GOVERNMENT OF THE DISTRICT OF COLUMBIA
Department of Energy and Environment

MEMORANDUM

TO: District of Columbia Stakeholders

FROM: Hamid Karimi
Deputy Director, Natural Resources Administration

DATE: November 28, 2017

SUBJECT: Updated Errata for the 2013 Stormwater Management Guidebook

---

Attached are clarifications of issues that stakeholders or the Department of Energy and Environment (DOEE) have noted in the 2013 Stormwater Management Guidebook (2013 SWMG). The 2013 SWMG provides technical guidance on compliance with the 2013 Rule on Stormwater Management and Soil Erosion and Sediment Control (2013 SW Rule), which was published as final in the *D.C. Register* on July 19, 2013.

This document is an update to the errata published on December 23, 2014. Page 1 briefly identifies the new entries. The full list of errata begins on page 2. Entries are organized by the page number where the original test is located in the 2013 SWMG and include an explanation of the reason for the change and the date of publication to this document. Each entry is designated as an omission or an edit. An omission (denoted as O) publishes clarifying information that was inadvertently excluded from the original document. An edit (denoted as E) is a substitution or deletion to clarify original intent or improve consistency.

DOEE will continue to update these errata as issues surface that require clarification and post the updated version at doee.dc.gov/swregs. DOEE will also send notifications about updates to its stormwater management email list. To be added to this list, please email Matt Johnson at matt.johnson2@dc.gov (and mention stormwater management listserv).

DOEE anticipates republishing the entire SWMG in 2018 and will include posted omissions and edits as well as any additional revisions. When republishing the entire SWMG, DOEE will notify the public through the stormwater management email list and the *D.C. Register*, and DOEE will provide an opportunity for public comment.

Errata for the 2013 Stormwater Management Guidebook

Department of Energy and Environment

November 17, 2017

Contents

New Entries

For more detail, see the errata entries for these items.

Description	Page	Date Published	Type
Revised Contributing Drainage Area limits for green roofs.	30	11/17/17	E
Clarified that green roofs need not have separate drainage and growing media layers.	34	11/17/17	E
Added language to address solar panels and other structures atop green roofs.	35	11/17/17	E
Clarified retention value for permanently irrigated green roofs.	37	11/17/17	E
Clarified retention value for permanently irrigated green roofs.	40	11/17/17	E
Revamped bioretention filter media specifications.	107	11/17/17	E
Revised recommendations regarding BMPs in floodplains.	263	11/17/17	E
Added falling head infiltration test and associated hydraulic conductivity conversion equation	O-3	11/17/17	E

Errata

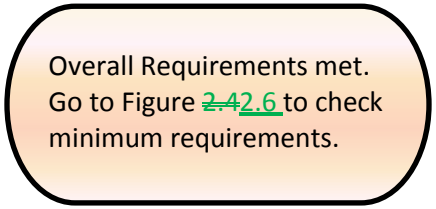
Entries are organized by the page number where the original text is located in the 2013 Stormwater Management Guidebook that is currently posted on DDOE's website at http://ddoe.dc.gov/swregs.

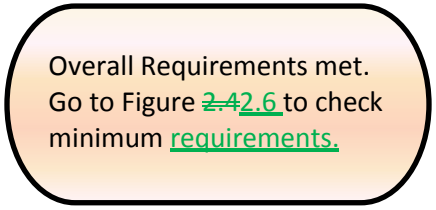
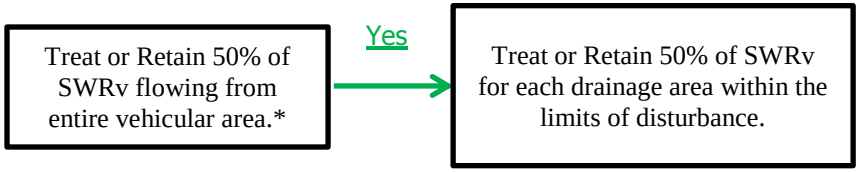
Each entry includes an explanation of the reason for the change and the date of publication to this document. Each entry is designated as an omission or an edit. An omission (denoted as **O**) publishes clarifying information that was inadvertently excluded from the original document. An edit (denoted as **E**) is a substitution or deletion to clarify original intent or improve consistency.

Note: Due to formatting limitations with the equation software, all edits to equations are shown as full revisions instead of strikethroughs and underlines and use a black font color instead of green.

