



City of Tacoma
Public Works Department

February 3, 2012

WA State Department of Ecology
Water Quality Program
PO Box 47696
Olympia, WA 98504-7696

Surface Water Management Manual for Western Washington Comments

Dear Sir/Madam:

Thank you for the opportunity to comment on the draft of Ecology's 2012 Surface Water Management Manual for Western Washington (SWMMWW). The City of Tacoma is pleased to see that the Department of Ecology is promoting the use of Low Impact Development Techniques. The City appreciates the work that has gone into updating the draft manual and is excited to see the end product. The City of Tacoma generally supports the proposed updates and the direction the manual is taking. Generally, our comments request clarification or additional details to aid in implementation of the manual requirements.

We have provided specific comments and edits to the draft permit with suggested language changes in the following attachment:

Attachment 1: Comments on the 2012 Draft

In addition, we would like to highlight the following comments:

1. Ensure all comments and revisions provided as permit comments are also incorporated into the final version of the SWMMWW.
2. **Infiltration Requirements** – Significant changes have been made to the requirements for infiltration. The City of Tacoma supports all changes that will make infiltration more reliable, and its design more appropriate. The rationale behind some of the changes is not clearly outlined in the SWMMWW. The City requests additional clarification for the following items:
 - a. **Infiltration Rate Determination**: The manual has been updated to require that Large or Small Scale Pilot Infiltration Tests be required for soils consolidated by glacial advance. Those areas consolidated by glacial advance encompass a large portion of northern Washington State, including a large portion of the City of Tacoma. The required PIT tests will greatly increase the cost of development due to the length of time professionals will be required to be in the field in order to complete these tests. If this test will provide better data than the USDA gradation method, the City of Tacoma supports this requirement. However, based on recent projects, it has become apparent that a combination of tests and borings may yield the best information and be a more economical solution. Borings can provide the geotechnical professional a deeper look into the subgrade to better evaluate limiting factors such as an impermeable layer or groundwater. A boring investigation could show consistent soils, which would allow the geotechnical professional to reduce the number of PIT tests to only a few critical locations. It should be noted that the PIT test is a more expensive and invasive test that may not be feasible in some locations, such as in the developed right of way.

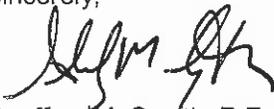
- b. **Groundwater Mounding Analysis:** Requirements have been added for groundwater mounding analyses for all large sites. The previous SWMMWW contained guidance for those circumstances when a mounding analysis would be required. Please clarify why all larger projects will now be required to conduct a mounding analysis.
- c. **Groundwater Monitoring:** Groundwater monitoring for one wet season now appears to be required prior to installing infiltration facilities. This will add significant delay to projects. Please provide an alternative option if a delay for an entire wet season of monitoring is not feasible.
- d. **Post Construction Testing of Infiltration Facilities:** This practice is included in the infiltration design sections. It is unclear from the language if this is required or not; please refer to specific comments in Attachment 1. If post construction testing is a requirement, it should be noted that this type of testing is difficult to conduct and evaluate. Please provide additional guidance for implementation.

These new requirements for sites evaluating infiltration will add additional cost and design time to developments and may make infiltration facilities less desirable. Since infiltration is a desired approach to stormwater management, ease of implementation should be a consideration.

3. **Low Impact Development Implementation** – The mandatory lists of LID BMPs and “Feasibility Criteria” as written appear difficult to implement and enforce because of the lack of definition for what can or cannot be “reasonably” designed under each list of feasibility criteria. The intent of the mandatory BMP lists and feasibility criteria is to make LID the first choice for stormwater management practices on new and redevelopment projects; however, the general nature of the criterion appear to make it too easy to determine LID is infeasible. In addition, it appears that the general nature of the feasibility criterion will make implementation by the permittees inconsistent. Additional clarification and guidance is requested.
4. **References to Guidance Documents not Attached to the Permit** – The numerous guidance documents referenced by the permit, but not included in the body of the permit, complicate permit compliance. Since several of the guidance documents are not available for public review during the comment period of the permit, we anticipate we will have additional permit-related comments once the documents are released, and request the opportunity to submit additional comments for consideration at that time. Some of our comments reference the Permit fact sheet (dated November 4, 2011) which contains important information for compliance that should be included in the Permit itself.
5. **Requirements and Recommendations** – Throughout the manual, a variety of words are used including, shall, should, must, may, recommended, suggested. The use of these words is unclear at times. All requirements should use the verb shall. A number of instances throughout the manual items are indicated and/or implied as mandatory and then a verb other than shall is used. It is important that requirements are clearly indicated for consistent enforcement by all permittees.

If you have any questions regarding the enclosed comments, please contact Erik Ward at 253-502-2171.

Sincerely,



Geoffrey M. Smyth, P.E.
Division Manager/Science and Engineering

Cc: Vince McGowan, Dept. of Ecology
Richard E. McKinley, Public Works Director
Michael P. Slevin III, P.E.
Lorna Mauren, P.E.

2012 Draft Stormwater Management Manual for Western Washington

Public Comment Period November 4, 2011 – February 3, 2012

Review Comments

Ecology SWMM Update Comments

General

1. Ensure all relevant revisions to the permit are incorporated into the SMMWW.
2. Ecology should consider working with WSDOT or using WSDOT standard specification format to develop standard specifications or provide template Special Provisions for stormwater facilities.
3. Incorporate the updates to the Draft LID Manual in Chapters 2, 3, 4 and 5 that apply to site assessment and site planning in the appropriate minimum requirements (especially Minimum Requirement #1, Preparation of Stormwater Site Plan and Minimum Requirement #2, Construction Stormwater Pollution Prevention) into the SMMWW. For example, vegetation and soil protection BMPs identified in Chapter 4 of the Draft LID Manual and precision site preparation techniques discussed in Chapter 5 of the Draft LID Manual should be included in the SWPPP checklist. The techniques identified for site assessment and stormwater site plans in Chapter 2 of the Draft LID Manual should be mirrored in Volume 1, Chapter 3 – Preparation of Stormwater Site Plans in the SMMWW.

Volume I

Page 1-6, Section 1.5.4 Flow Control BMPs, paragraph 3

4. The inserted text references the “pre-developed surface”. In the context of the overall SMMWW, pre-developed typically has the definition of a forested condition. The definition of pre-developed in the wetland guidance describes pre-developed as more of the existing condition prior to the proposed action. It is unclear what pre-developed definition should be used in this paragraph. It is suggested that the definition of pre-developed remain constant throughout the entire SMMWW and its Appendices and supporting documentation.

