspot” uses on a case by case basis. Not all “hotspots” are created equal. For example, a brand new auto service area that is completely enclosed or covered should not be subject to the same restrictions as your standard junkyard. **(Krebs & Lansing)**

Response: See response to Comment #113.

General Standard Questions

115. **Comment:** What will the mechanism for demonstrating feasibility for runoff reduction/infiltrative practices? **(External stakeholder meeting)**

Response: Following release of the draft VSMM (3/1/2016), the Department released a draft STP Selection Tool outlining the criteria for justifying the use of non-infiltrating practices for comment in support of the VSMM update process. This tool classifies the various STPs into tiers based on their performance and outlines objective and site specific criteria to aid designers in selecting appropriate practices and justifying use of other practices. The draft STP Selection Tool would exist outside of the VSMM but would support designers in the preparation of stormwater permit applications submitted in conformance with the VSMM. The draft STP Selection Tool may be refined based on additional feedback from designers and to reflect a final version of the 2016 VSMM once adopted.

116. **Comment:** Can you expand on the Watershed Lag Method? **(External stakeholder meeting)**

Response: The Watershed Lag Method is an objective method for determining the time of concentration for a catchment. It utilizes physical site characteristics, including a length term based on the catchment area, average catchment slope, and the stormwater runoff curve number. A more complete explanation of the Watershed Lag Method is presented in Sec. 2.2.4.3 of the revised draft VSMM, now included within the Water Quality Treatment Standard section of the Manual.

117. **Comment:** Some previously permitted sites have complex models. Will designers have to redo their models for large existing sites? **(External stakeholder meeting)**

Response: Expansions to previously permitted sites will be required to model the expanded portions under the new modeling framework, including use of the Watershed Lag Method, unless site specific justification for the use of a different time of concentration calculation method can be provided. However, the Department recognizes that designers have developed complex models based on the Velocity Method for certain common plans of development and therefore may consider allowance for utilizing these existing models in certain instances with approval from the Department.

118. **Comment:** Will site balancing be allowed under the new manual? **(External stakeholder meeting)**

Response: Yes, a “site balancing” optional design strategy has been included in the revised draft VSMM and may be used to meet applicable treatment standards.

119. **Comment:** VNRC is concerned about the setbacks proposed in Section 2.2.3 for water supplies and groundwater from infiltration of stormwater. VNRC requests that DEC provide the basis for why the setback provided are protective of water supplies and groundwater. In addition, we request that DEC explain how the manual amendments will assure that infiltration of stormwater will not violate applicable groundwater protection standards, including ANR’s obligation to manage groundwater as a public trust resource. **(VNRC)**

Response: In the revised draft of the VSMM, the Department has updated the setbacks for structural infiltration practices from potable water supplies that rely upon groundwater and for groundwater source protection areas. The Department relied upon existing and proposed Vermont Drinking Water and Groundwater Protection regulations in support of these established distances that are determined to be protective of groundwater. The Department further articulates how the revised draft VSMM is protective of groundwater in Section 1.3 of the revised draft.

120. **Comment:** We think it is important to clarify in the manual how alternative stormwater management, once known as credits, are managed at high elevation projects. Specifically, we propose that persons implementing alternative stormwater management (alternatives) at high elevation should be required to monitor the alternative measures to ensure that they are operating as designed. In order to provide ANR with surety that monitoring is conducted, a person implementing alternatives at high elevation should be required to report monthly to ANR. We have attached proposed language requiring monitoring and reporting. In addition, we believe that the proposed monitoring and reporting should be required for existing and new high elevation projects using alternatives. **(Rep. David Deen and Rep. James McCullough)**

Response: The Department was tasked by the Vermont Legislature to develop and adopt alternative best management practices (BMPs) for the stormwater permitting of renewable energy projects located in high-elevation settings in 2009 and 2010 (See Act 54 of 2009, Section 43, and Act 159 of 2010, Section 15). These alternative BMPs were subsequently identified to also be applicable to similarly sited telecommunication facilities (See Act 54 of 2011, Section 3a). At the time the Department was in the process of developing these standards, two renewable energy projects proposed similar BMPs under the alternative stormwater treatment practice (STP) design section of the 2002 VSMM, prior to the Department's adoption of the later-termed, Watershed Hydrology Protection Credit. As such, the Department required, through permit conditions, monitoring of the alternative STP proposals, which is ongoing for one of the two projects that have been constructed to date. Since the permitting of these two projects, the Department developed and adopted through rulemaking, the Watershed Hydrology Protection Credit, which allows those types of projects to utilize a suite of STPs without undertaking an extensive monitoring plan, since the credit is no longer explicitly identified in the 2002 VSMM as an alternative STP. To date, no renewable energy project or telecommunications project has utilized the credit since adoption. Projects that do propose to utilize the credit would be subject to permit conditions that include, initial statement of compliance following construction and annual inspection, maintenance, and reporting requirements, which the Department considers sufficient to oversee stormwater management system performance. The Department does not support the need for monthly reporting and considers monthly reporting to be unnecessary to ensure that the systems are operating and being maintained as designed. The Department's Stormwater Program also has the ability to conduct compliance site inspections, as needed, to assess compliance with issued permits. The Department therefore does not propose any changes in response to the comment. The Department will further review the ongoing monitoring being conducted at the permitted sites as to determine if changes to the VSMM are required in the future related to the Watershed Hydrology Protection Credit to address any water quality or stormwater management concerns.

121. **Comment:** Denoting runoff depth as Q is confusing as it is often used to denote peak rates. **(Stevens and Associates, Burlington)**

Response: Describing runoff as a depth denoted by “Q” is an accepted abbreviation used in TR-55 and numerous hydrology texts. The Department has not modified the draft VSMM in response to comment.

122. **Comment:** Considering including H/H modeling best practices, such as requiring separate routing of flow from connection impervious vs. pervious areas to avoid making impervious “disappear” in a site with a large “site area”. **(Burlington)**

Response: Flow weighted modeling will be required under the revised Manual. It is currently specified in the Application Requirements for Operational Permits document on the Department’s webpage, and is incorporated in the revised Manual through the use of the modified curve number methodology.

123. **Comment:** The site balancing procedure should be codified in the manual and not require an individual permit. **(Burlington)**

Response: See response to Comment #118.

124. **Comment:** Consideration of NET NEW impervious vs. requiring treatment of all “New-new” should be included in the manual to encourage removal of impervious on expansion sites. **(Burlington)**

Response: Requiring treatment on only the net new impervious would be a back slide from existing treatment requirements for projects that involve both new impervious surfaces and redeveloped impervious surfaces. A net reduction of impervious surface would also not preclude the requirement to obtain operational stormwater permit coverage when new impervious surfaces exceed the regulatory threshold. In response to comments, the Department has incorporated a *Net Reduction* optional design strategy in the revised draft VSMM that aims to provide greater flexibility for these types of projects involving combinations of new impervious, redevelopment, and removal of impervious, while still providing equivalent or better treatment and control in consideration of net changes and in consideration that disturbed site areas would be subject to the Post-Construction Soil Depth and Quality Standard.

125. **Comment:** 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. **(VHB)**

Response: This language exists in the 2002 VSMM (page 2-8) and the Department has included this language in the revised draft VSMM, which provides designers some additional flexibility and reliance on best professional judgement when presented with certain site- or project-specific constraints.

126. **Comment:** It is recommended that DEC prioritize for use of STPs which infiltrate and filtrate over retention and detention practices. Specifically, systems such as bioretention, gravel

wetlands, infiltration trenches and basins and permeable pavement practices are prioritized above wet swales and wet ponds. **(Williston)**

Response: STPs have been organized into tiers based on pollutant removal, with infiltrating and filtering systems prioritized over retention and detention practices. This change is reflected in the revised draft VSMM.

127. **Comment:** We would like to have site balancing incorporated into the general permit process, so that it no longer triggers an individual permit. **(Stevens & Associates)**

Response: See response to Comment #118.

128. **Comment:** We have a general concern about the process through which the draft manual was written and adopted. The new manual started out as a very collaborative process featuring lots of input from the design community and other stakeholders. The process then seemed to be stalled, with no additional meetings to the point where we openly wondered if the manual was still going to be updated. When the draft was issued we were surprised to see an emphasis on a number of items that were only briefly touched on or not discussed at all in the stakeholder meetings. We will touch on some of the specific items in other comments. **(Krebs & Lansing)**

Response: The Department acknowledges the concern and recognizes that the process to update the 2002 VSMM had been stalled following an extensive and collaborative stakeholder process. As previously noted, the Department contracted with Stone Environmental, Horsley Witten Group, and Adamant Accord in preparation of an initial draft. A draft revision to the VSMM was delivered to the Department, which was crafted in consideration of the earlier stakeholder process. The Department was further tasked with refining the draft in consideration of the Vermont Surface Water Management Strategy and the operational stormwater discharge permitting framework. The Department's release of a draft VSMM on March 1, 2016 was the next step to reengage stakeholder involvement. Furthermore, the Department subsequently conducted additional stakeholder meetings and additional presentations around the State related to the draft VSMM. The Department has taken feedback and comment on the draft VSMM in formulating the revised draft VSMM, that is responsive to designer's questions and concerns such that the revised draft is again a collaboratively produced document designed to meet state-wide water quality goals, while accommodating for development and redevelopment. The Department has made numerous changes to the draft VSMM in response to stakeholder feedback and comment.

129. **Comment:** Throughout the history of the Stormwater Program, staff has been careful to state that the program's goal is NOT to dictate how people develop their sites, but only how they manage stormwater runoff from the site. The new manual gets away from this philosophy and has a new emphasis on certain styles of site development. These emphases are at times in contradiction to other design constraints such as local zoning, and Act 250. We question whether it is appropriate to adopt a manual that has such an emphasis on site design versus the previous emphasis on treatment practices. **(Krebs & Lansing)**

Response: The revised Manual does not dictate site design. Information pertaining to site planning and design has been revised to more clearly identify guidance versus required elements. The emphasis remains on stormwater treatment practices, and further identifies preferred practices for treatment based on the best available information.

130. **Comment:** We would like to see the manual updated to include use of the site balancing procedure to include sites located in impaired watersheds. Based on experience, there are projects where this flexibility could provide a stormwater treatment system that would treat more runoff than the minimum required by the rules. Ultimately, because projects are so different and each is presented with its own challenges, this flexibility could result in better site designs and a reduction in flows and pollutant loading to the watersheds. **(Krebs & Lansing)**

Response: See response to Comment #118.

131. **Comment:** Infiltration in urban areas can be very challenging. When considering infiltration requirements, it is important that basements be considered. A waiver should be considered for urban sites that are proximate to existing buildings with full basements, especially for redevelopment projects. **(Krebs & Lansing)**

Response: The Groundwater Recharge Standard is already waived for redevelopment projects and will remain so under the revised draft VSMM. Redevelopment projects however must still consider use of higher performing practices under the tiered structure of the Manual, in consideration of feasibility based on site characteristics.

132. **Comment:** We would like to see the revised manual allow the removal of existing impervious surface to be accounted for in determining permitting thresholds for redevelopment projects. Currently, larger sites must get a permit for any increase in impervious surface (once the initial 5,000 sq. ft. exemption is achieved) unless the site is 100 percent redevelopment. We believe exempting projects with no net increase in impervious surface, or at a minimum, projects that achieve a reduction in impervious surface, from stormwater permitting makes sense and will improve water quality. **(Krebs & Lansing)**

Response: In response to comment, the Department has added an optional design strategy that accounts for net reductions in impervious into the revised draft VSMM to provide water quality treatment and flow attenuation credit for projects that result in a net reduction of impervious. The *Net Reduction* design strategy can be found in Section 2.1.1.

133. **Comment:** A careful review of the use of the word "shall" in the entire manual should be conducted. Section 1.1 indicates that the word "shall" means the standard or criterion is essential, it is not optional. Yet we note several instances in the manual where a "shall" is followed by exemptions or instances where the "shall" may not apply. Specific instances are noted in our comments, and there may be others. This presents a severe potential for litigation problems down the road. **(Krebs & Lansing)**

Response: The use of the term "shall", followed by specific exceptions is an appropriate method for identifying criteria that are required in all instances except those specifically identified.

134. **Comment:** VTrans would like to know the general content and direction of the "public linear transportation" and "site balancing" procedures before agreeing to the draft manual content. DEC has indicated that these two procedures will be incorporated into the new manual and would share relevant language as soon as it was available. While the "site balancing" procedure has utility for a broader range of projects, the "public linear transportation"

procedure could be rolled into a new chapter on public linear transportation projects, please advise on the status of these procedures. (VTrans)

Response: The Department has worked collaboratively with the Agency of Transportation to create a public transportation specific chapter in the revised draft VSMM. The revised draft VSMM also incorporates *Site Balancing* as an optional design strategy for meeting applicable treatment standards.