Description of Change	Page	Date Published	Type
Contents			
List of Figures Figure 5.3 As-built certification stamp. ..... 282 Figure 5.3.1 Professional Engineering Design stamp. .....282a Figure 5.3.2 Maintenance Responsibility stamp ..... 282b Figure 5..3.3 Statement by Person Responsible for Achieving Off-Site Retention stamp. .....282c Figure 5.4 Declaration of Covenants template .....283 Add entries in List of Figures for new figures 5.3.1 and 5.3.2 (pages 282a and 282b, respectively), which were inadvertently omitted from the text. Also add an entry for figure 5.3.3 (page 282c), which was developed to conform to the revised Declaration of Covenants template issued by the Real Estate Transactions Section of the D.C. Office of the Attorney General on April 23, 2014, which was updated to reflect the 2013 Rule on Stormwater Management and Soil Erosion and Sediment Control.	xix	05/01/2014	**O**

Description of Change	Page	Date Published	Type
Contents			
List of Equations Equation 2.1 Stormwater Retention Volume ..... 10 Equation 2.2 Water Quality Treatment Volume ..... 13 Equation 3.1 Storage Volume for Green Roofs ..... 35 Equation 3.2 Reservoir Layer or Infiltration Sump Depth ..... 88 Equation 3.3 Drawdown Time ..... 89 Equation 3.4 Permeable Pavement Storage Volume ..... 89 Equation 3.5a Bioretention Storage Volume ..... 117 Equation 3.5b Bioretention Storage Volume .....117a Equation 3.5c Bioretention Storage Volume .....117a Equation 3.6 Minimum Filter Surface Area for Filtering Practices.....143 Add “a” after entry for Equation 3.5 (page 117). Add entries in List of Equations for new equations 3.5b and 3.5c (page 117a), which were inadvertently omitted from the text.	xx	05/01/2014	**O**

Description of Change	Page	Date Published	Type
Chapter 2			
Figure 2.3 Determining the regulatory event used to calculate the SWRv.  Remove "2.2" and "2.3" and replace with "2.4" and "2.5" to correct typographical errors.	15	05/01/2014	**E**
Figure 2.4 Determining if overall retention requirements have been met, outside the AWDZ.  Remove "2.4…" and replace with "2.6" to correct a typographical error.	16	05/01/2014	**E**

Description of Change	Page	Date Published	Type
Chapter 2			
Figure 2.5 Determining if overall retention and water quality treatment requirements have been met, inside the AWDZ for regulated activity governed by the Anacostia Waterfront Environmental Standards Act of 2012.  Remove "2.4" and replace with "2.6" and "add "requirements." to correct typographical errors.	17	05/01/2014	**E**
Figure 2.6 Determining if minimum retention and water quality treatment requirements have been met.  Add a "yes" arrow from "Treat or Retain 50% of SWRZ flowing from entire vehicular area.*" to "Treat or Retain 50% of SWRv for each drainage area within the limits of disturbance." to correct an inadvertent omission.	18	05/01/2014	**O**

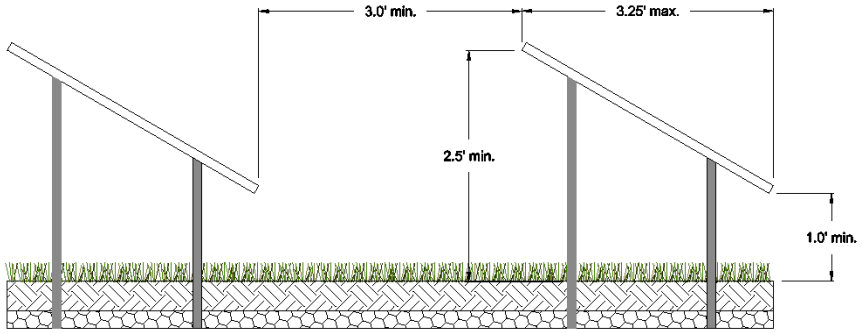
Description of Change	Page	Date Published	Type
Chapter 2 (continued)			
Figure 2.7 Determining retention and water quality requirements for projects in the existing public right-of-way (PROW). Overall Requirements met. Go to Figure ~~2.4~~2.6 to check minimum requirements. Remove "2.4" and replace with "2.6" and add "requirements." to correct typographical errors.	19	05/01/2014	**E**
Section 2.8 Acceptable Urban BMP Options **BMP Group 2 Rainwater Harvesting** Rain water harvesting systems intercept, divert, store, and release rainfall for future use. Rainwater that falls on a rooftop is collected and conveyed into an above- or below-ground storage tank (also referred to as a cistern or rain tank), where it can be used for non-potable water uses and on-site stormwater disposal/infiltration. The design includes: R-1 Rainwater harvesting for non-potable uses Add "The design includes: R-1 Rainwater harvesting for non-potable uses" to create consistent codes for incorporating the General Retention Compliance Calculator in DDOE's new Stormwater BMP Tracking Database.	24	05/01/2014	**O**