Page 1-25, Section 1.6.9 Construction Stormwater General Permit

5. Please add verbiage to clarify requirements for common plans of development which would outline coverage requirements for sites that are less than one acre in size and are a portion of the larger common plan of development.

Page 1-21, Section 1.6.15 Underground Injection Control Authorizations

6. The list of examples is misleading. An infiltration trench may not be an underground injection well if it serves only the roof of a single family home and other devices could be classified as

regulated through the program depending upon their design. It would be better to refer readers to Ecology's guidance on this issue than to provide examples.

Page 2-2, Exemptions, Road Maintenance

7. The City recommends that this section is renamed and narrative added to describe that the section is meant to apply to roads and all other paved surfaces such as parking lots.
8. Move the bullets to the definition for new and redevelopment.

Page 2-6, Land disturbing activity

9. The added sentence at the end of the paragraph should include maintenance of all types of public utility facilities, not just stormwater facilities.

Page 2-7, Pervious Surface

10. The following should be added to the end of the second sentence, "either native or installed in accordance with BMP 513 or other appropriate BMPs."

Page 2-4, Definitions

11. All definitions should be placed in the main glossary.

Page 2-8, Definitions

12. Add a definition for Project and Project Site. This should include the relevant concepts such as the common plan of development and that all elements of a related development should be incorporated into determining the overall project thresholds. Suggested language could include: "Those portions of a property, properties, or right of way subject to land disturbing activities, new or replaced impervious surfaces or conversions from native to other pervious surfaces. On-site and off-site improvements shall be added together when determining project impacts and related requirements. Impacts from on-and off-site development related by land subdivisions or common plans of development shall be considered together when determining minimum requirements."

Page 2-8, Pollution-generating pervious surfaces (PGPS)

13. Please clarify if synthetic turf sports fields are considered PGPS or if only natural grass sports fields are considered PGPS.

Page 2-8, Rain Garden

14. Revise definition to allow an imported rain garden mix within rain gardens.

Page 2-8, Replaced impervious surface

15. Clarify the definition by adding “or including” between the added “down to the” phrase.
Revised phrase “down to or including the”.

Page 2-10, Vehicular Use

16. Define “regular.”
17. The first bullet lists vehicular equipment storage yards, please provide a definition. In addition, please clarify if vehicle storage yards would be considered regularly used or not.

Page 2-11

18. Consider revising vegetation to uncultivated vegetation and use the following definition:
“Vegetation, including but not limited to, all annuals, woody and herbaceous perennials such as shrubs, vines, or trees that are not regularly or systematically maintained through any combination of the following: pruning, mowing, watering, trimming, fertilizing and any other activity intended to ensure public safety and assist vegetation to achieve full environmental and landscape function.

Page 2-15, Section 2.4.2 Redevelopment, Objective

19. The third paragraph states “As long as the replaced surfaces have similar pollution-generating potential...” Please provide guidance for determining similar pollution-generating potential.

Page 2-17, MR#1

20. It is unclear why the retention of native vegetation is included as part of MR#1. It appears to already be part of MR#5. It does not appear appropriate to have this requirement as part of preparing a SSP. In addition, a definition of site-appropriate development principles should be added or this phrase should be replaced with LID principles and specific guidance regarding LID principles and their application should be provided.

Page 2-22, Section 2.5.2, Element #3 – Control Flow Rates

21. Add guidance that discharges to flow control waterbodies must detain ½ of the 2 year to the 10-year events at the existing site conditions (see BMPs on construction filtration).

Page 2-22, Section 2.5.2, Element #5 – Stabilize Soils

22. Provide guidance to determine infeasibility of preserving topsoil as required per the bulleted item “Minimize soil compaction and, unless infeasible, preserve topsoil.”

Page 2-34

23. Please clarify that if a project is required to comply with both MR#5 and MR#7 and Mandatory List #1 is selected as the compliance method, but the items on Mandatory List #1 are found to

be infeasible, that it is not required to default to using the LID Performance Standard, instead the facilities would be designed to comply with MR#7.

Page 2-35 Mandatory List #1, last bullet

24. Clarify that BMP T5.13 is always feasible.

Page 2-36, For Roofs and Other Hard Surfaces.

25. It may be more sustainable to provide sheet flow dispersion instead of a rain garden designed in accordance with "Rain Garden Handbook for Western Washington". Providing dispersion and its associated flow path could promote overall site design more in keeping with LID principles. Maintenance of sheet flow dispersion is also very minimal.

26. Rain gardens and permeable pavement/infiltration should be ranked with the same order of precedence and the facilities should be designed using the same design criteria. Obviously, this comment somewhat negates the previous comment. Both comments are made for consideration, depending upon how Ecology chooses to address them.

27. Under Item 2. Of Other Hard Surfaces, it should be allowable to infiltrate the road runoff through an infiltration trench either under the road or elsewhere on the site if permeable pavement is not desired. Requirements for infiltration trench area could be set at a level Ecology feels is appropriate for long term facility performance.

Page 2-37, Mandatory List #2, Roofs, Item 3.

28. The final sentence of this section is unclear. It seems to possibly imply the use of an underdrain and soils with low infiltration rates as treatment for PGIS roofs, but it is unclear as written. Please clarify the intent of this sentence.

Page 2-37, Mandatory List #2, Other Hard Surfaces, Item 2.

29. Provide the footnote 1.

Page 2-37, Mandatory List #2, Other Hard Surfaces, Item 3.

30. The final sentence of this section is unclear. It seems to possibly imply the use of an underdrain and soils with low infiltration rates as treatment for pavement, but it is unclear as written. Please clarify the intent of this sentence.

Page 2-42, Flow Control Exempt Water Bodies, second filled bullet

31. For flow control exempt water bodies there is a requirement that the conveyance system between the project site and the exempt receiving water have sufficient hydraulic capacity to convey discharges from future build-out conditions of the site and the existing condition from non-project areas..." Is it the jurisdictions responsibility to determine what condition constitutes sufficient hydraulic capacity, and if so, how can this be applied evenly across all jurisdictions? It

is suggested that sufficient hydraulic capacity be quantified to a certain runoff event at a specified build out condition for the proposed project and offsite contributory areas.

Page 2-43, Section 2.5.7 Minimum Requirement #7: Flow Control, first bullet.

32. Native vegetation is called out here but removed from the flow chart. Revise for consistency.

Page 2-44, Section 2.5.7 Minimum Requirement #7: Flow Control, Standard Requirement, Item 2.