135. **Comment:** Request for Public Linear Transportation Projects Chapter- Public linear transportation projects, especially redevelopment projects, often include constraints that present significant challenges to meeting the required treatment standards that use the standard treatment practices (STPs) presented in the manual. These challenges are not often encountered with parcel based development. The constraints include, but are not limited to, restricted rights-of-way, discharges to multiple receiving waters, environmental and cultural resources immediately adjacent to the roadway, and aerial and underground utilities. Recognizing that these types of projects were difficult to permit under the 2002 manual, VTrans and DEC worked together to develop and implement the "site balancing" and "public linear transportation" procedures. These procedures facilitated interpretation of the current manual and provided flexibility to design and permit STPs without compromising water quality standards.

Public linear transportation projects, especially redevelopment projects, have not only relied heavily on these procedures, but also on the grass channel STP in order to provide water quality treatment and limit impacts to nearby properties and natural and cultural resources. The exclusion of the procedures and grass channels from the new draft VSMM, as well as increase from 20 to 50 percent required water quality volume treatment for redeveloped areas, will make it extremely challenging to permit necessary improvements to public linear transportation infrastructure without significant impacts to adjacent resources and properties, and in some cases to water quality.

The new draft VSMM recognizes similar challenges for designing and permitting high elevation renewable energy projects through the Watershed Hydrology Protection STP. Permitting these types of projects using STPs in the manual would result in undue alterations of a site's natural hydrology, including elimination of natural forest cover and creating concentrations of runoff where these concentrations normally would not occur. The overall framework of the Watershed Hydrology Protection STP (where if specific STPs are applied in a prescribed way, the project is presented to be compliant with certain treatment standards) could be a useful model in crafting a successful approach for linear transportation projects, especially those with substantial redevelopment components. Chapter 2.4 in the draft VSMM also acknowledges the potential need for using alternate STPs on redevelopment projects.

The Agency requests that a Public Linear Transportation Projects Chapter be included in the new VSMM that addresses the challenges described above. VTrans would develop the draft chapter and work with DEC staff to ensure that flexibility is included without compromising water quality treatment and stormwater management goals. Please advise, either informal response to these comments or under separate correspondence, if DEC is amenable to this idea. If so, VTrans will lead this effort and schedule a kick off meeting immediately "with the

goal of having key elements of the chapter drafted prior to the commencement of rule-making. (VTrans)

Response: See response to Comment #134.

Stormwater Treatment Practices

Pre-Treatment Practices

136. **Comment:** Is there a list of approved alternate practices that are acceptable for use as pre-treatment? (Stevens & Associates)

Response: The Department does not currently maintain a list of proprietary devices acceptable for pre-treatment. The Department anticipates that a list of approved proprietary devices determined to be acceptable for pre-treatment will be maintained in the future following the release of the revised VSMM. In response to the comment, the Department has revised the draft VSMM and noted that such a list will be maintained and available to designers.

137. **Comment:** Develop STPs for use of compost products for Pre-treatment. (CAV)

Response: Specific studies supporting the use of compost products for pre-treatment are unavailable. The revised draft VSMM allows for proprietary pre-treatment practices to be used for meeting the applicable requirements, which could include STPs that rely on compost for providing or supplementing treatment, provided there is information supporting its use.

138. **Comment:** The new standards create significant additional calculation/modeling requirements for pre-treatment. Is there any thought of a standard design (min. width, length, slope etc.) that could have “presumed” compliance without necessitating additional computations? (Krebs & Lansing)

Response: Pre-treatment filter strips and forebays, are volumetrically sized and do not require any modeling to demonstrate compliance. Given the number of site-specific variables that affect the sizing of pre-treatment swales, a geometric sizing criteria was not able to be created and explicit modeling will be required for pre-treatment swales. The Department anticipates that as part of application guidance materials, there will be an opportunity to develop a table that provides a geometric standard for pre-treatment swales that will provide a pre-determined length, in consideration of contributing drainage area, width, and slope to ease designer’s application requirements and time associated with modeling. The Department will take on this effort when application materials supporting the new Manual are developed.

139. **Comment:** Consider moving wet swales to pre-treatment, rather than to "Limited Applicability Practices" as discussed during the public hearing in March. (VTrans)

Response: The Department does not believe that there is sufficient evidence regarding wet swale performance to include them as a pre-treatment practice. Further, use of wet swales in Vermont has been extremely limited, such that development of design criteria and treatment credit is not warranted. The Limited Applicability Practice section was reorganized and renamed in the revised draft VSMM, as Detention and Conveyance Practices, which is now inclusive of Dry Detention, Storage Vaults, and Conveyance Swales, Subchapter 5.0.

140. **Comment:** If possible, please update the headers in Volume 1 to reflect the second-level heading (Section 4.1 Pre-treatment, etc.). **(VTrans)**

Response: The formatting in the revised draft VSMM has been updated and standardized throughout the document.

Pre-treatment Swales

141. **Comment:** Is the WQ_v Elevation calculated as the maximum water elevation in the swale during the WQ rainfall event without weirs, or is it the WQ_v distributed between the weirs as shown in the plan view? **(South Burlington)**

Response: The requirement for check dams in channels with longitudinal slopes greater than 2 percent was determined to be excessive and has been relaxed to channels with longitudinal slopes greater than 5 percent. There is no WQ_v elevation requirement for pre-treatment swales nor maximum check dam heights in the revised draft VSMM.

142. **Comment:** Are there sizing requirements for the notches in the weirs? **(South Burlington)**

Response: No, but the notch or center weir, shall be considered when determining the height of the check dam used for spacing calculations.

143. **Comment:** Is a pre-treatment forebay needed on a pre-treatment swale? This seems redundant. **(South Burlington)**

Response: The Pre-Treatment Swale schematic (Figure 4-1 in the draft VSMM) depicted a forebay as a design component in the plan view. The Department agrees that this design component is unnecessary and therefore is not required. The schematic was a relic of the 2002 VSMM that included grass channels as “primary” STPs, and therefore pre-treatment was necessary. The Department may consider updating schematics and figures where necessary. Schematics and figures have not been included in the revised draft of the VSMM, but will be revised and included for guidance following adoption of the Manual.

144. **Comment:** Please update the schematic drawing to be consistent with the pre-treatment use of these swales. No pre-treatment forebay or gravel diaphragm is specified in the design requirements and so should not be illustrated in the schematics. The pre-treatment appears to be an artifact from the 2002 manual's schematics. **(VTrans)**

Response: See the response to Comment #143.

145. **Comment:** The wording of the sizing for the pre-treatment swale length is unclear. Confirm that for projects with no primary inflow location that the 10 min residence time is still calculated from the beginning of the swale to the outlet. **(South Burlington)**

Response: Recognizing the use of these swales as pre-treatment practices, the minimum residence time for the Water Quality storm event has been decreased from 10 minutes to 5 minutes. For projects with distributed inflows, the residence time is still calculated from the beginning of the swale to the outlet, with the assumption that portions of the inflow will receive longer residence times than the minimum time based on a concentration inflow analysis. This language has been clarified in the revised draft VSMM.

146. **Comment:** Design guidance suggests providing a temporary grass cover of swale until its turf cover has been established. This seems redundant. **(South Burlington)**

Response: The intent of the guidance was not to set redundant requirements but to ensure the pre-treatment swale is stabilized promptly, as they can be more susceptible to erosion following construction due to concentrated stormwater runoff routed through the swale. In response to the comment, the Department will modify the guidance language accordingly. Guidance is not included in the revised draft VSMM for the purposes of rulemaking.

147. **Comment:** 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. **(VHB)**

Response: Stone is currently listed as an acceptable material for check dam construction and will be allowed in the revised draft VSMM. It is the Department's position that properly anchored check dams constructed of materials other than stone can also be effective and stable. It is the designer's responsibility to ensure that check dams constructed from materials other than stone have the ability to drain. This can be achieved through the addition of weep holes, or other means. Choke stone may be too fine for use with operational check-dams. The use of a sharp crested weir is not specified in the revised draft VSMM.

148. **Comment:** Clarification is requested regarding the required minimum length for pre-treatment swales. Is it assumed that pre-treatment swales in roadside ditch application are proportional to road length as shown in Figure 4-1, and in that application, the 50 ft. minimum length does not apply? **(VTrans, VHB)**

Response: A 50 ft. minimum length was specified in the design summary table for pre-treatment swales, but not specified in any of the required design elements of the draft VSMM. Pre-treatment swale length is dependent on swale geometry; bottom width, longitudinal slope, and contributing area routed to the practice. The minimum pre-treatment swale length has been removed from the revised draft VSMM, but pre-treatment swales must be shown to have a minimum residence time of 5 minutes based on the peak flow rate from the water quality storm.

149. **Comment:** The required element that pre-treatment swales "shall not intercept groundwater" should be relaxed to "should not intercept groundwater". A pre-treatment swale that would function perfectly 51 weeks of the year should not be dismissed because of a short spike in water table during April. Also, this creates an undue burden of proof on the designer, essentially requiring test pits wherever any stormwater treatment is proposed. **(Krebs & Lansing)**

Response: In response to the comment, the Department has modified the language to recognize that seasonal interception of groundwater may be unavoidable, and will not preclude the use of swales for pre-treatment or require test pits prior to their proposed use. Reference to the seasonal interception of groundwater is no longer specified in the revised draft VSMM, but may be added as guidance for clarification.

150. **Comment:** A 2 percent slope is an excessively flat requirement for pre-treatment. Have there been problems with 3-4 percent slopes in the field? We have many designs up to 4 percent and they seem to function fine, especially for pre-treatment. **(Krebs & Lansing)**

Response: The pre-treatment swale slope specification, specific to check dam requirements and maximum allowable slope, has been modified in response to comment and further consideration by the Department. As noted in the draft VSMM, pre-treatment swales were allowed for use on up to 6 percent slopes, however check dams were applicable above 2 percent. In response to comment, the Department has modified the design requirements for pre-treatment swales to require check-dams only in channels with slopes greater than 5 percent and revised the minimum residence time to 5 minutes.

151. **Comment:** 2:1 side slopes for pre-treatment should be allowed. In some cases, this enables a wider bottom which is much more important to pre-treatment than the side slopes. **(Krebs & Lansing)**

Response: After further consideration, the Department agrees that 2:1 side slopes are acceptable for pre-treatment swale geometry and the requirement in the revised draft VSMM was adjusted to reflect this change.

152. **Comment:** In general, the multiple restrictions on slope, side slopes, and width seem redundant with the requirement for a 10-minute residence time. Why all the restrictions on geometry if the goal is 10-minute residence time? For example, why can't a steeper swale that provides the 10-minute residence time be adequate for pretreatment? The new manual already states that the grass swale is only allowed for pre-treatment, which by definition, is only the largest sediment particles. The additional geometry requirements are more justifiable if the swale was actually allowed as a stormwater treatment practice. **(Krebs & Lansing)**

Response: The minimum residence time has been revised downward to 5 minutes and the internal side slopes relaxed to less than or equal to 2:1. The minimum channel width is intended to ensure an adequate width for filtration and the maximum slopes to prevent erosive velocities within the channel, which would not be captured by a solely time-based standard.

153. **Comment:** Can stone or timber "drops" be used to flatten slopes to meet the design requirements? We have done this in the past, but would like to see it specifically in the manual. **(Krebs & Lansing)**

Response: The Department believes that there is adequate flexibility with the number of pre-treatment options currently presented in the manual. Additionally, the Department believes that in situations where stone or timber drops could be used, check dams would be equally effective. The revised draft of the VSMM does not prohibit grading and the use of check dams or similar grade controls to achieve the maximum slope of 6 percent.

154. **Comment:** Many of the feasibility and design details for pre-treatment swales as set forth in the draft manual are reasonable in a parcel-based development context, but are inconsistent with needs and best practices for linear transportation projects. For instance, check dams can become a hazard to the traveling public when located too close to travel lanes, and this practice has been proven to perform well in linear transportation contexts on steeper slopes

than those specified in the draft manual. This practice has been commonly employed on VTrans projects in the past, and with design modifications to improve performance, it should continue to be pan of the toolkit for linear projects. **(VTrans)**

Response: The revised draft VSMM presents several options for pre-treatment other than pre-treatment swales that may be used on a site where swales with check dams are a concern. Additionally, the maximum allowable slope for channels without check dams has been increased to 5 percent. In addition, the Department has worked collaboratively with the Agency of Transportation to create a public transportation specific chapter in the revised draft VSMM.