Description of Change	Page	Date Published	Type
Chapter 2 (continued)			
Section 2.8 Acceptable Urban BMP Options **BMP Group 9 Ponds** Stormwater ponds are stormwater storage BMPs that consist of a combination of a permanent pool, micropool, or shallow marsh that promote a good environment for gravitational settling, biological uptake, and microbial activity. Design variants include: ~~P~~C-1 Micropool extended detention pond ~~P~~C-2 Wet pond ~~P~~C-3 Wet extended detention (ED) pond Remove "P-1," "P-2," and "P-3" and replace with "C-1," "C-2," and "C-3" to prevent duplication of the codes for BMP Group 4 when incorporating the General Retention Compliance Calculator in DDOE's new Stormwater BMP Tracking Database.	25	05/01/2014	**E**

Description of Change	Page	Date Published	Type
Chapter 2 (continued)			
Section 2.8 Acceptable Urban BMP Options **BMP Group 12 Proprietary Practices** Proprietary practices are manufactured stormwater BMPs that utilize settling, filtration, absorptive/adsorptive materials, vortex separation, vegetative components, and/or other appropriate technology to manage the impacts of stormwater runoff. Proprietary practices may meet the SWRv value as well as the TSS removal value, provided they have been approved by DDOE through the process detailed in Appendix S. The design includes: M-1 Proprietary practices **BMP Group 13 Tree Planting and Preservation** Trees can significantly reduce stormwater runoff by canopy interception and uptake of water from the soil. Trees are well documented in their ability to reduce stormwater runoff, particularly when the tree canopy covers impervious surface, such as in the case of street trees. Design variants include: T-1 Tree planting T-2 Tree preservation To create consistent codes for incorporating the General Retention Compliance Calculator in DDOE's new Stormwater BMP Tracking Database, add the following: "The design includes: M-1 Proprietary practices" and "Design variants include: T-1 Tree planting" and "T-2 Tree preservation."	26	05/01/2014	**O**

Description of Change	Page	Date Published	Type
Chapter 3			
Section 3.2.1 Green Roof Feasibility Criteria Update the Contributing Drainage Area subsection. Contributing Drainage Area. It is recommended that the ~~entire~~ contributing drainage area to a green roof ~~(including the green roof itself) be no more than 25 percent larger than the area of~~be limited to the green roof itself. ~~For example, a 1,000-square foot green roof should have no more than 250 square feet of additional impervious cover draining to it.~~ In cases where there will be additional contributing drainage area ~~exceeds this threshold~~, the designer must provide ~~supporting documentation of rooftop loading,~~ sufficient design ~~to distribute~~ detail showing distribution of this additional runoff throughout the green roof ~~and~~ area to prevent erosion or overloading of the roof ~~surface~~growing media with the use of level spreaders, splash pads, perforated piping, or other flow dissipation techniques.~~; and justification for incorporating a sizable external drainage area to the green roof.~~ The absolute maximum contributing area to a green roof shall be no more than 100% larger than the area of the green roof (e.g., a 1,000-square-foot green roof can have no more than 1,000 square feet of additional impervious cover draining to it). The revisions to the Contributing Drainage Area subsection are intended to address problems in design and performance that have been observed in green roofs that have significant input of runoff from external areas. The revisions • Clarify that the preferred design for green roofs does not include contributing drainage area, • Provide more detail on the types of flow dissipation that will be required for green roofs that do have additional contributing drainage area, and • Put an upper limit on allowable additional contributing drainage area.	**O**	11/17/17	**E**