33. It seems it would be reasonable to use the existing condition in 1985, rather than the existing condition at the date of development, for sites that meet this criterion.

Page 2-46, MR#8: Wetlands Protection

34. Add clarifying language to Minimum Requirement #8 about which flow control standard must be applied when a project is required to comply with MR#5, MR #7, and MR#8.

Page 2-47, MR#8: Wetlands Protection, Standard Requirement

35. "Projects within the drainage area..." Consider revising to projects that discharge directly or indirectly to a wetland as there may be projects within a drainage area that do not discharge to the wetland.

Page 2-48, MR#8: Wetlands Protection, Supplemental Guidance

36. This section says that Appendix I-D should be used for determining mitigation requirements; however, the "Standard Requirement" section requires the use of Appendix I-D. Revise language for clarity.

Page 2-49, MR#9: Operation and Maintenance

37. MR#9 states, "An operation and maintenance manual ...shall be provided for all proposed stormwater facilities and BMPs..." An operation and maintenance manual should be provided for all stormwater facilities of any size that are used to comply with any of the minimum requirements. It is important that the final owner of the facility be aware of its location, function and required maintenance regardless of the size or contributing area of the facility. Revise MR #9 and the flow charts to reflect this change.

Page 2-54, MR#8: Wetlands Protection, Exceptions

38. Provide a definition for administrator. Clarify if this is Ecology or local government staff.

Page 3-2, Step 1

39. When the Section is updated to be complementary with the LID Manual, additional review opportunities should be provided.

Page 3-2, Section 3.1.1 Step 1

40. As written, this section appears to apply to all proposed projects if the thresholds of MR #1 are met. This would mean that most single family homes would require a full survey and soils report as outlined in this section. It is suggested that smaller projects should not be required to provide such detailed information.

Page 3-3, Section 3.1.1 Step 1, Item 2, Soils Report

41. It appears that there is a requirement to provide a soils report prepared by a geotechnical engineer or licensed geologist. It does not seem appropriate to apply to smaller projects, such as those only installing a rain garden, per draft SMMWW definition. The WSU Rain Garden handbook does not have a requirement for this type of soils investigation. In Volume III under the infiltration design requirements, these types of professionals are also not required. Revise the requirements of Volume I and Volume III to be consistent and provide lesser requirements for small projects.

Page 3-3, Section 3.1.1 Step 1, Item 4

42. This seems like an onerous requirement for small projects particularly in urban settings.

Page 3-4, Section 3.1.2 Step 2

43. When the Section is updated to be complementary with the LID Manual, additional review opportunities should be provided.

Page 3-7, Permanent Stormwater Control Plan, Paragraph B.

44. Remove the last sentence as it may lead project proponents to believe that any amount of any type of compost is acceptable.

Page 3-8, Permanent Stormwater Control Plan

45. The inclusion of two possible types of LID type features in the paragraph is confusing. All stormwater features should be included on the drawings to ensure that the proposed facilities match the modeling and fit on the site as proposed. Revise the added text to read, "If distributed facilities are used, drawings are necessary to confirm accurate representation in the runoff model. Identify locations and approximate size of all facilities to be installed as part of the project, including those that will be installed on individual lots by subsequent contractors. Supporting areas such as the flow paths for dispersion BMPs should also be shown."

Page 3-11, Operation and Maintenance Manual

46. The inserted text for the first paragraph should be revised to read "including any distributed facilities that are used".

Page 4-3, Step III, Step 5

47. Ensure that all LID elements are available in the free version of WWHM prior to permit implementation.

Page 4-3, Step IV

48. It seems it would be appropriate to include a Select Onsite Management Step before Step IV: Select Flow Control BMPs and Facilities.

Page 4-4, Step V

49. A reference only to a separate Section does not seem appropriate. Actual text is likely to be clearer.

Appendix I-B

50. Delete Appendix I-B and have each jurisdiction determine their own rainfall events or provide a note that states that each jurisdiction can determine their own rainfall events.

Appendix I-D

Page D-3, Guide Sheet 1

51. Item 1 Special conditions listed in this item should also include listed plant species.

52. Second to the last paragraph. It is unclear if wetlands that will receive flows from an upgradient stormwater system are required to comply with Guide Sheets 3B and 3C. If they are not, is the jurisdiction required to provide guidance for these types of wetlands? Is the “should” in this paragraph intended to be “shall.”

53. Last paragraph, Quantify “large storms” and clarify what design criteria are being referred to.

Page D-4, Guide Sheet 2

54. Please add that alteration of a wetland would likely require federal, state and local permits.

Page D-6, Guide Sheet 3A, #7

55. In addition to modeling, pre-development monitoring should be conducted to establish existing hydroperiods.

56. Provide reference page for design of a spreader swale.

Page D-7, Criterion 1

57. It is unclear if the applicant is required to use WWHM or another model to determine if the criteria are met. Provide additional guidance. If the applicant is not required to use a model, is there a particular source that is required for obtaining precipitation data.

Page D-9, Guide Sheet 3 B, WWHM Modeling

58. The word pre-development is used in this guidance differently than in the remainder of the SMMWW; in this guidance, pre-development is defined as what would be considered existing in the remainder of the SMMWW. It is confusing to define the same word in different ways, use “existing” to be consistent throughout the manual.
59. Is the modeling meant to apply to the entire basin upstream or solely to the project site?
60. Under Assumption – clarify how groundwater flows are determined. If the designer selects the groundwater button in WWHM, will that be sufficient for estimating groundwater flows?

Page D-10, Guide Sheet 3 B, Monitoring

61. Provide requirements for monitoring. It appears as if one possible method is presented.

Page D-10, Guide Sheet 3C, Item 3

62. Clarify the type of treatment or the process to determine the type of treatment for urban runoff into the wetland. Why is only urban runoff treated? Define urban.
63. Second paragraph. Clarify the nutrients to be controlled or the process to determine the type of nutrient control.

Page D-13, Guide Sheet 4, Item 6.d.

64. The rationale behind the order of preference and the reasons why certain facilities are preferred on-site are different from those that are noted for regional facilities. These lists should be re-evaluated. Specific concerns include: Why is a constructed wetland not listed for on-site? Why is an infiltration basin or trench preferred over a retention pond? Why couldn't below ground detention or an infiltration pond be used on a regional scale?
65. The term retention should be replaced with infiltration.

Page D-15, Guide Sheet 4, Monitoring

66. Fourth bullet. The parenthetical phrase is very open. Are there criteria for when the sample should be rescheduled? Does the parenthetical phrase apply to all the bullets?
67. Are there standard methods to be used for sample analysis?