155. **Comment:** Consider revising the maintenance requirement wording such that pre-treatment swales shall be inspected annually and maintained as needed, consistent with existing and anticipated reporting of annual inspections and findings to DEC. **(VTrans)**

Response: Inspection and maintenance requirements for each stormwater treatment practice have been removed from the draft VSMM, and will be dictated by permit requirements, which typically require annual inspection. The Department plans to develop STP-specific inspection and maintenance guidance, which will be more comprehensive and practice specific, and otherwise be available to support application materials.

Filter Strips

156. **Comment:** 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). **(VHB)**

Response: The Department recognizes that there are inconsistencies in many of the figures compared to the requirements in the text. The Department is updating schematics and figures, where necessary. The schematics and figures have been removed from the revised draft VSMM for the purposes of rulemaking and will be added back as guidance following adoption.

157. **Comment:** 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. **(VHB)**

Response: This requirement has been removed from the revised draft VSMM.

158. **Comment:** In regards to Filter Strip Design, the requirement for flow to travel over impervious area and "...then drop at least 2 inches onto the clean stone diaphragm" is a terrible idea. A 2 inch drop off pavement is what we would commonly refer to as an "ankle breaker", and will lead to injuries and potential lawsuits. In addition, this type of lip leads to decaying and broken pavement along the edge that will be an ongoing nuisance and maintenance issue. This requirement should be reduced to no more than 1 inch, or eliminated completely. **(Krebs & Lansing, VTrans)**

Response: The requirement for a 2-inch drop to the stone diaphragm has been removed in the revised draft VSMM.

159. **Comment:** At what slope is the drop to stone diaphragm required? Only on slopes greater than 4 percent? **(VTrans)**

Response: See response to Comment #158.

160. **Comment:** "Slopes may be between 4 and 6 percent, but such slopes will require erosion control matting and a detailed engineering evaluation." Is this guidance or a required element? Typically, in transportation projects, erosion matting is not required on slopes less than 33 percent. **(VTrans)**

Response: After further review by the Department, the requirement that slopes between 4 and 6 percent require erosion control matting and a detailed engineering evaluation has been removed in the revised draft VSMM.

161. **Comment:** Consider striking "shall be removed at least once / year", instead removing sediment build-ups when needed. **(VTrans)**

Response: See response to Comment #158.

162. **Comment:** Combining filter strip pre-treatment with a dry swale, or with disconnection to vegetated buffer/engineered filter strip, bears substantial similarity to 'dispersion' as in NHRCP, WashDOT, etc. research and manuals. These resources allow and prove feasibility of use of this practice on much steeper slopes (15 percent without gravel spreader, 33 percent with). This practice could have great utility on linear transportation projects, and we anticipate working with DEC to develop design elements acceptable to all parties for use on linear projects, especially in redevelopment situations. **(VTrans)**

Response: This comment is addressed through the addition of a public transportation chapter now incorporated into the revised draft VSMM.

Forebays

163. **Comment:** The table and figure for the pre-treatment forebay conflict in regard to forebay depth. They should be either 2'-6' or 2'-4'. If the depth in the Figure is relative to the spillway and the depth in the Table is relative to the berm, it should be clearly noted. **(South Burlington)**

Response: Figures and schematics are intended for guidance only and not necessarily reflective of all required design elements. The Department will update schematics and figures, where necessary. The schematics and figures have been removed from the revised draft VSMM for the purposes of rulemaking and will be added back as guidance following adoption.

164. **Comment:** 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. 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. **(VHB)**

Response: The reference to “peak design storm depth” has been removed. This comment was made in reference to the requirement for a safety bench. The safety bench requirement has been redefined and would be applicable when forebays are designed with a permanent pool depth of four feet or greater. The figures in the Manual that depart from the text are guidance rather than design requirements. In the case of forebays, the design requirements allow for the forebay to be separated from the main cell of the STP by “an acceptable barrier such as an earthen berm, gabion baskets, or a concrete weir,” which would accommodate the structures described above.

165. **Comment:** 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. **(VHB)**

Response: The reference to the 100-year event has been removed from this section in response to comment.

166. **Comment:** 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. **(VHB)**

Response: The sediment depth marker helps to ensure that the conditions that would trigger maintenance are readily apparent to all parties responsible for the STP, including owners and consultants not involved with the original design. The Manual allows for flexibility in the design of the depth marker, which should allow for designs that are aesthetically pleasing.

Deep Sump Catch Basins

167. **Comment:** Although deep sump catch basins are not approved as pre-treatment for a catch basin-to-catch basin drainage system, has the Agency considered an alternative credit for these types of systems? Encouraging a drainage network of deep sump catch basins would provide for additional sediment storage capacity, which would likely result in the resuspension of less sediment than conventional systems. **(Burlington, South Burlington)**

Response: In response to the comment, the Department considered whether credit was warranted for a catch basin-to-catch basin closed drainage system. While crediting may not be an accurate way to describe the proposal, there may be an opportunity to qualify a specific system as acceptable, such as the one described as meeting equivalent pre-treatment requirements. The draft Manual allows for proprietary pre-treatment practices and other alternative STP to be used where data or a specific design supports that it will be effective. The Department however does not intend to accept a catch basin drainage network as equivalent pre-treatment without site-specific information that would indicate the system would provide an acceptable level of pre-treatment. The Department can consider many types of pre-treatment proposals in the framework of the draft VSMM.

168. **Comment:** Consider revising Deep Sump Catch Basin Detail so that pipe connections are required to be booted sleeve connections, rather than grouted in place. Permit frame and grate to be brought to grade with concrete grade rings. Consider not listing specific

manufacturers in the design detail. Depth from invert to sump should be either 4' or 48", rather than 4". **(South Burlington, VTrans)**

Response: The schematic is only to be relied upon for guidance. The Department will update schematics to correct typographical errors noted by the comment, removed references to manufacturer, and will modify the language in added guidance so as not to dictate grouted connection or booted sleeve connections, and to rely upon designers to follow established standards for catch basin/pipe connections and other design components related to grate design.

169. **Comment:** 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 pre-treatment for up to 0.5 acres otherwise their required spacing would become prohibitive. **(VHB)**

Response: The Department does not consider the drainage area restriction on the pre-treatment deep sump catch basin to be prohibitive, as these are not to be designed as typical catch basin-to-catch basin systems, but designed for capture of a particular drainage area where space or other options for pre-treatment may be limited. Other pre-treatment options for larger drainage areas are available in the draft VSMM. The deep sump catch basin is only one option for pre-treatment and designers are encouraged to utilize other pre-treatment practices, proprietary or otherwise for meeting the required pre-treatment when this design option is unavailable.

170. **Comment:** 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. **(VHB)**

Response: The Department has removed the flow rate specification for the deep sump catch basin in response to the comment. Grates are therefore to be sized by designers according to established standards and manufacturers specifications.

171. **Comment:** 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. **(VHB, VTrans)**

Response: Inspection and maintenance requirements for each stormwater treatment practice (STP) have been removed from the draft VSMM, and will be dictated by permit requirements, which are typically required annually. The Department plans to develop STP-specific inspection and maintenance guidance, which will be more comprehensive and practice specific, and otherwise be available to support application materials.

172. **Comment:** In this and other sections of the manual it is noted that certain practices, such as Deep Sump Catch Basins, will require inspections a minimum of 2 times a year. Having different practices with different inspection requirements presents a bookkeeping nightmare when it comes to keeping track of inspection requirements. The Agency has only recently cleared up a very confusing system where some permits had annual inspections, some bi-annual, and some bi-annual with only an annual report. Do we really want to go back to this same type of situation? In addition, the units are required to be cleaned annually or whenever the depth of sediment is greater than or equal to half the sump depth. Why require the annual cleaning if inspections note it is not necessary? Maintenance is certainly needed and desired in general, but requiring maintenance for structures that don't need it is counterproductive. **(Krebs & Lansing)**

Response: See response to Comment #171.

173. **Comment:** Several aspects of the design requirements as presented in the draft manual may unnecessarily preclude the use of this promising pre-treatment practice in linear transportation projects, especially in urban areas with substantial utility conflicts and in redevelopment situations. VTrans is ready to work with DEC to develop design requirements for use of this practice in transportation applications, especially with relation to sump depths, baffle placement, and inspection/maintenance frequency. **(VTrans)**

Response: The Department does not consider the revised design requirements on the pre-treatment deep sump catch basin to be prohibitive, as these are not to be designed as typical catch basin-to-catch basin systems, but designed for capture of a particular drainage area where space or other options for pre-treatment may be limited. The Department considers that the pre-treatment section of the VSMM allows for sufficient flexibility in the design for pre-treatment, including use of alternative or proprietary practices when site constraints are present. The Department had also engaged with the Vermont Agency of Transportation on the development of a public transportation chapter, now incorporated into the revised draft VSMM.

Proprietary Pre-Treatment

174. **Comment:** The underflow outlet pipe in Figure 4-8 is not seen in many manufactured stormwater hydrodynamic swirl separator devices. Confirm that this is not a design requirement. **(South Burlington)**

Response: Proprietary pre-treatment practice schematics have been removed from the revised draft VSMM.

175. **Comment:** In Section 4.1.5.2, how was 50 percent total suspended solids (TSS) removal selected and what data supports this number? What guidelines will be used to assess which "certain retrofit cases and other cases" will be required to have higher removal efficiencies? **(South Burlington)**

Response: The 50 percent TSS removal criteria was selected to accomplish the goal of removing larger sediment particles to protect downstream STPs. The 50 percent performance standard is used in many other jurisdictions and generally aligns with pre-treatment goals set

by STP performance verification protocols. As such, the standard should allow for use of a wide range of proprietary practices currently available.

176. **Comment:** Proprietary devices are manufactured for many different flow rates. The 1-acre impervious contributing area guidance should be removed. **(VHB, Contech)**

Response: The contributing drainage area restriction has been removed from the revised draft VSMM in response to comment.

177. **Comment:** 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. **(VHB)**

Response: This has been clarified in the revised draft VSMM.

178. **Comment:** Section 4.1.5 identifies proprietary devices as a broad category that are acceptable for pretreatment applications. This section also specifically states: “Often, these proprietary devices are not capable of achieving the level of water quality performance required by this manual (Schueler, 2000; Claytor, 2000; UNHSC, 2007).” As you are likely aware, proprietary practices now span a wide range of technology categories that include simple screening and settling technology as well as advanced filtration and biofiltration systems. Many advanced technologies were not available when that sentiment prevailed relative to proprietary practices. We suggest making this distinction in the text so readers are not lead to believe that the majority of proprietary practices are only suitable for pretreatment. Many technologies have now been thoroughly vetted through TAPE, TARP and ETV field tests and are capable of providing a high level of pollutant removal. You have acknowledged this later in section 4.4 so it seems logical to do so in this section as well. Perhaps including language that states those technologies that have not demonstrated they can meet performance criteria in one of the acceptable programs you have identified should only be used for pretreatment.

We also noted that 3 rather dated references were used in making the statement referenced above about proprietary practices. Two from 2000 (16 years ago) and one from 2007. We suggest referencing current information on these practices in making broad statements about their performance. Referencing programs such as TAPE, NJDEP, VA BMP clearinghouse and others which provide up to date information on these practices and their performance would be more relevant. **(Contech)**

Response: The references have been removed in the revised draft VSMM and now the Manual simply states that proprietary practices may not be able to demonstrate the water quality performance standards. The Department will not seek to characterize the state of proprietary stormwater practices generally in the pre-treatment section.

179. **Comment:** The graphics included in Section 4.1.5 for proprietary devices are outdated and not representative of the technology category. Figure 4-8 is a wastewater device not a proprietary stormwater practice, and the OGS device in figure 4-7 is a rarely used practice. We suggest including examples of modern devices common for pretreatment applications like hydrodynamic separators and other sedimentation systems. We would be happy to provide or suggest graphics if desirable. **(Contech)**

Response: The schematics referenced have been removed from the draft VSMM in response to comment. The Department realizes that there are wide range of proprietary practices available and does not want to imply prescription of certain practices.

180. **Comment:** It is stated that flow through proprietary devices need to treat the water quality volume, but there is not a reference to an appropriate means of converting the water quality volume to a peak water quality design flow. The existing manual uses the graphical peak discharge method to make this conversion and we suggest continuing with this practice and referencing the method in the text accordingly. Additionally, it should be stated that proprietary device sizing be based on the flow rates the devices were tested at not just the manufacturers recommendations. **(Contech)**

Response: Section 2.2.4.2 details the acceptable method for calculating peak flows for the Water Quality storm event. The graphical peak discharge method has limitations for small and non-contiguous areas which are considered un-ideal. The wide availability and use of computer-aided modeling software makes the graphical peak discharge method unnecessary. The revised draft VSMM has been updated to allow for the sizing recommendations from any third party verification program relied upon to establish the performance claims.