<table>
<tr><th>Description of Change</th><th>Page</th><th>Date Published</th><th>Type</th></tr>
<tr><td colspan="4">Chapter 3 (continued)</td></tr>
<tr><td>Section 3.2.4 Green Roof Design Criteria
Update the second-to-last row of Table 3.1.
<table><tr><td>Growth Media</td><td>70% to 80% lightweight inorganic materials and a maximum of 30% organic matter (e.g., well-aged compost). Media typically has a maximum water retention of approximately 30%. Material makeup and proof of maximum water retention of the growing media must be provided. Media must provide sufficient nutrients and water holding capacity to support the proposed plant materials. Determine acceptable saturated water permeability using ASTM E2396-05. <u>An acceptable emerging industry practice combines the drainage layer with the growing media layer.</u></td></tr></table>The sentence regarding combining the drainage layer with the growing media layer is added to clarify that green roofs are not required to have both a drainage layer and a growing media layer.</td><td>34</td><td>11/17/17</td><td>E</td></tr>
<tr><td>Section 3.2.4 Green Roof Design Criteria
Add the subsection “Solar Panels and Other Structures” immediately before the “Green Roof Sizing” subsection.
<u>Solar Panels and Other Structures</u>
<u>Occasionally, structures such as solar panels or HVAC systems must be installed above a green roof. These structures can be incorporated into a green roof design with no adverse effects to the retention value assigned to the green roof if specific design requirements for runoff disbursement, maintenance access, and sun/wind exposure are incorporated, including the following:</u>
▪ <u>Structures above the green roof must be no more than 3.25 feet wide.</u>
▪ <u>Structures must have a minimum 3-foot separation between them.</u>
▪ <u>The lower edge of the structure must be at least 1 foot above the top of the green roof, and the upper edge must be at least 2.5 feet above the top of the green roof.</u></td><td>35</td><td>11/17/17</td><td>E</td></tr>
</table>

Description of Change	Page	Date Published	Type
These design requirements are illustrated in Figure 3.2.  **Figure 3.2: Design Requirements for structures constructed above green roofs.** The "Solar Panels and Other Structures" subsection is added to describe how shaded green roofs will be accommodated in the Guidebook. DOEE determined that, while it is possible that shading may reduce evapotranspiration in green roofs, there is not enough available research to justify a reduction in green roof retention value for shaded roofs at this time. As more research becomes available, the retention value for shaded green roofs will be re-examined.			

Description of Change	Page	Date Published	Type
Chapter 3 (continued)			
Section 3.2.5: Green Roof Landscaping Criteria Delete the first two sentences in the sixth bullet and replace them with a new bullet immediately below. ▪ ~~When appropriate species are selected, most green roofs will not require supplemental irrigation, except for temporary irrigation during drought or initial establishment. The design must provide for temporary, manual, and/or permanent irrigation or watering systems, and the use of water efficient designs and/or use of non-potable sources is strongly encouraged.~~ The planting window extends from the spring to early fall; although, it is important to allow plants to root thoroughly before the first killing frost. Green roof manufacturers and plant suppliers may provide guidance on planting windows as well as winter care. Proper planting and care may also be required for plant warranty eligibility. ▪ When appropriate species are selected, most green roofs will not require supplemental irrigation, except for temporary irrigation during drought or initial establishment. The use of water efficient designs and/or use of non-potable sources is strongly encouraged. Permanent irrigation of extensive roof designs is prohibited. For intensive roofs, permanent irrigation may be included. However, permanent irrigation can adversely impact the rainfall retention capacity of the green roof. For this reason, soil moisture monitors are a required part of the irrigation system for all irrigated green roofs, and the calculated retention value for green roofs with permanent irrigation must be reduced by 50%. Since an irrigated green roof will inherently have less storage space available than an unirrigated green roof, DOEE cannot reasonably expect a green roof with permanent irrigation to achieve the same performance level as a green roof without permanent irrigation. A number of projects have proposed to plant green roofs with species that are not drought tolerant and with permanent irrigation installed. Assigning the full retention value that would normally be used would not be consistent with the performance standard identified in the Municipal Separate Storm Sewer System (MS4) Permit issued to the District by EPA or with Chapter 5 of Title 21 of the District of Columbia Municipal Regulations. To be consistent with those performance standards and provide clarity about the appropriate retention value for a green roof with permanent irrigation, the bullet regarding irrigation is revised to more accurately account for the reduced retention benefit provided by permanently irrigated green roofs.	37	11/17/17	E

<table>
<tr><th>Description of Change</th><th>Page</th><th>Date Published</th><th>Type</th></tr>
<tr><td colspan="4">Chapter 3 (continued)</td></tr>
<tr><td>
Section 3.2.8 Green Roof Stormwater Compliance Calculations
Revise the first paragraph and Table 3.2 as follows:

Unirrigated ~~G~~green roofs receive 100~~percent~~% retention value for the amount of storage volume (Sv) provided by the practice. Permanently ~~I~~irrigated green roofs receive 50% retention value for the amount of Sv provided by the practice (see Table 3.4). Since the practice gets 100~~percent~~% retention value, it is not considered an accepted total suspended solids (TSS) treatment practice.