Page D-16

Guide Sheet 4, Monitoring, Last sentence

68. How are the goals for sampling established?
69. Under Data Needed for Guide Sheet 2, the term “existing flows” is used in this location but in other sections of the appendix the term “pre-developed” is used. Ensure consistency within this appendix and the entire SMMWW.
70. Why and how should one characterize the changes to water quality coming from the development?
71. Under Data Needed for Guide Sheet 3B, Ensure that all required modeling elements are included in the free version of WWHM prior to SMMWW implementation dates.

Page D-17 Definitions

72. The definitions in this section should be made consistent with the definitions for the entire SMMWW and combined into one section for the entire document.

Page D-19 Polishing

73. It appears that a portion of the Post-development definition has been added to this definition.

Page D-19 Pre-Development

74. Revise the definition to be consistent with the pre-development definition within the entire SMMWW.

Page D-19 Pre-treatment

75. Revise the definition to be consistent with the pre-treatment definition within the entire SMMWW.

Appendix I-E

76. Page E-2. Rename table “Flow Control-Exempt Surface Waters List”.
77. Page E-3. Within the list, City of Tacoma is changing all references to “T-Street Gulch” to “First Creek”. Please revise.

Appendix I-F

78. Please clarify whether infeasible means that it is not required or not allowed. The City would support the clarification of “not required”. The City agrees that it is not advisable to require developments to infiltrate in poor soils, however, if a project proponent wanted to infiltrate and

sized the facilities correctly and in accordance with a geotechnical professional, then infiltration should be allowed for the project.

Item 1.A. Bioretention:

79. Page F-1. The note for the setback distances is not clear.

80. Include “Within local setbacks from adjacent property lines” as a feasibility criterion.

81. Page F-2. The first full criterion on the page indicates hydraulic conductivity of 0.30 inches per hour as an infeasibility criterion, however, in the body of Volume 1, Page 2-37, Mandatory List #2, Roof: it is stated that soils with hydraulic conductivity of less than 0.30 inches per hour should be used for runoff from roofs that are considered pollution generating. The use of the phrase “in these instances” on Page F-2 is unclear. Specific language such as “When the saturated hydraulic conductivity is less than 0.30 inches per hour,...” should be substituted in this sentence and in Mandatory List #2, Item 3., it should be clarified that the facility would serve primarily as a water quality feature and an underdrain would be required. Please clarify and remove inconsistencies within the SMMWW.

82. Page F-2. The final criterion is if there is a lack of useable space. Provide guidance to use for a lack of usable space determination. For example: Would a project proponent be expected to decrease the size of new improvements in order to install a bioretention facility?

Permeable Pavement:

83. Page F-2. Recommend revising road type classifications to ADT counts when determining feasibility. Arterial and collector roads vary significantly across the area of applicability of this manual. Some arterials and collectors may have less traffic and lower pollutant loading than a typical residential street in an urban city.

84. Page F-2. Please clarify the second infeasibility criterion. It appears that the intent is to not have permeable pavements in parking lot drive aisles if the runoff cannot be conveyed and infiltrated in the parking spaces. Parking lots vary from those serving large big box retail stores to small offices that have employees parking all day with very little traffic flow. It appears that this criterion is intended to address concerns with wheel movements tearing up permeable asphalt. It is our understanding that this concern does not apply to concrete or pavers. The criterion should be revised to only those areas where asphalt is proposed. However, it is recommended to move this concern to a design criteria requirement to consider rather than leave it within the feasibility criteria.

85. Page F-3. The Asphalt industry represents that pervious asphalt is constructible up to 9-10%. Additional design considerations may be required at this slope such as subgrade check dams, terracing, and/or excellent soils, but pervious asphalt should be considered feasible beyond 5% slope.

86. Page F-3. Define excessively steep slopes.
87. Page F-3. In the second criterion, add “or to manufacturer’s recommendation” at the end of the first sentence. Specific types of pavers may have specialized requirements for slope.
88. Page F-3. Define regular and heavy in the context of sand applications.
89. Page F-3. Third and fourth criterion from the bottom of the page. If a designer is concerned about adjacent impervious pavements or basements, geomembrane liners have been proven to be very effective in mitigating these concerns. This does not make permeable pavement infeasible.
90. Page F-3. Permeable pavements are performing fine in the City of Chicago supporting heavy loads in industrial and commercial areas. The pavement needs to be designed correctly with adequate assumptions and pavement calculations. This should not be a criterion for infeasibility but rather a design consideration.
91. Page F-4. Last criterion under permeable pavements. Includes hydraulic conductivity of 0.30 inches per hour as an infeasibility criterion, however, in the body of Volume 1, Page 2-37, Mandatory List #2, Other Hard Surfaces: it is stated that soils with hydraulic conductivity of less than 0.30 inches per hour could be used for runoff from pollution-generating areas. The use of the phrase “in these instances” on Page F-4 is unclear. Specific language such as “When the saturated hydraulic conductivity is less than 0.30 inches per hour,...” should be substituted in this sentence and in Mandatory List #2, Other Hard Surfaces, Item 3., it should be clarified that the facility would serve primarily as a water quality feature and an underdrain would be required. Please clarify and remove inconsistencies within the SMMWW.
92. Page F-4, under Vegetated roofs. Additional guidance on “technically be designed” should be given. Structural Engineers can design to accommodate most loadings. The criterion should be modified to state where the structural design would increase costs of the roof structure and supporting structures by a given percentage.

Glossary

Page 7, Bond

93. Manager should be replaced with administrator and administrator should be defined.

Page 7, Capital Improvement Project or Program

94. The final word should be “project” not “program”.

Page 8, Certified Pervious Surface

95. “Certified pervious surface” should read “converted pervious surface”. It appears to be consistent with other wording in the manual, the word “native” should be removed.

Page 10, Common Plan of Development

96. The word “contact” should read “contract”. Also, there is a reference to utility project, but utility projects are exempt so that reference should not be included in the definition. This definition should reference the concept of a project or project site that would be used to determine the stormwater thresholds.

Volume II

Page 3-4

97. The requirements of the SWPPP should include an “as applicable” statement as each component of the narrative and drawing may not be applicable to every project.

Page 3-29

98. This section should be written to include the protection of all BMPs during construction. Keeping as LID only may lead the applicant to think that only protecting those BMPs during construction is important, when it is equally important to protect all types of infiltration BMPs, proprietary filter devices, and other stormwater facilities. Consider revising entire BMP without the LID emphasis.