181. **Comment:** Is the annual maintenance 'required element' of inspections 2x/year truly required, or should inspections be performed as recommended by the proprietary device manufacturer? **(VTrans)**

Response: Inspection and maintenance requirements for each stormwater treatment practice have been removed from the draft VSMM, and will be dictated by permit requirements, which typically require annual inspection. The Department plans to develop STP-specific inspection and maintenance guidance, which will be more comprehensive and practice specific, and otherwise be available to support application materials.

Non-Structural Stormwater Treatment Practices

Reforestation

182. **Comment:** Please consider adding a separate Tree (vs. reforestation) credit as meeting the reforestation credit is not feasible in urban areas, yet we want to incentivize sites to plan as many trees as possible. A tree credit could be based on providing some small amount of impervious credit for trees planted with adequate soil volume to support longevity and healthy canopies and which are planted adjacent to and overhanging impervious surface (based on the municipal credits outlined in Stone's Tree Credit white paper). If the Agency is willing to advance this idea, we can provide more details about soil volume requirements. We do not agree with the Agency's position that tree credits are not a viable option because of inspection requirements. If site designers are going to be examining dispersed, individual bio-retention systems and disconnections etc., they can also verify that a "stormwater tree" is still on site. **(Burlington)**

Response: In response to comment and further review, the Department has added a credit for individual tree plantings, which may allow the practice to be utilized in urban areas where large areas for reforestation are unavailable. In keeping with the overall calculation framework, each tree is given a treatment volume credit, rather than an impervious surface

reduction. In addition, the revised draft VSMM includes a reduction in the minimum contiguous area necessary for Reforestation, and allows additional options for using this practice.

183. **Comment:** It is difficult to see how this would ever be a cost-effective treatment method for anyone considering the size of land required, the types and spacing of trees required, and the minimal credit given. Consideration should be given to either re-writing the Reforestation section to give more credit or just eliminating it altogether. **(Krebs & Lansing)**

Response: The minimum area required to apply the Reforestation practice has been decreased from 10,000 ft² to 2,500 ft². The minimum width requirement for Reforestation has also been reduced to 25 feet. Single tree credits have also been added, and the crediting framework reconstructed. The Department recognizes that this practice may not be suitable for all projects for meeting applicable treatment standards.

184. **Comment:** The Reforestation practice would be very difficult to use on linear transportation projects, due to the 0.22-acre minimum area. Consider allowing the use of reforestation on smaller or narrow minimum areas for credit. **(VTrans)**

Response: See response to Comments #182 and 183.

185. **Comment:** Will 1 year inspections for reforestation be part of the initial designer certification? **(VTrans)**

Response: Inspection and maintenance requirements for each stormwater treatment practice have been removed from the draft VSMM, and will be dictated by permit requirements, which typically require annual inspection. The Department plans to develop STP-specific inspection and maintenance guidance, which will be more comprehensive and practice specific, and otherwise be available to support application materials.

Simple Disconnection

186. **Comment:** Is there partial credit allowable for disconnections less than the full length? **(External stakeholder meeting)**

Response: No, partial credit for disconnections at less than the required full length would be difficult to administer and credit and might result in the need for recollection of partially disconnected stormwater runoff for meeting applicable treatment standards.

187. **Comment:** Do you have to have 35+ feet to disconnect a sidewalk or narrow path? **(External stakeholder meeting)**

Response: No, disconnection for contributing lengths of up to 10 feet may be equal to the contributing length on slopes less than 8 percent, or twice the contributing length on slopes greater than or equal to 8 percent.

188. **Comment:** The vegetated treatment flow path length should be required to be equal to the contributing flow path not a pre-determined prescribed 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. **(VHB)**

Response: The disconnection lengths are based on the flow lengths needed to provide infiltration of the water quality volume from the contributing impervious surface. If space constraints are of concern on a site, there are other more compact GSI practices that may be utilized in a smaller footprint than disconnection.

189. **Comment:** 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. **(VHB)**

Response: Disconnection is feasible on vegetated areas that meet the slope and length requirements set forth in Table 4-1 of Section 4.2.2.4 and the Post-Construction Soil Depth and Quality Standard. The 25-foot setback from property boundaries and consideration of downslope abutters are design suggestions that the Department feels should be included in good design, but are not required elements of the Simple Disconnection practice in the revised draft VSMM.

190. **Comment:** Why is the minimum width of the disconnection 12 feet, versus being equal to the width of the impervious? For example, disconnecting 5-foot wide sidewalks into green strips between the sidewalk and road has been an effective tool in the past. **(Krebs & Lansing)**

Response: The 12-foot minimum width was meant to apply to the width of a disconnection area provided for a downspout disconnection for rooftop runoff. For Simple Disconnection that does not involve downspouts, the disconnection width shall be equal to the width of the contributing impervious width. This is not to be confused with disconnection length, which for contributing lengths less than or equal to 10 feet, may be equal to the contributing length if disconnection slopes are less than 8 percent, or twice that length if greater than or equal to 8 percent. In the above example, a 5-foot-wide sidewalk would have a 5 foot contributing length and therefore require a disconnection length at least 5 feet long, and as wide as the sidewalk is long. The Department has clarified this distinction in the revised draft VSMM.

191. **Comment:** The sliding scales for disconnection area length based on soil type are excessive if those same areas are required to meet the Post-Construction Soil Depth and Quality Standard. Meeting the soil standard essentially turns those areas into "A" or "B" soils during low to moderate storm events. This should be reflected in the disconnection area lengths. **(Krebs & Lansing)**

Response: There are multiple options for meeting the Post-Construction Soil Depth and Quality Standard, the simplest being to avoid disturbing the soils altogether, especially in proposed disconnection areas. Such areas would not warrant any change in hydrologic soil group based on changes in the soil. The Department does not consider the disconnection area lengths to be excessive to allow for infiltration of the water quality volume and the draft VSMM was not modified in response to comment.

192. **Comment:** It is unclear if maintained lawns can be used for simple disconnections. They should be, as this will be very effective in typical residential subdivisions for roof downspouts etc. **(Krebs & Lansing)**

Response: Maintained vegetated areas are allowable for Simple Disconnection (Section 4.2.2) and for Disconnection to Filter Strips (Section 4.2.3 in the revised draft VSMM).

193. **Comment:** Consider allowing simple disconnection to flow into wooded and otherwise vegetated natural areas. Turning undisturbed areas into turf doesn't seem necessary. **(VTrans)**

Response: Disconnection areas for Simple Disconnection are not required to be turf. Areas with established dense vegetation that meet the slope requirements and the Post-Construction Soil Depth and Quality Standard would be eligible for disconnection areas. Woods may be appropriate for disconnection areas if the forest floor is densely vegetated and the natural grade is such to maintain distributed flow over the disconnection flow path to prevent flow concentration.

194. **Comment:** The requirement for a level spreader every 20 feet on slopes 8-15 percent is unnecessary and impractical in lawn areas. Our understanding of TR-55 is that a properly graded site with sheet flow does not become channelized as shallow concentrated flow for approximately 100 feet. The 20 feet requirement is therefore unnecessary. **(Krebs & Lansing)**

Response: Treatment via disconnection relies on both filtering of stormwater runoff through vegetation and infiltration into the underlying soils. The disconnection practices were designed not only to distribute flow, but also to provide the opportunity for the runoff to infiltrate. Grade controls will help promote infiltration and may be designed and constructed in a manner that is compatible with lawn and turf areas.

195. **Comment:** Consider allowing flexibility in required disconnection area lengths, especially for shared use paths and other relatively narrow linear applications, Shared use paths typically are 10' wide and if on any slope the contributing length will be longer than 100 feet, the minimum 35' receiving area flow path length would then be required under the current draft manual. Rural roadways with a normal crown will have a similar challenge, with a 16' contributing impervious length at maximum. Flexibility in other design aspects, especially maximum slopes, will also be very helpful in adapting this practice to successful use in linear transportation projects--especially in redevelopment situations. **(VTrans)**

Response: The Department collaboratively worked with the Vermont Agency of Transportation to identify public transportation specific practices that consider the constraints associated with public transportation projects and have addressed this and other comments through a public transportation specific chapter of the revised draft VSMM.

196. **Comment:** The draft manual does not explicitly credit this practice towards Q_p other than through "Tv credit equal to the WQ_v of the disconnected area". What about HC_v / CP_v ? If the Overbank Flood Protection Standard (Q_p10) or the Extreme Flood Protection Standard (Q_p100) applies to a site, will these disconnected areas then be required to be re-connected? **(VTrans)**

Response: Stormwater runoff volumes are explicitly credited at a rate equal to the water quality volume for the disconnected impervious surface. This volume is applied as a Treatment Volume (Tv) and is therefore applied to all applicable standards, including the Channel Protection Standard, Overbank Flood Protection Standard, and Extreme Flood Protection Standard.

197. **Comment:** Structural infiltration practices have a minimum infiltration rate of 0.2 in/hr. Is it the intent to be consistent for non-structural practices? **(VTrans)**

Response: Structural infiltration practices have a specified minimum infiltration rate for practice feasibility because they generally include storage and infiltration over time. Disconnection relies on more rapid and distributed infiltration as water passes over the surface and does not generally include any way of storing water at the surface.

198. **Comment:** Will permeability testing be required or can soil map HSG be used? **(VTrans)**

Response: A designer may use the mapped HSG for the disconnection area, or if there is reason to believe that the mapped HSG is not reflective of site conditions, permeability test results or site specific on-site soils investigation results could be submitted as justification for using a shorter disconnection length, in accordance with the lengths specified in the Manual.

199. **Comment:** Consider allowing flexibility in use of wetland buffers (not wetlands) for disconnection where sites are constrained, particularly when no earthwork is proposed in the buffer. **(VTrans)**

Response: Siting of STPs within wetlands or wetland buffers is subject to the Vermont Wetland Rules. Stormwater disconnection to wetland buffers may meet this requirement when disturbance is not required and as allowable under the Vermont Wetland Rules.

Disconnections to Filter Strips and Vegetated Buffers

200. **Comment:** Stone level spreaders should be allowed. They have been installed in past projects and have been observed to be functional. **(VHB)**

Response: Stone level spreaders have been added in the Disconnection to Filter Strips and Vegetated Buffers section of the revised draft VSMM.

201. **Comment:** Disconnection to Filter Strips and Vegetated Buffers is a practice with great promise and potential applicability for linear transportation projects. As presented in the draft manual, several required elements (3 inch drop and gravel diaphragm as pre-treatment, for example) can represent hazards to the traveling public or are otherwise inappropriate for roadway projects. **(VTrans)**

Response: The requirement for a 3-inch drop has been removed in the revised draft VSMM in response to comment. Clean stone diaphragms remain as a pre-treatment option.

202. **Comment:** As with Simple Disconnection, the draft manual does not explicitly credit this practice towards Q_p other than through "Tv credit equal to the WQv of the disconnected area". If the Overbank Flood Protection Standard (Q_{p10}) or the Extreme Flood Protection Standard (Q_{p100}) applies to a site, will these disconnected areas then be required to be re-connected? **(VTrans)**

Response: See response to Comment #196.

203. **Comment:** Request that for all instances in this Chapter, the "Design Summary" heading includes the practice name, as it is for all the remaining subchapters. **(VTrans)**

Response: In response to comment the practice name will be added to the Design Summary table for each STP in the revised draft VSMM, however Design Summary tables are not

included in the revised draft VSMM for purposes of rulemaking since these tables provide a limited summary of requirements and guidance.

204. **Comment:** Consider using the term "traction sand" instead of "road sand". **(VTrans)**

Response: The term road sand has been changed to "traction sand" in applicable sections of the Manual in response to comment.

205. **Comment:** There is a formatting problem, the last bullet of "Treatment" section is formatted the same as the caption for Table 4-2. **(VTrans)**

Response: Formatting errors have been corrected in the revised draft VSMM.

206. **Comment:** Combining filter strip pre-treatment with a dry swale, or with disconnection to vegetated buffer/engineered filter strip, bears substantial similarity to 'dispersion' as in NHRCP, WashDOT, etc. research and manuals. These resources allow and prove feasibility of use of this practice on much steeper slopes (15 percent without gravel spreader, 33 percent with). This practice could have great utility on linear transportation projects, and we anticipate working with DEC to develop design elements acceptable to all parties for use on linear projects, especially in redevelopment situations. **(VTrans)**

Response: This comment is addressed through the addition of a chapter specific to public transportation projects, added to the revised draft VSMM, as a result of a collaborative effort between the Department and the Vermont Agency of Transportation.