Table ~~3.2~~3.4 Green Roof Design Performance
<table>
<tr><td>Retention Value (unirrigated)</td><td>= Sv</td></tr>
<tr><td>Retention Value (irrigated)</td><td>= 0.5 × Sv</td></tr>
<tr><td>Accepted TSS Treatment Practice</td><td>N/A</td></tr>
</table>

This section is revised to differentiate the retention values for unirrigated and irrigated green roofs based upon the revision made in Section 3.2.5.
</td><td>40</td><td>11/17/17</td><td>E</td></tr>
</table>

Description of Change	Page	Date Published	Type
Chapter 3 (continued)			
Section 3.3 Rainwater Harvesting **Definition.** Rainwater harvesting systems store rainfall and release it for future use. Rainwater that falls on a rooftop or other impervious surface is collected and conveyed into an above- or below-ground tank (also referred to as a cistern), where it is stored for non-potable uses or for on-site disposal or infiltration as stormwater. Cisterns can be sized for commercial as well as residential purposes. Residential cisterns are commonly called rain barrels. The design includes: R-1 Rainwater harvesting for non-potable uses Non-potable uses of harvested rainwater may include the following: ▪ Landscape irrigation, ▪ Exterior washing (e.g., car washes, building facades, sidewalks, street sweepers, and fire trucks), ▪ Flushing of toilets and urinals, ▪ Fire suppression (i.e., sprinkler systems), ▪ Supply for cooling towers, evaporative coolers, fluid coolers, and chillers, ▪ Supplemental water for closed loop systems and steam boilers, ▪ Replenishment of water features and water fountains, ▪ Distribution to a green wall or living wall system, and ▪ Laundry~~, and~~. ▪ ~~Delayed discharge to the combined sewer system.~~ Add "The design includes: R-1 Rainwater harvesting for non-potable uses" to create consistent codes for incorporating the General Retention Compliance Calculator in DDOE's new Stormwater BMP Tracking Database. Also, relocate "and" and remove "Delayed discharge to the combined sewer system." to be consistent with the categories in the Rainwater Harvesting Retention Calculator.	43	05/01/2014	**O**

Description of Change	Page	Date Published	Type
Chapter 3 (continued)			
Section 3.3.6 Rainwater Harvesting Construction Sequence **Construction Supervision.** The following items should be inspected by a qualified professional in the mechanical, electrical, or plumbing fields prior to final sign-off and acceptance of a rainwater harvesting system: ▪ Rooftop area matches plans ▪ Diversion system is properly sized and installed ▪ Pretreatment system is installed ▪ Mosquito screens are installed on all openings ▪ Overflow device is directed as shown on plans ▪ Rainwater harvesting system foundation is constructed as shown on plans ▪ Catchment area and overflow area are stabilized ▪ Secondary stormwater treatment practice(s) is installed as shown on plans ▪ System commissioning Add "in the mechanical, electrical, or plumbing fields" to clarify the type of qualified professional. Also add "System commissioning," which was inadvertently omitted from the text.	63	05/01/2014	**O**

Description of Change	Page	Date Published	Type
Chapter 3 (continued)			
Equation 3.4 Permeable Pavement Storage Volume remove: $Sv = \left(d_p \times \eta_r \times A_p\right) + \left(\frac{i \times t_f}{2}\right)$ replace with: $Sv = A_p \times \left[\left(d_p \times \eta_r\right) + \left(\frac{i \times t_f}{2}\right)\right]$ Reorder Equation 3.4 to correct a typographical error.	89	05/01/2014	**E**
Section 3.5.6 Permeable Pavement Construction Sequence ***Step 2:*** **Install Soil Erosion and Sediment Control Measures for the ~~Bioretention~~Permeable Pavement.** As noted above, temporary soil erosion and sediment controls are needed during installation to divert stormwater away from the permeable pavement area until it is completed. Special protection measures, such as erosion control fabrics, may be needed to protect vulnerable side slopes from erosion during the excavation process. The proposed permeable pavement area must be kept free from sediment during the entire construction process. Construction materials contaminated by sediment must be removed and replaced with clean material.◄ Remove "Bioretention" and replace with "Permeable Pavement" to correct a typographical error.	91	05/01/2014	**E**

<table>
<tr><th>Description of Change</th><th>Page</th><th>Date Published</th><th>Type</th></tr>
<tr><td colspan="4">Chapter 3 (continued)</td></tr>
<tr><td>Table 3.17 Standard Permeable Pavement Value and Pollutant Removal