Volume III

General

99. Consider adding guidance in the operation and maintenance section of each BMP that clearly specifies when each maintenance task should be performed. The Pierce County manual is a good example.

Section 2.2.2, Page 2-8

100. Will the “Future” versions of WWHM referenced be free to the public?

Section 2.2, Page 2-12

101. The section states that Ecology does not have guidance for modeling wetlands in WWHM. What is the guidance in Volume 1 for WWHM and wetlands?

Page 3-3, figure 3.1

102. Revise this flowchart to include the new Minimum Requirement #5 requirements, include the order of preference for infiltration facilities.

Page 3-4, Application

103. #1. The 22,000 square foot threshold does not appear to apply. Per MR#5, all lots are required to provide infiltration if feasible. Consider revising statement or removing statement.
104. #5. This statement does not coincide with the feasibility criteria. Revise statement to reference the feasibility criteria for downspout infiltration.

Page 3-4 and 3-5, Procedure for Evaluating Feasibility

105. #1: A soils report prepared by a professional is required for roof downspout infiltration systems but not required for roof downspout rain gardens. Since roof downspout infiltration is further ahead on the MR#5 Mandatory List #1 it seems like the soils report would be available for trying to determine if infiltration is feasible and in that case the Rain Garden Handbook soils classification should not be used. Suggest requiring a soils professional for both infiltration trenches and rain gardens.
106. #1: The information required for the soils report and the type of professional allowed to perform the soils testing is different in this section than that required in Volume 1 for Stormwater Site Plan evaluation. Ensure consistency.
107. #3: The minimum depth for the soils log should depend on the depth of the proposed facility; a minimum 4 foot depth may be misleading. Provide additional language to indicate that the actual depth of soils log should be based upon the depth of the proposed facility and depth required to verify required separation to seasonal high groundwater.
108. #4: Provide the separation requirements from bottom of facility for clarity.

Page 3-5, Design Criteria for Infiltration Trenches

109. For the downspout infiltration trenches, is the minimum length per 1000 square feet of roof area based upon USDA soil type, if so, please specify. Since the option of classifying soils per the USDA is no longer proposed for determining infiltration rates, the table should be updated or expanded based upon new requirements.

Page 3-6, Design Criteria for Infiltration Trenches

110. #5: The requirements here are different than those required in Volume 1 for Stormwater Site Plan evaluation. Ensure consistency.
111. #6: Ensure consistency between these criteria and the LID feasibility criteria. BMPs that are intended to infiltrate stormwater should have consistent criteria.

Page 3-10, Setbacks

112. #2: Ensure consistency between these criteria and the LID feasibility criteria. BMPs that are intended to infiltrate stormwater should have consistent criteria.

Page 3-12, Design Criteria for Dispersion Trenches

113. It is unclear what is meant by sheet flow from non-native impervious surface? Provide a definition or revise the statement.

Page 3-14, Figure 3.6

114. Concerns have been raised by contractors/inspectors about the use of treated grade board and the integrity/longevity of this element when constantly exposed to water. Additionally, the diagram shows the support post going through the filter fabric. Consider revising the figure to allow additional materials for the support post.

Page 3-15, Downspout Dispersion Systems

115. It is unclear what is meant by sheet flow from non-native impervious surface? Provide a definition or revise the statement.

Page 3-16, Perforated Stub-Out Connections

116. Will perforated stub-out connections be a requirement of MR #5 or are they just included as an additional option when infiltration using a trench or rain garden and dispersion cannot be utilized?

Page 3-21, Embankments

117. #1-#5: It is unclear why a professional engineer with geotechnical expertise and geotechnical engineer are used differently when designing pond embankments. Ensure consistency between the statements.

Page 3-22, Detention Facilities

118. Overflow, Emergency Overflow Spillway, and Access are good guidelines to apply to many BMPs including bioretention. Consider referencing these sections in other BMPs that will contain similar components.

Page 3-35, Maintenance

119. Ecology should develop a guidance manual or provide a leadership role in helping homeowners associations understand their maintenance requirements and ensure that these associations cannot disband when they are tasked with stormwater maintenance and ownership.

Page 3-46, Detention Vaults

120. This BMP should be clarified or expanded to include Detention Tanks and Stormtech Chambers. There is currently no direct guidance for these features. Consider revising the name and potentially components within the BMP to be more inclusive.

Page 3-65, Description

121. It is stated that at a minimum, pretreatment for the removal of TSS is necessary prior to discharge to the infiltration facility. If the facility will not be receiving pollution generating stormwater this requirement does not appear necessary. Consider adding clarifying language.

Page 3-68, Steps for the Design of Infiltration Facilities, Paragraph 1

122. “Designs of infiltration facilities for larger projects must incorporate the results of a groundwater mounding analysis...” The statement does not specifically define larger project. Define larger project. Note, that the thresholds should be based upon area serving the facility as opposed to the site area.
123. The LID Manual indicates that a mounding analysis is required for a single facility serving over 1 acres of drainage area. Revise the SMMWW to be consistent with the LID Manual. In addition, clarify when the mounding analysis would not be required. For instance, if over 1 acre is served by more than one infiltration facility would the mounding analysis still be required?
124. It is unclear if permeable pavement facilities are included here as infiltration facilities. Provide additional clarifying language.
125. Figure 3.27, Page 3-97 indicates that only unusually complex or critical design cases require a mounding analysis but the statement in this paragraph indicates that all larger projects will be required to perform a mounding analysis. Ensure consistency throughout the document.

Page 3-69, Steps for the Design of Infiltration Facilities, #5, Determine the design infiltration rate:

126. This section requires the use of the Large Scale or Small Scale Pilot Infiltration Tests for soils consolidated by glacial advance. If unconsolidated soils are present, use of the grain size analysis is allowed. Due to the number of tests that could be required, this requirement could add significant cost and delays to projects.
127. How does the PIT test requirement apply to a new development? A number of pit tests sprinkled all over the site to determine where you should put your facility?
128. A PIT test may not be practical for a road redevelopment. A PIT test has an approximate bottom of 100 sft and maybe 2 ft deep for porous pavement and 4-5 ft deep for an infiltration trench. This doesn't fit in a planter strip; this requirement would likely require closing a sidewalk and ½ of a lane for one day in each location in order to complete the test.
129. The City recommends allowing flexibility by the geological expert in determining the number of borings and test pits that a given site or project may need. If borings show consistent geology through a project site, PIT tests may be redundant. Consider adding clarifying language in the manual about the required number and location for soils testing. As written, the requirements seem onerous.