207. **Comment:** Consider allowing stone level spreader for transportation-specific applications - stone level spreaders are allowed in the Watershed Hydrology Protection STP section. **(VTrans)**

Response: See response to Comment #200. The revised draft VSMM now incorporates a chapter specific to public transportation projects.

Watershed Hydrology Protection

208. **Comment:** 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. **(VHB)**

Response: See response to Comment #10. The Department considers the Post-Construction Soil Depth and Quality Standard to still be applicable to areas disturbed as part of construction, which will be altered from their existing condition.

209. **Comment:** 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. **(VHB)**

Response: The Department disagrees that the requirements are unclear. The requirement is intended to protect all streams, perennial or otherwise, from the potential impacts from stormwater runoff from the project site, which includes both impervious surfaces and areas disturbed during construction. The requirements do not apply to necessary and authorized construction of stream crossings.

210. **Comment:** 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. **(VHB)**

Response: The Department disagrees with the comment. The forest cover requirement is an important component of the practice. Areas of a project site that are not able to meet this requirement may consider use of other acceptable STPs for meeting applicable treatment standards. Therefore, the Department maintains this requirement in the practice.

211. **Comment:** 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. **(VHB)**

Response: The requirements for drainage conveyance structure spacing is the minimum spacing and designers should consider additional conveyance or other measures where determined to be necessary to maintain a site’s natural hydrology. The spacing specified is not considered excessive and ensures that appropriate cross drainage is provided to maintain the natural hydrology of the site post-construction. The *Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont* was relied upon in part in setting this required spacing.

212. **Comment:** 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 (now Section 2.2.4.3) specifies a maximum sheet flow length of 100 feet. **(VHB)**

Response: The 150-foot disconnection flow path was established for stormwater runoff collected and redistributed by level spreader, which incorporated an additional margin of safety as compared to distributed stormwater runoff that enters a disconnection directly from the impervious surface. Distribution of stormwater runoff by level spreader generally will involve larger, collected areas of impervious surface, and thus the Department considers the margin of safety to be warranted. The flow path lengths specified for direct conveyance from road surface is established in Table 4-5, Flow Path Sizing. The Flow Path Sizing is dependent upon contributing road width and type of ground cover, which varies from 55 feet to 100 feet. The 110-foot disconnection flow path referenced in the comment is not applicable to disconnections but is specific to protective strip widths required between roads and streams. The Section 2.2.4.3. in reference to sheet flow is specific to modeling limitations and is unrelated to the Watershed Hydrology Protection practice.

213. **Comment:** 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. **(VHB)**

Response: Inspection and maintenance requirements for each stormwater treatment practice have been removed from the VSMM, and will be dictated by permit requirements, which typically require annual inspection. The Department plans to develop STP--specific inspection and maintenance guidance, which will be more comprehensive and practice specific, and otherwise be available to support application materials.

214. **Comment:** In the design summary for the Watershed Hydrology Protection Credit, there is a reference to “interception of groundwater table shall be avoided”. It is our experience that high elevation road/crane path building is not possible without the occasional interception of groundwater. The manual seems to acknowledge this with the emphasis on rock sandwiches and culverts, yet the reference to “shall” is there several times. “Shall” should be changed to “should” in these (and several other) instances throughout the manual. **(Krebs & Lansing)**

Response: The Department considers the statement to be necessary, however has added “where possible” in the revised draft VSMM, to ensure consistency with the subsequent requirements that dictate other measures to be utilized when interception of the groundwater table is unavoidable due to road sections with ditch cuts or slope cuts. Design Summary tables are not included in the revised draft VSMM for purposes of rulemaking since these tables provide a limited summary of requirements and guidance.

Structural Stormwater Treatment Practices

Bioretention Areas and Rain Gardens

215. **Comment:** What is the purpose of the groundwater separation distance for bioretention? It seems like the media should be sufficient for ensuring water quality. **(External stakeholder meeting)**

Response: The media depths presented in the Manual are meant to provide sufficient water quality treatment and no separation distance is required for those bioretention practices designed to receive and infiltrate stormwater runoff from storms equal to or less than the Water Quality storm. For flows greater than the water quality event, a separation distance may be required, dependent on design storm and contributing drainage area.

216. **Comment:** 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 Appendix 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. **(VHB)**

Response: The Department may consider adding additional information to the VSMM which will provide technical guidance in support of an adopted final version of the VSMM. The Department is receptive to additional information or comment in regards to mounding analysis guidance to be incorporated into the Manual.

217. **Comment:** 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. **(VHB)**

Response: The Department has removed the 1 foot per second flow rate from the bioretention practice, and will instead rely on designer discretion to ensure conveyance of influent will be in a safe and non-erosive manner.

218. **Comment:** 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. **(VHB)**

Response: The pre-treatment section has been revised such that any practice defined in Section 4.1 (Pre-Treatment Practices) may be used for satisfying the pre-treatment requirements for bioretention.

219. **Comment:** The second bullet (under pre-treatment) appears to be conflicting with prior bullet. Or maybe just redundant? **(VTrans)**

Response: See response to Comment #217.

220. **Comment:** Soil amendments, including water treatment residuals, have been shown to increase phosphorus removal when used as part of a bioretention soil mix. As opposed to requiring certification as an Alternative Stormwater Treatment Practice the use of soil amendments for the purpose of pollutant removal should be incorporated in to this manual. **(Williston)**

Response: As discussed previously in the Department's response to comments on the Water Quality Standard, the Department does not feel that there has been sufficient testing on the performance of soil amended bioretention in the field to support its inclusion in the VSMM at this time. A designer may consider the use of water treatment residuals under an Alternative STP design.

221. **Comment:** Separate Rain Gardens and Bioretention Systems Rain gardens and bioretention are two separate systems and should be treated as such in the stormwater manual. Throughout the manual rain gardens and bioretention systems are seemingly used interchangeably as shown by the heading "4.3.1 Bioretention Areas and Rain Gardens". However, in this section the bioretention system is the only system with supporting information such as design summary, cross sections and feasibility discussion. Rain gardens, while an important tool for single family residential parcels, is not a rigorous approach to water quality nor quantity control. The VT Rain Garden Manual is not a technical design document for engineers. Two critiques to the Rain Garden Manual itself include the use of compost as an amendment (See compost discussion above) and the use of bioretention system from Portland Oregon as visual examples for rain garden systems. Lastly, what truly makes a bioretention system is the bioretention soil mix (BSM). Rain gardens are not intended to utilize an engineered BSM and, instead, are intended to capture localized runoff and infiltrate into native soils. For the reasons mentioned above it is suggested that rain gardens and bioretention systems are A) separated in the stormwater manual and B) that rain gardens be removed from the "Acceptable STP" section of the manual and placed in the "STPs with Limited Applicability" section. **(Williston)**

Response: Rain gardens under the VSMM are considered small bioretention practices that are designed to infiltrate without underdrains. For a rain garden to be approved as an acceptable practice under the Manual, it will have to meet the same design requirements as bioretention.

In response to comment, the practice is simply titled, Bioretention to ensure consistent design specifications.

222. **Comment:** We are pleased to see some minor relaxation of separation to groundwater requirements for smaller contributing drainage areas. However, these should be extended to larger areas as well. To have similar or more stringent restrictions for the separation of stormwater treatment to groundwater as there are for on-site wastewater disposal systems makes no sense. **(Krebs & Lansing)**

Response: Bioretention and other infiltration based practices can experience higher hydraulic loading under normal operation when compared to onsite sewage disposal systems, which increases the risk of mounding into these systems. Mounding of the water table also tends to be more severe for larger practices and therefore practice size will be dictated by the contributing impervious areas².

223. **Comment:** We are puzzled by the requirement for a groundwater mounding analysis for practices designed to infiltrate more than the 1-year storm event. As mentioned during the initial meeting to present the Manual, larger storm events are essentially “clean water” with the majority of pollutants being picked up during the “first flush”. So why such a concern for groundwater mounding? Isn’t the whole idea of the manual to promote more infiltration and absorption on site? The response in the meeting was that the aquifer needed time to draw down between storm events, but by definition these storms only occur once a year or once every ten years. How does that make sense? Finally, if a mounding analysis is required, it is ludicrous for it to have to show the full 3-foot separation from the bottom of the practice to the mounded water table. Again for the treatment of wastewater the requirement is to show that groundwater only mounds to within 6 inches of the ground surface. **(Krebs & Lansing)**

Response: See the Department’s response to Comment #222.

224. **Comment:** It should be allowable to use fill to meet the separation to groundwater table, similar to the way a mound style wastewater system is allowable for wastewater treatment. **(Krebs & Lansing)**

Response: The draft VSMM has been revised to not prohibit fill as part of infiltrating practices, provided remaining requirements are met.

225. **Comment:** There should be a blanket reduction for separation to seasonal high groundwater table to 1 foot for rooftop runoff that is not co-mingled with other stormwater runoff. **(Krebs & Lansing)**

Response: As the Department explained in response to Comments #221 and 222, the concern with mounding for larger storms is primarily hydraulic, for which the same risks exist regardless of the source area of the runoff. The Department expects the majority of

² USGS Scientific Investigations Report 2010-5102 *Simulation of Groundwater Mounding Beneath Hypothetical Stormwater Infiltration Basins*, modeled infiltration systems with ten and one acre contributing drainage areas under a range of surface and subsurface conditions. Median maximum mounding for 10 acre sites was 1.8 ft compared with 1.0 ft for 1 acre sites. Full report can be accessed here: <http://pubs.usgs.gov/sir/2010/5102/>

bioretention systems to have small contributing drainage areas and will be able to use reduced separation distances.

226. **Comment:** Is 48 hours required, or recommended? Consider using 72 hours as the required maximum drain time instead. **(VTrans)**

Response: The 48-hour drain time is a required element, consistent with other practices that infiltrate. A two-day drain time helps to ensure that the practice has capacity for subsequent storm events.

Dry Swales and Wet Swales

227. **Comment:** Why did you remove wet swales as a water quality practice? **(External stakeholder meeting)**

Response: Review of the literature suggests that wet swales do not meet the minimum 80 percent TSS/50 percent TP removal efficiencies required for practices to meet water quality requirements in the draft VSMM. The National Stormwater Database (Winer, 2000) reported 74 percent TSS and 28 percent TP removal based on two studies. Additionally, the International Stormwater Database (2014) reported 24 percent TSS and 8 percent TP removal based on eight studies of STPs described as “wetland channels” which closely resemble the design requirements of wet swales.

228. **Comment:** In the past, a number of “dry swales” used sand. Is this practice still acceptable? **(ACEC)**

Response: In response to comment and further review, the Department realized that the use of sand as a filter bed media was omitted from the draft VSMM. The revised draft VSMM has been modified to include sand as an allowable substrate media.

229. **Comment:** 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. **(VHB)**

Response: The 1.0 foot/day permeability was defined for systems that contained a bioretention soils media. In response to comment, sand has been added as an allowable filter substrate in the revised draft VSMM. Permeability is expected to be higher for sand than a bioretention soil mix.

230. **Comment:** The Dry Swale is another practice with great promise and potential applicability for linear transportation projects. As presented in the draft manual, several required elements (3 inch drop and gravel diaphragm as pre-treatment, and check dams in close proximity to the traveled way, for example) can represent hazards to the traveling public or are otherwise inappropriate for roadway projects. **(VTrans)**

Response: The reference to a 3 inch drop from pavement surfaces has been removed in response to comment in consideration of safety concerns. Check dams or other grade controls are necessary when systems are constructed on slopes to allow for infiltration to occur.

Infiltration Trenches and Basins

231. **Comment:** 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. **(VHB)**

Response: In consideration of comments and further review, contributing drainage area (CDA) limitations have been removed for infiltration practices.

232. **Comment:** 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. **(VHB)**

Response: Reference to field-confirmation of fill for infiltration is not included in the revised draft VSMM; however, designer's may be required to certify a design following construction as required through permit.

233. **Comment:** 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? **(VHB)**

Response: Practices designed as filtering systems must comply with the design requirements of filtering practices in Section 4.3.4. For infiltrating practices, three feet of unsaturated soil below the practice part of the required elements for water quality treatment is required. Separation requirements to the seasonally high groundwater table (SHGWT) are detailed in the feasibility requirements.