<table><tr><td>Retention Value</td><td>~~= Sv~~4.5 ft^3/100 ft^2~~</td></tr><tr><td>Accepted TSS Treatment Practice</td><td>~~N/A~~=Sv</td></tr></table>
Remove the Retention Value of “Sv” and replace with “4.5 ft^3/100 ft^2.” Also, remove the Accepted TSS Treatment Practice value of “N/A” and replace with “=Sv.” These changes are needed for the table to correspond the text in Section 3.5.8.</td><td>98</td><td>05/01/2014</td><td>E</td></tr>
<tr><td>Section 3.6.4 Bioretention Design Criteria

Revise the Filter Media subsection as follows:

Filter Media. The filter media of a bioretention practice consists of an engineered soil mixture that has been carefully blended to create a soil media that maintains long-term permeability while also providing enough nutrients to support plant growth. The final filter media shall consist of a well-blended mixture of medium to coarse sand, base loam soil (soil fines), and an organic amendment (compost). The sand maintains a desired long-term permeability of the media while the limited amount of soil fines and organic amendments are considered adequate to help support initial plant growth. It is anticipated that the gradual increase of organic material through natural processes will continue to support plant growth without the need to add fertilizer, and the root structure of maturing plants and the biological activity of the media will maintain sufficient long-term permeability~~ and surface cover are the two most important elements of a bioretention facility in terms of long-term performance.~~

~~▪ Particle Size Composition. The bioretention soil mixture shall be classified as a loamy sand on the USDA Texture Triangle, with the following particle size composition:~~

~~♦ 80–90 percent sand (at least 75 percent of which must be classified as coarse or very coarse sand)~~
~~♦ 10–20 percent soil fines (silt and clay)~~</td><td>107</td><td>11/17/17</td><td>E</td></tr>
</table>

Description of Change	Page	Date Published	Type
~~♦ Maximum 10 percent clay~~ ~~♦ The particle size analysis must be conducted on the mineral fraction only or following appropriate treatments to remove organic matter before particle size analysis.~~ ~~▪ **Organic Matter.** The filter media must contain 3 to 5 percent organic matter by the conventional Walkley-Black soil organic matter determination method or similar analysis. Soil organic matter is expressed on a dry weight basis and does not include coarse particulate (visible) components.~~ ~~▪ **Available Soil Phosphorus (P).** The filter media should contain sufficient available P to support initial plant establishment and growth, but not serve as a significant source of P for long-term leaching. Plant-available soil P should be within the range of Low+ (L+) to Medium (M) as defined in Table 2.2 of Virginia Nutrient Management Standards and Criteria (2005). For the Mehlich I extraction procedure this equates to a range of 5 to 15 mg/kg P or 18 to 40 mg/kg P for the Mehlich III procedure.~~ ~~▪ **Cation Exchange Capacity (CEC).** The relative ability of soils to hold and retain nutrient cations like Ca and K is referred to as cation exchange capacity (CEC) and is measured as the total amount of positively charged cations that a soil can hold per unit dry mass. CEC is also used as an index of overall soil reactivity and is commonly expressed in milliequivalents per 100 grams (meq/100g) of soil or cmol+/kg (equal values). A soil with a moderate to high CEC indicates a greater ability to capture and retain positively charged contaminants, which encourages conditions to remove phosphorus, assuming that soil fines (particularly fine silts and clays) are at least partially responsible for CEC. The minimum CEC of the filter media is 5.0 (meq/100 g or cmol+/kg). The filter media CEC should be determined by the Unbuffered Salt, Ammonium Acetate, Summation of Cations or Effective CEC techniques (Sumner and Miller, 1996) or similar methods that do not utilize strongly acidic extracting solutions.~~ ~~The goal of the filter media mixture described in this section is to create a soil media that maintains long-term permeability while also providing enough nutrients to support plant growth. The initial permeability of the mixture will exceed the desired long-term permeability of 1 to 2 in./hr. The limited amount of topsoil and organic matter is considered adequate to help support initial plant growth, and it is anticipated that the gradual increase of organic material through natural processes will continue to support growth while gradually decreasing the permeability. Finally, the root structure of maturing plants and the biological activity of a self-sustaining organic content will maintain sufficient long-term permeability as well as support plant growth without the need to add fertilizer.~~			