130. It is unclear if the PIT tests are required in addition to a complete soils investigation. A PIT test may provide the saturated hydraulic conductivity but will not yield information such as depth to groundwater. Provide clarifying language about what is required for each type of infiltration facility.

Page 3-70, Construct the Facility

131. Provide guidance regarding the type of and procedures for performance testing. Clarify if ongoing performance testing is required.

Page 3-71, Figure 3.26

132. "Perform subsurface characterization and collection including location of water." Water should read seasonal high groundwater.
133. "Soil gradation" should read Soil Gradation.
134. Provide an assumed in/hour in the Choose trial based... box.

Page 3-72, Subsurface Characterization

135. #1: Does the subsurface exploration need to be so deep? Since PIT tests will be required the exploration should really only need to be conducted to 5 feet below the infiltration facility to ensure no high groundwater table (SSC-5).
136. #2: The requirements in the note for the type of professional are not consistent with those contained in the requirements for the Stormwater Site Plan in Volume 1. Ensure consistency with the requirements in Volume 1

Page 3-73, Subsurface Characterization

137. #3: The requirement for 1 year of monitoring is onerous and will add significant delays to projects and development. If there is a real concern about the function of infiltration facilities based upon soils information obtained, Ecology should assist municipalities in acquiring the appropriate information or require additional factors of safety be placed on infiltration facilities. The LID Manual requires monitoring wells when it cannot be confirmed that seasonal high groundwater is greater than 5 feet below the facility. The SMMWW should be modified to be consistent with the LID Manual.
138. #3: Provide additional guidance as to what would be appropriate historical data.

Page 3-75, Section 3.3.5. Infiltration Receptor

139. #3. Last bullet: This section indicates that a mounding analysis "should" be conducted at all sites where the seasonal ground water table is less than 15 feet and when designing an infiltration facility with a contributing area of more than 1 acre. This contradicts Volume III, Page 3-68. Section 3.3.4 which requires a groundwater mounding analysis for all larger projects.

Ensure consistency throughout the SMMWW. Section 3.3.5 appears to be more appropriate for determining when a groundwater mounding analysis is necessary.

140. #3. Also in this section clarify what the 15 feet is measured from: existing ground surface, bottom of infiltration surface, proposed ground surface or some other point.

Page 3-78, Design Saturated Hydraulic Conductivity – Guidelines and Criteria

141. Provide guidance on how to determine if a project site is within an area that has soils that are unconsolidated by glacial advance. Is a soils map sufficient to determine this information or must the soils be classified by a soils expert in order to determine this information.

Page 3-79, Three Methods for Determining Saturated Hydraulic Conductivity for Sizing Infiltration Facilities

142. “Verification testing of the completed facility is strongly encouraged.” It is unclear if verification testing is required based upon this statement. Page 3-70 appears to require performance testing.

Page 3-83, Large Scale, Pilot Infiltration Test (PIT)

143. Is the PIT test required to be conducted by a professional? If so, provide the guidance as to what the qualifications would be.

Page 3-84, Small-Scale Pilot Infiltration Test

144. Please define small-scale LID BMPs.

Page 3-85, Infiltration Test

145. “Use a rigid diameter pipe...” It is unclear what rigid diameter pipe means.
146. “At the conclusion of testing, over-excavate the pit to see...” Provide guidance as to the amount of over-excavation.

Page 3-86, Soil Grain Size Analysis Method

147. “For critical designs...” Define critical designs.

Page 3-90, SSC-1 Setback Criteria

148. Include setback criteria from property lines to ensure neighboring properties are not affected.

Page 3-91, SSC-3 High Vehicle Traffic Areas

149. Commercial or industrial sites subject to an expected ADT greater than or equal to 100 vehicles per 1000 square feet of gross building area is not a good indication of impacts to an infiltration facility. A big box store may not meet this threshold but a small mini-mart or espresso stand might just due to the small size of the parking lot versus the size of the building. Revise criterion to acknowledge overall traffic at a site.

Page 3-93, SSC-6 Soil Physical and Chemical Suitability for Treatment

150. "Waste fill materials should not be used as infiltration..." Provide a definition for waste fill materials. Also, this statement would be more protective as a "shall" statement. Consider revising.
151. "Field performance evaluations, using acceptable protocols,..." Provide examples of acceptable protocols.

Page 3-94, SSC-9 Verification Testing of the Completed Facility

152. Page 3-70 appears to imply that performance testing of infiltration facilities is required where this section appears to imply that performance testing is recommended. Ensure consistency and revise language as necessary.

Page 3-97, Figure 3.27

153. The flow of the flowchart is unclear. Revise the flowchart for clarity.
154. The figure is not consistent with 3.3.4 Steps for the Design of Infiltration Facilities Page 3-68 regarding when a mounding analysis is required.
155. Provide a definition for unusually complex, critical design cases.

Page 3-100. Calculate the hydraulic gradient

156. "The correction factor was developed for ponds with bottom areas between 0.6 and 6 acres in size." What guidance should be followed for ponds less than 0.6 acres in size?

Page 3-102, Groundwater Mounding Analysis

157. The groundwater mounding analysis seems overly restrictive when applied to all commercial projects larger than 1 acre and subdivisions like plats. If the soils are investigated thoroughly and PIT tests are completed with an appropriate factor of safety applied to design the risk for failure should be fairly minimal. The jurisdiction should be able to require the mounding analysis at their discretion based upon the soils information received.
158. It is unclear if the groundwater mounding analysis is intended to apply to areas draining to each facility or to the site as a whole. It seems unreasonable to require a mounding analysis

for an infiltration facility that is only receiving 2000 square feet of runoff but the site is 3 acres. Provide additional language as necessary to clarify.

159. The City of Tacoma suggests that the following be recommendations for when a groundwater analysis is not necessary:
- a. At the recommendation of a geologic professional
 - b. Borings 10 ft below the facility showing consistent soils
 - c. Permeable pavement receiving no runoff

Page 3-105, Construction Criteria

160. The construction criteria for all infiltration features including LID features should be the same.
161. "After construction is completed, prevent sediment from entering the infiltration facility by first conveying the runoff water through an appropriate pretreatment system such as a pre-settling basin, wet pond, or sand filter." Previous sections require pretreatment. Ensure consistency.

Page 3-106, Verification of Performance

162. Page 3-70 appears to imply that performance testing of infiltration facilities is required where this section appears to imply that performance testing is recommended. Ensure consistency and revise language as necessary.