234. **Comment:** As described in reference to Section 4.3.1. (bioretention and rain gardens) 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. **(VHB)**

235. **Response:** See response to Comment #216. **Comment:** 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. **(VHB)**

Response: The prohibition for subsurface infiltration practices under pavement has been removed. The Department did not intend to preclude the use of subsurface infiltration systems. Access must still be provided for maintenance.

236. **Comment:** What is the logic behind requiring the sediment forebay to have an impermeable liner. Why is "incidental" infiltration a problem? In theory the forebay will clog over time anyway, so why require the additional costs of an impermeable liner? **(Krebs & Lansing)**

Response: In response to comment and upon further review, this requirement has been removed in the revised draft VSMM and instead a three-foot separation to the SHGWT is required from the bottom of the forebay for infiltration practices.

237. **Comment:** It is not clear how an applicant will demonstrate compliance with the required pre-treatment volume for infiltration practices if a vegetated filter strip is used as the pre-treatment practice. Is compliance with this condition not required since the vegetated filter strip is not a "volumetrically sized pre-treatment practice"? **(VTrans)**

Response: Sizing for filter strips and non-volumetrically sized pre-treatment need to meet the design requirements in Section 4.1 of the Manual.

238. **Comment:** For infiltration and filtration practices in ROWs, the pre-treatment requirements can preclude their use due to limited space. Consider relaxing pre-treatment requirements for linear projects, especially in redevelopment situations. **(VTrans)**

Response: Section 4.1 contains a variety of practices that can be used for pre-treatment. Some of these, including deep sump catch basins and proprietary systems, can have very small footprints and can be built under impervious surfaces. Adequate pre-treatment is important to ensuring the long-term function of infiltration and filtration practices, especially if the contributing drainage area generates sediment, like roads and other transportation infrastructure. The Department does not consider it to be appropriate to relax pre-treatment requirements for linear transportation projects in general. Further accommodation for linear transportation projects has been included in a new chapter specific to public transportation projects, reflective of a collaborative effort between the Department and the Vermont Agency of Transportation.

Filtering Systems

239. **Comment:** Is the minimum allowable infiltration rate for filtering practices that infiltrate meant to be 0.2 inches/hour? **(VTrans)**

Response: Yes, the minimum allowable infiltration rate for an infiltrating filter is meant to be 0.2 inches/hour. The Department has corrected in the revised draft VSMM.

240. **Comment:** The required filtering pre-treatment methods appear to conflict. Are "forebay" (first bullet) and "sedimentation basin" (second bullet) meant to be interchangeable terms for the same pre-treatment method? **(VTrans)**

Response: Yes, forebays and sedimentation basins had been used interchangeably in this location in the draft VSMM. The second bullet has been removed in the revised draft VSMM

and the designer can instead rely on the forebay design requirements in the pre-treatment section.

241. **Comment:** Required element: "During the six months immediately after construction, filter practices shall be inspected following at least the first two precipitation events of at least 1.0 inch to ensure that the system is functioning properly. Thereafter, inspections shall be conducted on an annual basis and after storm events of greater than or equal to the 1-year, 24-hour storm event". Is inspection after the first two storm events suggested or required. Please keep inspection requirements consistent. The ongoing storm-based inspection requirement for filtering systems is not consistent with other practices or with DEC inspection/reporting requirements. **(VTrans)**

Response: Inspection and maintenance requirements for each stormwater treatment practice have been removed from the draft VSMM, and will be dictated by permit requirements, which typically require annual inspection. The Department plans to develop STP-specific inspection and maintenance guidance, which will be more comprehensive and practice specific, and otherwise be available to support application materials.

242. **Comment:** We request that filtering practices designed to infiltrate also be credited for the infiltrated volume against the Overbank Flood Protection Standard and the Extreme Flood Protection Standard, as for bioretention? **(VTrans)**

Response: Any T_v credit that is provided by a practice through infiltration will be credited towards all the applicable treatment standards. The revised draft VSMM has been updated to clarify this in response to comment.

Treatment Wetlands

243. **Comment:** How should the depth of the gravel bed in gravel wetlands be determined? Does a 24" gravel bed provide the same WQ treatment as a 36" gravel bed? **(South Burlington)**

Response: The depth of the gravel bed in a gravel wetland shall be at least 24 inches, but may be deeper depending on the Water Quality Volume that is being treated and the geometry of the gravel bed in plan view and cross-section.

244. **Comment:** Based on the Required Elements language, it is unclear if Gravel Wetlands can be used to detain and release the CPv. Please confirm. Gravel wetlands should be allowed to detain the CPv in order to meet flow reduction targets, as well as provide water quality treatment to meet Phosphorus TMDLs, without requiring multiple treatment systems per site. **(South Burlington)**

Response: The second bullet of Treatment Wetland Feasibility indicates that treatment wetlands, including gravel wetlands, may be used to detain and release the Channel Protection volume, and larger storm events when sized appropriately for larger design storms and designed with necessary outlet structures.

245. **Comment:** Second bullet in the pre-treatment section is redundant based on bullet above. **(VTrans)**

Response: The redundant bullet under Wetland Pre-Treatment has been deleted in response to comment.

246. **Comment:** Inspection frequency in Year 1 is inconsistent with other STPs. This indicates inspection would be required in year 1 after any storm event greater than or equal to 1.0 inches, not just the first two. **(VTrans)**

Response: Inspection and maintenance requirements for each stormwater treatment practice have been removed from the draft VSMM, and will be dictated by permit requirements, which typically require annual inspection. The Department plans to develop STP-specific inspection and maintenance guidance, which will be more comprehensive and practice specific, and otherwise be available to support application materials.

247. **Comment:** Credit towards treatment standards for treatment wetlands is not specified in design summary table 4.3.4.12 or in Treatment Wetland Treatment section 4.3.5.3. Do these practices receive credit towards the calculated WQv, CPv (extended detention), and Qp, but not for HCv or Rev? **(VTrans)**

Response: Correct, a shallow surface treatment wetland is designed to meet the Water Quality Treatment Standard, Channel Protection Standard, and can also be designed to accommodate and control larger storm events (Qp10, Qp100). The shallow surface treatment wetland is not a practice that achieves runoff reduction and therefore does not meet the Groundwater Recharge Standard (Re_v) and therefore receives no T_v credit under the Hydrologic Condition Method (HCM). This section of the revised draft VSMM has been updated to reflect this information.

Wet Ponds

248. **Comment:** For sites where infiltration is not feasible, the City has included a significant number of stormwater ponds as STPs in our Flow Restoration Plans that have a drainage area of less than 10 acres. Replacing these proposed ponds underground storage will add significant cost to implementing the FRP. **(South Burlington)**

Response: The 10-acre minimum drainage area for ponds has been removed from the practice requirements in response to comments.

249. **Comment:** Design Guidance in the 2002 manual recommended a 10-acre minimum drainage area for ponds. Does this new requirement explicitly prohibit wet ponds for drainage areas less than 10 acres, or are they still permitted with a feasibility analysis? **(South Burlington)**

Response: See response to Comment #248.

250. **Comment:** 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. **(VHB, Krebs & Lansing)**

Response: See response to Comment #248.

251. **Comment:** 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. **(VHB)**

Response: See response to Comment #248. The 25-ft setback from structures has been also been removed in response to comment.

252. **Comment:** Why has the minimum length to width ratio doubled from 1.5:1 to 3:1? What research has shown this to provide better treatment? The Agency should make this guidance criteria, rather than a requirement. **(South Burlington)**

Response: Longer length to width ratio provides a longer flow path allowing greater potential for particle settling, decreases the likelihood of hydraulic short-circuiting, and is supported by the Wisconsin Department of Natural Resources, the NJ Stormwater BMP Manual, and various studies on hydraulic performance of ponds that conclude that larger length to width ratios promote sedimentation. The Department has not modified the draft VSMM in response to comment.

253. **Comment:** Using the minimum drainage area, minimum surface area, geometry, and 25-foot buffer requirements would lead to a minimum pond footprint of 97' x 191', or 0.43 acres. **(South Burlington)**

Response: See response to Comments #248, #251, and #252.

254. **Comment:** Has the Agency tracked the performance of STPs that have implemented the proposed underdrain outlet? How has the underdrain outlet design performed over its lifespan in comparison to an orifice with a trash rack? There are concerns for higher failure rates of these systems due to shorter life spans and greater complexity of construction. **(South Burlington)**

Response: No, the Department has not tracked overall performance of STPs with gravel outlet trenches, and has not tracked their performance in comparison to a traditional outlet structure with orifice and trash rack. This approach was considered in an effort to address thermal impacts that are often associated with stormwater ponds and stormwater wetlands. Furthermore, the Department received comments from the Vermont Department of Fish and Wildlife expressing interest and support for addressing thermal impacts to cold water fisheries. The Department also consulted with the Maine Department of Environmental Conservation (DEP) on this design element, which has been implemented since 2006. Maine DEP indicated that maintenance and performance issues have been limited, but indicated that the only failures were associated with systems that were not protected from clogging during construction activity. Any stormwater ponds used as sediment basins during construction would need to be brought up to permitted design specifications prior to completion.

255. **Comment:** The last bullet indicates that the outlet structure shall be located within the embankment, however Figure 4-33 (A) does not show the outlet structure located within the embankment. **(South Burlington)**

Response: Figure 4-33(A) is a generalized detail of the stone outlet trench. The perforated underdrain shown in the detail would tie into an outlet structure located in the embankment,

as indicated in Figures 4-30 through 4-32. Schematics and graphics included in the draft provided guidance only and have been removed from the draft VSMM for purposes of rulemaking.

256. **Comment:** In Section 4.3.6.4., what is considered “prevalent” for road sanding? This requirement is based on a factor that is widely variable and can change based on who is performing road maintenance. **(South Burlington)**

Response: In response to comment, this requirement was removed in the revised draft VSMM.

257. **Comment:** “Ponds shall not be drained in the spring, without prior approval from the Agency, as temperature stratification and high chloride concentration can occur at the pond bottom and result in negative downstream effects.” Please provide information on studies that show how this varies through the year, including best time to drain ponds and relative impact when compared to draining in the spring. **(South Burlington)**

Response: In response to comment, the Department has removed the prohibition on pond draining in the spring. A new requirement regarding draining ponds in a non-erosive manner has been added to the Wet Ponds required elements.

258. **Comment:** Pond mowing requirements should not be increased from annually to four times per year. The City of South Burlington has found annual pond mowing to be perfectly adequate. The manual could suggest semi-annual mowing, but any *requirements* for further mowing are absurd. **(South Burlington, VTrans)**

Response: Inspection and maintenance requirements have largely been removed from the draft VSMM and will be dictated by required permit conditions.

259. **Comment:** 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. **(VHB)**

Response: requirements set forth in the VSMM do not preclude the requirements to meet all other applicable local, state, federal rules and regulations.

260. **Comment:** 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. **(VHB)**

Response: It is the opinion of the Department that a properly designed and maintained wet pond with adequate pre-treatment would not be subject to clogging or significant ongoing maintenance. The underdrain may tie into the riser barrel as a single outlet. Figure 4-33(A) as had been included in the draft VSMM was intended to provide detail on the underdrain rather

than dictate outlet structure configuration. Further, stone outlet trenches have been required in certain stormwater ponds in Maine since 2006. The Department consulted with the Maine Department of Environmental Protection, which indicated that stone outlet trenches that are properly protected during construction have not been subject to clogging or had significant maintenance problems. Schematics and graphics included in the draft provided guidance only and have been removed from the draft VSMM for purposes of rulemaking.

261. **Comment:** Are there any maintenance concerns with gravel trench outlets? How long have they been in use in Maine? **(External stakeholder meeting)**

Response: Stone outlet trenches have been required in Maine since 2006. The Department consulted with the Maine Department of Environmental Protection which indicated that there are not maintenance concerns with the stone outlet trench. See the response to Comment #260.

262. **Comment:** Without any input or discussion during the stakeholder meetings, a gravel trench has been added as a requirement for stormwater ponds and wetlands. The Agency has described the purpose of this new measure as a means for providing thermal impact mitigation. It is our understanding that part of the Channel Protection Treatment Standard is to provide stormwater release in a manner that already considers the warm water or cold water aquatic habitat. The orifice that is sized to control the Water Quality storm is already required to release the runoff within 24 hours. It is our opinion that the manual already has temperature protection measures in place. The addition of the gravel trench adds unnecessary costs to existing stormwater treatment practices that have been designed and constructed to accommodate future growth. Furthermore, for new construction, the gravel trench appears to have a much higher potential for clogging. Because the inlet control orifice is not visible, inspections may not identify clogging, and if clogging is present, access and maintenance during clogging is much more difficult and costly than the use of a trash rack structure. **(Krebs & Lansing)**

Response: See the response to Comments #, 254 and 260. The Channel Protection Standard release of 12- or 24-hours may not address potential thermal impacts associated with the displacement of the permanent pool volume associated with the Water Quality storm. Additionally, the revised draft VSMM considers the use of existing stormwater treatment practices in the revised tiered approach for STP selection.