Description of Change	Page	Date Published	Type
The following is the recommended composition of the three media ingredients: ▪ **Sand (Fine Aggregate).** Sand shall consist of silica-based medium to coarse ~~aggregates~~sand, angular or round in shape~~ and meet the mixture grain size distribution specified in Table 3.19~~. ~~No substitutions of alternate materials (such as diabase, calcium carbonate, rock dust, or dolomitic sands) are accepted. In particular, mica can make up no more than 5 percent of the total sand fraction. The sand fraction may also contain a limited amount of particles greater than 2.0 mm and less than 9.5 mm per the table below, but the overall sand fraction must meet the specification containing greater than 75 percent coarse or very coarse sand. Consult Table 3.19 for recommended sand sizing criteria.~~The materials shall not be derived from serpentine and shall be free of loam or clay, diabase, surface coatings, or any other deleterious materials and shall contain less than 0.5% mica by weight when tested with ASTM C295, Petrographic Examination of Aggregates for Concrete. ASTM C-33 concrete sand will typically meet the requirements for the sand to be used in filter media. However, some samples of ASTM C-33 sand may have too high a fraction of fine sand and silt- and clay-sized particles to allow the final filter media particle size distribution requirements to be met. In general, coarser gradations of ASTM C-33 will better meet the filter media particle size distribution and hydraulic conductivity requirements. Any other materials, such as limestone-based sands or crushed glass, shall meet the required particle size distribution and be demonstrated as adequately durable when tested by AASHTO T-103 or T-104.			

Description of Change	Page	Date Published	Type

~~Table 0.1- Sand Sizing Criteria~~

~~Sieve Type~~	~~Particle Size (mm)~~	~~Percent Passing (%)~~
~~3/8 in.~~	~~9.50~~	~~100~~
~~No. 4~~	~~4.75~~	~~95 – 100~~
~~No. 8~~	~~2.36~~	~~80 – 100~~
~~No. 16~~	~~1.18~~	~~45 – 85~~
~~No. 30~~	~~0.60~~	~~15 – 60~~
~~No. 50~~	~~0.30~~	~~3 – 15~~
~~No. 100~~	~~0.15~~	~~0 – 4~~

~~Note: Effective particle size (D10) > 0.3mm. Uniformity coefficient (D60/D10) < 4.0.~~

- ~~**Topsoil**~~**Base Loam Soil.** Base loam ~~Top~~soil is generally defined as the combination of ~~the ingredients referenced in the bioretention filter media:~~ sand-sized material, fines (silt and clay), and any associated soil organic matter. Since the objective of the specification is to carefully establish the proper blend of these ingredients, the designer (or contractor or materials supplier) must carefully select the topsoil source material in order to not exceed the amount of any one ingredient.

  Generally, ~~the use of a topsoil defined as~~ a natural loamy sand, sandy loam, or loam (per the USDA Textural Triangle)~~ will be an acceptable ingredient and in combination with the other ingredients meet the overall performance goal of the soil media.~~ A-horizon topsoil free of subsoil, large stones, earth clods, sticks, stumps, clay lumps, roots, viable noxious weed seed, plant propagules, brush, or other objectionable, extraneous matter or debris is suitable for the base loam (soil fines) source material.

- **Organic ~~Matter~~Amendments.** Organic ~~materials~~amendments ~~used in the soil media mix should~~shall consist of stable, well-decomposed, natural, carbon-~~C~~containing organic materials such as peat moss, humus, ~~compost~~or yard waste (consistent with the material specifications found in Appendix J)~~, pine bark fines or other organic soil conditioning material. However, per above, the~~

Description of Change	Page	Date Published	Type

combined filter media should contain 3 to 5 percent soil organic matter on dry weight basis (grams organic matter per 100 grams dry soil) by the Walkley-Black method or other similar analytical technique. The material shall be free of debris such as plastics, metal, concrete, stones larger than 1/2 inch, larger branches and roots, and wood chips over 1 inch in length or diameter.

In creating the filter media, it is recommended to start with an open-graded coarse sand material and proportionately mix in the topsoil materials to achieve the desired ratio of sand and fines. Sufficient suitable organic amendments can then be added to achieve the 3 to 5 percent soil organic matter target. The exact composition of organic matter and topsoil material will vary, making the exact particle size distribution of the final total soil media mixture difficult to define in advance of evaluating available materials. Table 3.20 summarizes the filter media requirements.