Page 3-107, Design Criteria Specific for Basins

163. The fourth bullet down references a Chapter 0. Revise.

Page 3-115, Description

164. It states that at facilities serving a drainage area exceeding 1 acre, a groundwater mounding analysis should be conducted but Page 3-102 provides requirements for groundwater mounding analysis which seems to indicate that a groundwater mounding analysis would be required for infiltration trenches but only recommended for a bioretention facility. This appears to make infiltration trenches less desirable than bioretention areas.
165. It states that a small-scale pilot infiltration test is appropriate for bioretention areas on smaller commercial sites. It is unclear why a small-scale PIT test is more appropriate than a large scale PIT test for bioretention facilities but an infiltration trench might be required to do a large-scale test. Define smaller.
166. In the last paragraph it is unclear if the groundwater mounding analysis is required. Ensure consistent use of "should" and "shall" to ensure that requirements are clear.

Page 3-116, Permeable Pavement

167. It states that for projects required to comply with MR#1-5 that infiltration testing is not required but infiltration testing is required for infiltration trenches when complying with MR#1-5. It does not make sense to require infiltration testing for some infiltration facilities but not others. Additionally, would testing be required if the permeable pavement accepted runoff?
168. "However, field tests to observe groundwater elevations between December 1 and April 1 are necessary." What types of field tests and how many are required? Reference the applicable infiltration section.
169. It states that permeable pavements should be the first choice but per MR#5, dispersion of these surfaces is the first choice. Ensure consistency between language of the minimum requirement and this section.
170. "Results of the testing must be submitted with the plat or short plat application..." Also include building or construction permit application.

Page 3-117, Permeable Pavement

171. It seems inappropriate to base the design of permeable pavement upon the weighted average of the infiltration rates. In a given project, there can be one area of a site with a hydraulic conductivity of 0.1 inches per hour and another area with 10 inches per hour. It seems that averaging would lead to a facility that will not function properly.

Appendix III-C

General

172. Why are the LID BMPs hidden in an appendix? Include them in the appropriate chapters (3 or 5) or provide a separate chapter for LID.

Page C-3, Permeable Pavement

173. The City does not agree that averaging the hydraulic conductivities across a large site is appropriate as conditions can vary significantly for a given project.

Page C-11, Vegetated Roofs

174. The Green Roof Element should be available in the free version of WWHM prior to SMMWW implementation.

Page C-23, Ecology Comment Box

175. The City of Tacoma believes that all requirements for infiltration should be consistent whether it is an infiltration trench or a rain garden. The mechanism for reducing flows is the same, by infiltrating into the native soils.

Page C-24 Modeling of Multiple Rain Gardens

176. The title should be revised to read Modeling of Multiple Bioretention Facilities

Page C-26, Ecology Dialog Box

177. Is the remainder of the guidance going to be updated? If so, when will there be an opportunity to comment on this section?

Volume IV

Section 2.1, Page 2-2

178. Bullet three now requires the use of vacuum sweepers quarterly, or more frequently as needed, for all surfaces of those sites mentioned in Appendix IV-A. The land uses in Appendix IV-A may not be amenable to vacuum sweeping or portions of the site may not be amenable to vacuum sweeping. Provide documentation as to why quarterly sweeping is required as opposed to another time frame and provide documentation as to why vacuum sweeping is preferential to other methods of dust and debris collection.

Page 2-25

179. The second bullet states, “The valve may be opened to convey contaminated stormwater to a sanitary sewer, if approved...” The first bullet states that the valve shall remain closed. The second bullet states that the valve may remain open. It is unclear if the valve may remain open or must be closed. Provide additional clarifying language.

Volume V

Section 1.4.3, Page 1-2 to 1-4

180. There appears to be design requirements for various treatment options contained within this section of the manual. These requirements or guidelines should be deleted from this section and placed within the appropriate BMP for each treatment facility. This will avoid confusion.

Section 1.4.3, Page 1-3

181. Pretreatment: Will porous pavement be included as a pretreatment device.

Section 1.4.3, Page 1-4

182. Bioinfiltration: Do the soils need to be imported if the onsite soils meet the treatment requirements? It seems that amended onsite soils should also be allowed. Requiring export of onsite soils and import of soils for every facility is not sustainable. Section 2.1, Page 2-8, Step 6

183. It is unclear why landscaped areas of industrial, commercial, and multi-family project sites require basic treatment. These areas may not be subject to fertilizer use, etc. Revise this statement for clarity.

Section 2.2, Page 2-9 and 2-10

184. Consider removing this section as each BMP contains the restrictions to using the BMP. The reader is not likely to go to this section to determine if a BMP is feasible.

Table 2.1, Page 2-12

185. Consider removing this table. Its inclusion is misleading.

Page 3-8, Bioretention

186. Consider removing the term imported from the definition of bioretention. Onsite soils that meet the requirements for the soil mix or amended onsite soils should also be allowed. Requiring export of onsite soils and import of soils for every facility is not sustainable.

Section 4.3.1, Page 4-6

187. The “shall” term is used under the header of *Examples of setbacks commonly used*, it is unclear if these items are required setbacks that jurisdictions should follow or just examples of setbacks that jurisdictions could choose to adopt.

Section 4.4.2, Page 4-8

188. It is unclear why a 2 foot thick layer of soil is required for treatment liners whereas a bioretention facility only requires 18” of treatment. Additionally per conversation with Ecology, a 6” layer of sand may be used under permeable pavement in order to meet the basic treatment goals. Consider revising the layer thickness or removing this section entirely as it does not appear to be consistent with other treatment options.

Section 4.5.1, Page 4-12

189. It is unclear why the baffle wall of a flow splitter is required to be 4 inches thick. Consider removing this requirement or providing justification.

Section 4.6, Page 4-30

190. Move the maintenance checklists into the volume that contains the BMP or move all the checklists to Volume 1.

Section 4.6, Page 4-46

191. Remove checklist #15. This type of Stormfilter is not standard and the inclusion of this checklist is misleading.

Chapter 5, Page 5-1

192. Consider making onsite management its own volume, as onsite management is not necessarily water quality treatment.

Page 5-2, Site Design BMPs

193. "Sites that can fully infiltrate or fully disperse are not required to provide runoff treatment or flow control facilities." Revise this statement. Sites that are required to provide water quality treatment must provide treatment before infiltration or use infiltration as treatment.
194. "Impervious surfaces that are not fully dispersed should be partially dispersed to the maximum extent practicable and then hydrologically modeled." This statement assumes that a professional engineer is required for all sites regardless of site size. This also appears to contradict the order of precedence in MR#5.