263. **Comment:** Spillways should be sized by the designer. The 8-foot minimum spillway width requirement is arbitrary and should be removed. **(VHB)**

Response: In response to comment, the minimum spillway geometry has been removed. It will be the designer's responsibility to design and certify a safe emergency spillway.

264. **Comment:** 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. **(VHB)**

Response: Figure 4-33 is used for example purposes and does not supersede the requirements in the Manual that the riser shall be located within the embankment for maintenance and access. Schematics and graphics included in the draft provided guidance only and have been removed from the draft VSMM for purposes of rulemaking.

265. **Comment:** 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. **(VHB)**

Response: The Department has removed the requirement for a 25-foot setback for stormwater ponds from permanent structures in response to the comment. The term “setback,” as used in the referenced context, is not to be confused with a “riparian,” “lacustrine,” or “wetland buffer,” which may be used elsewhere in the VSMM.

266. **Comment:** The requirement to remove sediment in the forebay every 5 years, or after 50 percent of the total forebay capacity has been lost, should be changed to only need based. Why require sediment removal if the forebay is only 10 percent full after 5 years? The requirement for a vertical marker removes the “guesswork” from the determination. **(Krebs & Lansing)**

Response: The requirement to remove sediment every 5 years, regardless of remaining capacity has been removed. Forebays shall be maintained as needed on a volumetric basis, once 50 percent of the forebay capacity has been lost. Additionally, inspection and maintenance requirements for each stormwater treatment practice have been removed from the draft VSMM, and will be dictated by permit requirements, which typically require annual inspection. The Department plans to develop STP-specific inspection and maintenance guidance, which will be more comprehensive and practice specific, and otherwise be available to support application materials.

267. **Comment:** Will storm event-based inspections be required after every 1-inch or greater storm? **(VTrans)**

Response: Inspection and maintenance requirements for each stormwater treatment practice have been removed from the draft VSMM, and will be dictated by permit requirements, which typically require annual inspection. The Department plans to develop STP-specific inspection and maintenance guidance, which will be more comprehensive and practice specific, and otherwise be available to support application materials.

268. **Comment:** Credit towards treatment standards for wet ponds is not specified in design summary table 4.3.6.1 or in Wet Pond Treatment section 4.3.6.5. Does this practice receive credit for WQv, CPv (extended detention), and Qp, but not for HCv or Rev? **(VTrans)**

Response: Treatment volume credits are only applied to runoff reduction practices that decrease the runoff volume from the site. Wet Ponds would receive no credit under the Hydrologic Condition framework or the Groundwater Recharge Standard, as they do not reduce runoff volumes. They do provide treatment for the Water Quality Treatment Standard, and the Channel Protection Standard can be met using Wet Ponds through the Extended Detention method. The Overbank and Extreme Flood Protection Standards may also be met using Wet Ponds.

Green Roofs

269. **Comment:** Discussion in the opening paragraph indicates that blue roofs only provide a modest runoff reduction. Do green roofs provide any greater runoff reduction than blue roofs? **(South Burlington)**

Response: Blue roofs provide flow attenuation through storage and controlled release, whereas green roofs provide runoff reduction through evapotranspiration. The revised draft VSMM reflects this change in response to comment.

270. **Comment:** Has the Agency looked into recent studies on green roofs leaching phosphorus and has this been addressed in the design requirements? **(South Burlington)**

Response: Due to the concern for nutrient leaching from green roof growing media, green roofs are not considered to be an acceptable STP for meeting the Water Quality Treatment Standard, but may provide some credit (Tv) under the Hydrologic Condition Method through runoff reduction. Since the WQTS is applicable on all permitted sites, no site will be able to use a green roof to entirely meet the treatment standards, and water quality treatment will be handled by another STP.

271. **Comment:** Consider providing more detail for coordination between the architecture of the roof and engineering design. **(South Burlington)**

Response: The Department is expected to provide additional information related to the construction of green roofs with reference to ASTM standards for several green roof components as guidance. Designers are expected to follow established standards, building codes, and other regulatory requirements, as applicable, pertaining to building construction. For purposes of rulemaking, the revised draft VSMM is specific to requirements.

272. **Comment:** Has the DEC considered the requirement to implement green roofs on all new flat roof construction and the potential to provide redevelopment credits to those existing buildings with adequate slopes which wish to incorporate green roofs as part of their redevelopment requirements? **(Williston)**

Response: The Department will not require green roofs on all new flat roof construction. Since green roofs are currently not an acceptable STP for water quality treatment, green roof applicability for redeveloped surfaces is limited.

273. **Comment:** Consideration should be given to at least a partial WQv Credit for green roofs designed in accordance with the manual if the engineered soil has phosphorus levels that meet certain criteria. There is certainly a level of water quality treatment achieved via filtering through green roof soils and vegetative uptake. **(Krebs & Lansing)**

Response: The Department does not feel that there is adequate documentation of consistent performance of green roofs, especially in cold climates. Combined with the nutrient leaching concerns, green roofs will not be given any credit under the Water Quality Treatment Standard. A designer still may propose a green roof for water quality treatment under an Alternative STP when data and design-specific information support that the practice will meet the pollutant removal goals.

274. **Comment:** Are green roofs also credited based on ponding space between planting medium and overflow? The design summary is inconsistent with requirement in the Treatment section. **(VTrans)**

Response: Green roof treatment volume (Tv) credit is based on the volume stored in the pore space of the planting media only. An important design element in green roofs is a drainage layer, situated below the planting media, that prevents ponding to ensure an aerated condition in the planting media. The design summary table, treatment section, and equation have been revised for consistency related to treatment volume.

Permeable Pavement

275. **Comment:** "Failure to properly construct and maintain a permeable pavement surface can result in the surface becoming effectively impervious and thus subject to regulation and retrofit treatment requirements." Once "effectively impervious" what course of action will be taken by the Agency, and in what sort of time frame? **(Burlington, South Burlington)**

Response: The Department cannot specifically respond to a future course of action in regards to a compliance investigation. If a permeable surface becomes impervious such that there is a discharge of stormwater runoff from impervious surface, the Department would investigate consistent with the Department's environmental compliance policies and procedures.

276. **Comment:** Construction criteria should include protection of permeable pavement from heavy truck traffic. **(South Burlington)**

Response: Designer's will need to consider current and anticipated future use of a surface when proposing a permeable surface that may be susceptible to compaction or other impacts from heavy equipment or vehicles. The Department may consider adding a statement in this regard to the permeable design guidance outside of the rulemaking process.

277. **Comment:** How is a compaction test done on stone layers for permeable pavement? Materials testing firms have confirmed that this is not possible. **(ACEC)**

Response: Reference to a compaction test requirement for stone layers for permeable pavement has been removed in response to the comment.

278. **Comment:** Why would rooftop volume infiltrated using a permeable pavement system not count towards Qp? Would this volume somehow be required to be re-connected to a downstream detention practice? (Same comment applies to the Permeable Pavement Treatments section 4.3.8.5). **(VTrans)**

Response: The infiltrated volume will count toward the Channel Protection Standard, the Overbank Flood Protection Standard (Qp10), and the Extreme Flood Protection Standard (Qp100). This has been clarified in the revised draft VSMM.

279. **Comment:** We would like to see more incentive for applying this promising practice (permeable pavement) - for instance, greater ability to disconnect rooftop areas into permeable pavement systems, and potentially treating run-on from adjoining ground-level impervious surfaces. **(VTrans)**

Response: Given the difficulty with providing pre-treatment for adjacent stormwater run-on and the still emerging information on permeable pavement performance, the Department does not believe additional applications of permeable pavement are warranted at this time.

The draft VSMM does allow for treatment and infiltration of stormwater runoff from rooftop surfaces, which would not require pre-treatment.

Alternative Treatment Practices

280. **Comment:** How will acceptance of Alternate Treatment Practices work? **(External stakeholder meeting)**

Response: The Alternative STP section of the VSMM has been revised to allow for reliance on independent research and certification programs. The Department expects that as a result of this change, more proprietary devices will be proposed for use and approved for use in Vermont. The Department plans to maintain a list of approved alternative treatment practices.

281. **Comment:** Publish a list (online) of acceptable proprietary devices that gets updated as new devices get approved. **(ACEC)**

Response: See response to Comment #280.

282. **Comment:** Consider having a separate approval process for proprietary devices. We are not going to use a device in our design until the State approves it. If the only time the state will review devices is during the design review, engineers are not going to use them because it's too costly to create a solution dependent on such an unknown. **(ACEC)**

Response: The Department understands that an approved list of proprietary devices would be beneficial to designers in advance of developing a stormwater management plan, where uncertainty of approval may result in a delayed review. As such, the Department will encourage manufacturers and distributors of proprietary devices to request approval ahead of and outside of the permit application review process.

283. **Comment:** The requirements for completing a monitoring study under the TARP, TAPE or ETV protocols which are identified in Section 4.4.1 as being required as a means of demonstrating a practice meets performance criteria are much more complex and stringent than the requirements for monitoring listed in Section 4.4.2. We suggest making these requirements consistent and requiring if a practice is to be monitored as a means of approval that monitoring must comply with the requirements of the aforementioned protocols. It is important to maintain a consistent and robust process for accepting alternate and new practices. **(Contech)**

Response: The Department feels that the point raised in this comment is valid, but does not have the resources to develop protocols of the same detail and rigor as the protocols listed above. Section 4.4.1 has been revised to encourage designers to consult the aforementioned protocols in their study design. The study plan must be submitted for approval by the Department at the time of permit application.

Limited Applicability Practices (Detention and Conveyance Practices)

284. **Comment:** Again, the complete removal of a commonly used practice should have been discussed and vetted with the design community. There was no discussion of Pocket Ponds at any of the Stakeholder meetings. It's difficult to imagine the design requirements for Pocket

Ponds couldn't have been modified in such a way as to retain them as a useful practice rather than just cutting it from the manual. **(Krebs & Lansing)**

Response: The Department determined that the multiple design variants for stormwater ponds previously included in the 2002 VSMM were unnecessary. A pocket pond design was distinguished in the 2002 VSMM as a pond that has such a small contributing area that little or no base flow is available to sustain water elevations during dry weather. In response to comments on stormwater wet ponds, the minimum contributing drainage area requirement of 10 acres included in the initial draft of the VSMM has been removed. As such, designers will be able to design a "pocket" stormwater wet pond when deemed appropriate under the framework of the revised draft VSMM. The revised draft VSMM maintains other design requirements to improve upon the stormwater wet pond design which will not affect a designer's ability to incorporate a stormwater "pocket" pond, or another pond design variation when allowable.

General Practice Questions

285. **Comment:** Will there be consideration of relaxing the infiltration requirements where there is no water supply? **(External stakeholder meeting)**

Response: Prior to infiltration, practices must provide the necessary treatment, in order to protect both surface water and groundwater quality. Infiltration trenches, basins, and similar STP designs rely upon the (typically) native soils between the bottom of the practice (i.e. floor of a basin) and the seasonal high groundwater table (SHGWT). Practices such as dry swales and bioretention/rain gardens, designed to infiltrate, rely upon the installed filter bed within the practice, as such, the filter bed depth can extend to just above the SHGWT. A site-specific analysis may inform a minor modification to the design requirements as may be allowable on a case-by-case basis, however the Department did not make any modifications to the draft VSMM in response to comment. Proximity to a water supply is considered in the VSMM, however absence of a water supply is not considered justification for any less treatment prior to discharge.

286. **Comment:** Will you allow for the option to allow a site specific analysis to set groundwater separation distance on infiltrating practices? **(External stakeholder meeting)**

Response: See response to Comment #285.

287. **Comment:** Please remove/modify the following required element to allow for subsurface infiltration (via Stormtech® chambers or equivalent) underneath paved surfaces: "Direct access shall be provided to infiltration practices for maintenance and rehabilitation. If a stone reservoir or perforated pipe is used to temporarily store runoff prior to infiltration, the practice shall not be covered by an impermeable surface." **(Burlington)**

Response: The Department did not intend to prohibit the use of infiltrating stormwater chambers/vaults/pipes below impervious surfaces. The Department has since revised the draft VSMM to exclude this language. All systems will still be required to provide adequate access for inspection and maintenance.