Page 5-8, Additional Design Criteria for Dispersion Trenches

195. In the last bullet, provide a definition for a non-native impervious surface.

Page 5-17, Rain Gardens

196. It is our understanding that the Rain Garden Handbook for Western Washington Homeowners is being updated. This document should be available for public comment since it is the guidance document referenced here and in the permit.
197. The current Rain Garden Handbook needs to be revised to better define that a rain garden is a non-engineered facility and how a rain garden relates to a bioretention area.
198. Page 9 of the Rain Garden Handbook sets a lower limit of 0.1 inches per hour as an appropriate infiltration rate for the feasibility of rain gardens. The SWMM sets a lower limit of 0.3 inches per hour as an appropriate infiltration rate for the feasibility of bioretention facilities. Is the intent to allow lower infiltration rates for rain gardens? These two guidance documents should be revised for consistency.
199. Page 11 of the Rain Garden Handbook provides rain garden size based upon annual volume of water held in a rain garden. What annual volume will Ecology require for meeting Minimum Requirement #5? If it is left up the jurisdiction, the MR will not be applied consistently. The actual requirement must be put into the SMMWW.

BMP R5.30, Page 5-18

200. Can a site that was previously cleared and then restored be considered to be part of the 65% of native vegetation or must the native vegetation area be a predeveloped condition?
201. Under the last bullet provide a definition for utilities.

Page 5-20, Roof Downspouts

202. "...and if they comply with the downspout dispersion requirements of BMP T5.10 and have vegetated flow paths through native vegetation exceeding 100 feet." It seems appropriate that the vegetated flowpaths include non-native vegetation when the soil has been amended per BMP T5.30. Revise to include.

Page 5-21, Roadway Dispersion BMPs

203. #2: It seems appropriate for a geotechnical expert to evaluate sheet flow over road fill slopes to determine feasibility. Consider adding this requirement.
204. #5: It states that "Dispersion trenches shall have a minimum spacing of 50 feet." Is this a minimum spacing of 50 feet from each other? Provide additional clarifying language.

Page 5-22, Ecology Dialog Box

205. It states that the section on Native Vegetation and Landscaped Areas will be completed at a later date. This section should be available for public comment before finalization of the manual.

Page 6-1, Pretreatment

206. Since it appears that pretreatment will be required before all infiltration trenches, operational BMPs such as street sweeping, etc. should be considered as options for pretreatment.
207. Under Section 6.2 remove the reference to catch basin inserts as they are no longer being considered a viable option for pretreatment.

Page 7-4, Purpose

208. Remove the reference to imported soils when referring to bioretention.

Page 7-8, Application and Limitations

209. It states that the amount of stormwater that is predicted to pass through the soil profile may be estimated and subtracted from the 91% volume that must be treated. Clarify that all stormwater that is required to be treated must be treated, so that if water from PGHS areas is subtracted it must be treated.

Page 7-9, Site Suitability

210. The minimum separation from the seasonal high groundwater mark appears to be a recommendation as opposed to a requirement. Is it the intent that jurisdictions will determine the appropriate separation from groundwater, if so; facility design will be inconsistent amongst jurisdictions. Ecology should provide these requirements.

211. These separation requirements appear to be applicable to pervious pavement as well. Consider adding to pervious pavement section or referencing.

Page 7-10, Site Suitability

212. It is stated that a liner may be required if there are concerns about soil and groundwater contamination. The City recommends a requirement to evaluate this risk on all sites.

Page 7-11, Design Criteria for Bioretention

213. “Flows should be less than 1.0 ft/second to minimize erosion potential.” Revise to read, “Flows should be less than 1.0 ft/second to minimize erosion potential or adequate dissipation shall be provided.”
214. Under the third bullet, provide the appropriate sized river rock. Tacoma recommends checking with local suppliers to determine readily available sizes of river rock for Western Washington.

Page 7-12, Design Criteria for Bioretention

215. The City of Tacoma recommends a 1 foot minimum curb cut width spaced every 100 feet or more often as required based upon roadway slope.
216. On the second bullet define small forebay.

Page 7-13, Design Criteria for Bioretention

217. Under the Note, The City recommends adding that the 12-inch shoulder shall be at a maximum slope of 2%.
218. Under the third bullet, clarify that greater ponding depths may be appropriate for areas that are not subject to pedestrian or vehicular traffic.

Page 7-14, Design Criteria for Bioretention

219. Under the 6th bullet, define free water.

Page 7-16, Design Criteria for Bioretention

220. Under Underdrain (Optional) In WWHM, it is possible to model the underdrain as an orifice. Consider adding this guidance.
221. Consider adding a depth above the high groundwater table that an underdrain system would be located so that groundwater will not be drained by the facility.

Page 7-17, Design Criteria for Bioretention

222. Consider adding the WSDOT standard specification for perforated PVC underdrain pipe (WSDOT specification section 9-05.2(6)). If Ecology believes this specification is not sufficient provide guidance as to why it is not appropriate.

BMP T7.30, Page 7-21, Design Criteria for Bioretention

223. It states, “The soil need only be tested for organic content.” It is unclear why this test needs to be conducted. It is presumed that the organic content comes from the compost component so it seems that this test would not be necessary.

Page 7-23, Design Criteria for Bioretention

224. It is recommended that the “Determining subgrade infiltration rates” section refer readers to Volume 3 to ensure no inconsistencies amongst the similar methods.

Page 7-26, Compost-Amended Vegetated Filter Strips

225. CAVFS are included as an infiltration device in Volume 5, yet the BMP has no requirements for underlying native soils. The inclusion as an infiltration device may be misleading without requirements for underlying conditions.

Page 7-27, Soil Design Criteria

226. There are several “shoulds” on this page that the City recommends to be “shalls” or it must be clarified what requirements apply to the soil design. As written, the soil requirements will not be applied evenly across all jurisdictions.

Page 8-16, Additional Design Criteria

227. #3: This underdrain information provided here should be referenced in the bioretention section.

Section 9.4, Page 9-2

228. Provide the supporting data as to why Narrow Area Filter Strips are excluded from basic treatment. If data exists that proves they do not provide basic treatment, can they be considered a pretreatment option? These facilities have been utilized in urban areas.

Chapter 11, Page 11-3

229. Are the dimensions shown for the CP separator meant to be required dimensions?

Section 11.6, Page 11-7

230. Provide sizing information for the afterbay.

231. Should the forebay and afterbay for API and CP separators be similarly sized?

BMP T11.11, Page 11-11

232. A plate sizing of $\frac{3}{4}$ inch is not typical for all manufacturers. Some use $\frac{1}{2}$ plates. Is there additional guidance based upon plate sizing?