288. **Comment:** VTrans appreciates DEC's efforts to improve the presentation of inspection and maintenance activities that are required for STPs in the draft manual, and that in many cases, regular oversight and maintenance is vital to the performance of these STPs. However, the inspection frequencies for STPs in the draft VSMM, especially in the first year of operation, are often inconsistent with DEC's existing requirements for inspection and reporting. We suggest that the relevant sections for each STP require maintenance as needed, with annual inspections as is the current rule. **(VTrans)**

Response: Inspection and maintenance requirements for each stormwater treatment practice have been removed from the draft VSMM, and will be dictated by permit requirements, which typically require annual inspection. The Department plans to develop STP-specific inspection and maintenance guidance, which will be more comprehensive and practice specific, and otherwise be available to support application materials.

289. **Comment:** Allow increase in SOM (soil organic matter?) above 5 percent as STP to meet runoff reduction, the Groundwater Recharge, Water Quality, and Channel Protection Standards. **(CAV)**

Response: The draft VSMM does not preclude designers from amending soils above 5 percent organic content to restore healthy soils. The draft VSMM however cannot provide specific volumetric credit for soil amendments, which would be extremely difficult to measure and to ensure for long-term performance.

290. **Comment:** Require the use of Compost Blankets to reestablish vegetation on embankments. **(CAV)**

Response: The Post-Construction Soil Depth and Quality Standard does not preclude the use of compost blanks for restoring healthy soils and establishing vegetation. Embankments will likely exceed a slope of 3:1 and therefore may not be subject to the standard. Compost blankets may still be an available measure for stabilization of disturbed soils.

291. **Comment:** See excerpt of Rodale Study at end of the comments provided by CAV. Given these breakthroughs in keeping P and N bound in compost, we ask ANR to work with a soil scientist knowledgeable in the development of Filter Media using materials in Vermont. **(CAV)**

Response: The draft VSMM allows for the use of an alternative stormwater treatment practice (Alternative STP) for meeting the applicable treatment standards, when such practices can meet the required pollutant removal goals, subject to approval by the Department. The Department will review each proposal on a case-by-case basis.

292. **Comment:** Require or allow the use of Compost Filter Socks. **(CAV)**

Response: The draft VSMM allows for the use of an alternative stormwater treatment practice (Alternative STP) for meeting the applicable treatment standards, when such practices can meet the required pollutant removal goals, subject to approval by the Department. Compost filter socks can be proposed by a designer under the Alternative STP, which would require supporting information documenting design specifications and monitoring data. The draft VSMM does not preclude their use for bank stabilization or agricultural applications that are

otherwise not subject to the requirements of the VSMM. These other applications may be subject to other regulatory requirements.

293. **Comment:** Require treatment if runoff is from roof mounted solar panels.

<http://water.usgs.gov/wrri/10grants/progress/2010TX360B.pdf> (CAV)

Response: “Impervious surface” is defined under 10 V.S.A. § 1264(b)(6), and within Chapters 18 and 22 of the Stormwater Management Rules. Solar projects that propose impervious surfaces such that the regulatory threshold is reached require a state stormwater discharge permit. Under the draft VSMM, impervious surfaces are only differentiated by the stormwater runoff pre-treatment requirements, designed to capture and remove total suspended solids (TSS). Stormwater runoff from non-rooftop impervious surfaces requires pre-treatment. Stormwater runoff from roof mounted solar panels would not require any additional treatment beyond what is required for the rooftop itself, and only when the impervious surface constructed is jurisdictional. Mounting a solar panel on an existing rooftop does not constitute redevelopment or any treatment requirements, beyond what would already be required.

294. **Comment:** Renew mulch annually to specified depth in planting beds/rain gardens. Develop STPs for Maintenance component, including specifications for mulch material so sediment and nutrient trapping are part of the maintenance goal. (CAV)

Response: Inspection and maintenance requirements for each stormwater treatment practice have been removed from the draft VSMM, and will be dictated by permit requirements, which typically require annual inspection. The Department plans to develop STP-specific inspection and maintenance guidance, which will be more comprehensive and practice specific, and otherwise be available to support application materials.

295. **Comment:** Allow compost products to be used for upstream sediment removal and to build level spreaders where revegetation and downstream bank stabilization would benefit from this practice. (CAV)

Response: The VSMM allows for the use of an alternative stormwater treatment practice (Alternative STP) for meeting the applicable treatment standards, when such practices can meet the required pollutant removal goals, subject to approval by the Department. Compost filter socks can be proposed by a designer under the Alternative STP, which would require supporting information documenting design specifications and monitoring data. The VSMM does not preclude their use for bank stabilization or agricultural applications that are otherwise not subject to the requirements of the VSMM. These other applications may be subject to other regulatory requirements.

296. **Comment:** Allow/Require Compost Filter Sock as part of treatment train for trapping contaminants – e.g. parking lot or street storm drain inlet. (This practice can also be used at inlets to agricultural field tile drains as interim practice until field soils are improved) (CAV)

Response: See response to Comment #295.

297. **Comment:** Align inspection frequency with that established by the permit and make the same for all stormwater treatment practices. (VHB)

Response: Inspection and maintenance requirements for each stormwater treatment practice have been removed from the draft VSMM, and will be dictated by permit requirements, which typically require annually inspection. The Department plans to develop STP-specific inspection and maintenance guidance, which will be more comprehensive and practice specific, and otherwise be available to support application materials.

298. **Comment:** The draft manual states that “Compost and other materials shall meet organic content and contaminant limit requirements of the Vermont Solid Waste Management Rules §6-11 and this practice standard.” However, in the section referenced there is no mention of phosphorus concentrations contained within compost. While individual treatment systems, such as Bioretention, reference phosphorus standards (pg. 4-60 of draft manual) compost for use in STPs should be more rigorously defined in its own dedicated section. **(Williston)**

Response: There are two specific instances where compost may be proposed as part of meeting the stormwater treatment standards established within the draft VSMM: designs that utilize bioretention for treatment and also under the Post-Construction Soil Depth and Quality Standard. In addition, compost may be proposed as part of an Alternative STP (see response to Comment #295). The Department does not consider a phosphorus concentration specification is needed for the Post-Construction Soil Depth and Quality Standard since these are not specific structural filtering practices that will discharge treated stormwater runoff.

Transition Questions

299. **Comment:** How much training and lead time will there be for the new manual? **(External stakeholder meeting)**

Response: Once a revised VSMM is finalized and adopted through rulemaking, the Department will develop and make available supporting application materials produced to assist designers with the submittal of complete stormwater permit applications under the updated VSMM. The Department’s Stormwater Program also plans to schedule multiple training opportunities around the State to assist designers and other partners in understanding the changes set forth in a revised VSMM. The proposed VSMM identifies an effective date of July 1, 2017, which is subject to change pending adoption

300. **Comment:** How will this affect permit renewals? **(External stakeholder meeting)**

Response: Stormwater permit renewal requirements are not directly dictated by the VSMM, but design requirements, including for retrofits, if applicable, may be informed by a revised engineering feasibility analysis (EFA) and any new general permit requirements. The VSMM may also be relied upon for other stormwater retrofits, when required.

301. **Comment:** What should I do now if I am designing a site now that I anticipate that will need to expand after the adoption of the new manual? **(External stakeholder meeting)**

Response: Designers are always encouraged to anticipate future development when considering stormwater design for a current project. As the revised VSMM is routed through the rulemaking process designers may be able to consider the anticipated VSMM framework in project design. See response to Comment #299.

302. **Comment:** Will there be worksheets available to help demonstrate compliance with the new standards? **(External stakeholder meeting)**

Response: Once a revised VSMM is finalized and adopted, the Department's Stormwater Program will make available supporting application materials developed to assist designers with the submittal of complete stormwater permit applications under the updated VSMM. The Department welcomes additional feedback from designers on these materials once they become available.

Questions not specific to the manual

303. **Comment:** When will the Lake Champlain TMDL be released? **(External stakeholder meeting)**

Response: The update to the VSMM is not contingent on the Lake Champlain TMDL, which was released by EPA on June 17, 2016.

304. **Comment:** Are the thresholds changing? How seriously are you considering lowering the thresholds? **(External stakeholder meeting)**

Response: The Department supported a proposal to lower the regulatory threshold to 0.5 acre (total resulting impervious surface) during the 2016 legislative session, which was in the end not enacted into law. The Department's position is further outlined in the Department's Report on Regulatory Threshold for Permitting Stormwater Runoff from Impervious Surfaces, submitted to the Vermont General Assembly on January 15, 2016. The regulatory threshold remains at one-acre total resulting impervious surface.

305. **Comment:** Is there going to be a new engineering feasibility analysis (EFA) developed in parallel to this manual? **(External stakeholder meeting)**

Response: An EFA, which would be applicable to the renewal of expired permits, three-acre sites (see the response to Comment #307), and other similar retrofits, is being developed in parallel to this VSMM update.

306. **Comment:** Are there any proposed changes to enforcement? **(External stakeholder meeting)**

Response: The revised VSMM does not result in any changes to the Department's compliance and enforcement of applicable regulations.

307. **Comment:** What is the three-acre permit? **(External stakeholder meeting)**

Response: During the public stakeholder meeting held on March 1, 2016 in Montpelier, one comment was made pertaining to a "three-acre permit." The reference to the three-acre permit is unrelated to the development of the revised VSMM, but is specific to a new requirement specified under 10 V.S.A. § 1264(c)(7) and (g)(3), enacted under Act 64, the Vermont Clean Water Act. Stormwater discharges from impervious surfaces of three or more acres in size, that were either previously not permitted or were permitted prior to the 2002 VSMM, will be required to obtain permit coverage, on a schedule established by the Secretary. Treatment requirements will be established by a new general permit for such purpose. The revised VSMM is expected to be relied upon under that general permit once applicable.

308. **Comment:** How will this affect the design work we have already done for the flow restoration plans (FRPs)? **(External stakeholder meeting)**

Response: The overall treatment standards included within the VSMM are not expected to change. Therefore, design work that has already been completed or is under way for implementation of FRPs, specially related to designing for the Channel Protection Standards will remain applicable. Projects that are required to apply for a permit following the effective date of the revised Manual would be subject to the design requirements of the Manual.

309. **Comment:** VTrans does not want the new manual to prohibit the forthcoming TS4 permit for the agency from providing the necessary flexibility for "redevelopment", including the use of watershed scale site balancing and/or offsets to assist in meeting the higher (50 percent) redevelopment standard for water quality treatment. VTrans would like to work with DEC to address this issue in a new transportation chapter of the manual. **(VTrans)**

Response: See the response to Comments #6 and #49.

310. **Comment:** Ban coal tar based asphalt sealants. [http://invw.org/2011/05/05/washington-is-first-state-in-nation-to-ban-toxic-pavement-sealants/\(CAV\)](http://invw.org/2011/05/05/washington-is-first-state-in-nation-to-ban-toxic-pavement-sealants/(CAV))

Response: The public comment related to coal tar asphalt sealants is not applicable to the draft VSMM.

311. **Comment:** Develop incentives and certification for exceeding Run-off Reduction and for Zero Discharge sites. LEEDS Credits and Compost for North Carolina:
http://www.filtrexx.com/wpcontent/uploads/2014/08/Webinar-Slides_Filtrexx-for-LEED-GreenBuilding.pdf <http://carolinacompost.com/wp-content/uploads/2015/09/Going-Grey-to-Green-NCGBC-082715.pdf>

Response: The revised draft VSMM requires project design to first consider the use of higher performing practices, including those stormwater treatment practices that utilize infiltration and disconnection for achieving runoff reduction, what would amount to zero discharge through the water quality storm. The state stormwater discharge permit application and permit requirements include a certification component for the designer to complete.

312. **Comment:** Add section for Solar Projects. **(CAV)**

- Given anticipated changes in the fabrication of solar panels, require soil health monitoring
- Require soils on solar array development sites be amended to increase soil organic matter to 5 percent.
- Develop stormwater management BMPs commensurate with the industrial toxins/heavy metals that can leach from solar panels.
<http://water.usgs.gov/wrri/10grants/progress/2010TX360B.pdf>

Response: "Impervious surface" is defined under 10 V.S.A. § 1264(b)(6), and within Chapters 18 and 22 of the Stormwater Management Rules. Solar projects that propose impervious

surfaces such that the regulatory threshold is reached, require a state stormwater discharge permit. Under the VSMM, impervious surfaces are only differentiated by the pre-treatment requirements for stormwater runoff. Stormwater runoff from non-rooftop impervious surfaces requires pre-treatment. For a solar development project that requires a state stormwater discharge permit due to the creation of impervious surfaces, soil disturbance as a result of development activity would be subject to the Post-Construction Soil Depth and Quality Standard.