- Table 0.2 Filter Media Criteria for Bioretention

Soil Media Criterion	Description	Standard(s)		
General Composition	Soil media must have the proper proportions of sand, fines, and organic matter to promote plant growth, drain at the proper rate, and filter pollutants	80% to 90% sand (75% of which is coarse or very coarse); 10% to 20% soil fines; maximum of 10% clay; and 3% to 5% organic matter		
Sand	Silica based coarse aggregate1	**Sieve Type**	**Particle Size (mm)**	**Percent Passing (%)**
		3/8 in.	9.50	100
		No. 4	4.75	95–100
		No. 8	2.36	80–100
		No. 16	1.18	45–85
		No. 30	0.6	15–60
		No. 50	0.3	3–15
		No. 100	0.15	0–4
		Effective Particle size (D10) > 0.3mm Uniformity Coefficient (D60/D10) < 4.0		

Description of Change	Page	Date Published	Type

~~Top Soil~~	~~Loamy sand or sandy loam~~	~~USDA Textural Triangle~~
~~Organic Matter~~	~~Well-aged, clean compost~~	~~Appendix J~~
~~P-Index or Phosphorus (P) Content~~	~~Soil media with high P levels will export P through the media and potentially to downstream conveyances or receiving waters~~	~~P content = 5 to 15 mg/kg (Mehlich I) or 18 to 40 mg/kg (Mehlich III)~~
~~Cation Exchange Capacity (CEC)~~	~~The CEC is determined by the amount of soil fines and organic matter. Higher CEC will promote pollutant removal~~	~~CEC > 5 milliequivalents per 100 grams~~

~~1Many specifications for sand refer to ASTM C-33. The ASTM C-33 specification allows a particle size distribution that contains a large fraction of fines (silt and clay sized particles< 0.05 mm). The smaller fines fill the voids between the larger sand sized particles, resulting in smaller and more convoluted pore spaces. While this condition provides a high degree of treatment, it also encourages clogging of the remaining void spaces with suspended solids and biological growth, resulting in a greater chance of a restrictive biomat forming. By limiting the fine particles allowed in the sand component, the combined media recipe of sand and the fines associated with the soil and organic material will be less prone to clogging, while also providing an adequate level of filtration and retention.~~

~~In cases where greater removal of specific pollutants is desired, additives with documented pollutant removal benefits, such as water treatment residuals, alum, iron, or other materials may be included in the filter media if accepted by DDOE.~~

Complete Filter Media. The complete filter media soil mix shall consist of a pug milled or mechanically blended mix of the three source materials resulting in a filter media that meets the following particle size composition, as well as the grain size distribution indicated in Table 3.19.

<table>
<tr><th>Description of Change</th><th>Page</th><th>Date Published</th><th>Type</th></tr>
<tr><td>

- 80%–90 % sand (at least 75 % of which must be classified as coarse or very coarse sand)
- 10%–20 % soil fines (silt and clay)
- Maximum 10% clay

Note: The above percentages are based on weight rather than volume. The particle size analysis must be conducted on the mineral fraction only or following appropriate treatments to remove organic matter before particle size analysis. The DDOT Green Infrastructure Standards include a bioretention soil specification based on volume, not weight, so the percentages listed there do not match those listed here, even though the two specifications are substantially equivalent.

Table 3.17 Sand Sizing CriteriaFilter Media Grain Size Distribution

Sieve Type	Particle Size (mm)	Percent Passing (%)
	8.0	100
No. 5	4.0	92–100
No. 10	2.0	72–100
No. 18	1.0	43–95
No. 35	0.5	20–65
No. 60	0.25	11–37
No. 140	0.105	10–25
No. 270	0.053	10–20
	0.002	0–10

The filter media shall also meet the following criteria:

- Organic content shall be between 3.0% and 5.0% by weight;
- pH shall be between 6.0 and 7.2;
- Cation exchange capacity (CEC) shall be a minimum of 5 meq/100g or cmol+/kg;
- Phosphorus content shall meet one of the following:
  - P-Index between 10 and 30;
  - 5–15mg/kg Mehlich I Extraction;
  - 18–40mg/kg Mehlich III Extraction; and
- Soluble salts shall be less than 500 ppm/0.5 mmhos/cm.

</td><td></td><td></td><td></td></tr>
</table>

Description of Change	Page	Date Published	Type

Notes:

1. P-Index is an agronomic test used in North Carolina to indicate the potential for P leaching from soil. The test method has been revised to add P concentration to facilitate local lab testing. The value of the P-Index is the correlation between the CEC and P concentrations: higher CEC indicates greater adsorption sites within the media, thus increasing the ability to fix P within the soil, thereby allowing higher P concentrations without leaching. While P-Index may be a better overall representation of P, the test method may not be readily available.
2. Tests for organic content, CEC, soluble salts, and pH are referenced to be in accordance with Recommended Soil Testing Procedures for the Northeastern United States, Current Edition, Northeastern Regional Publication No. 493.

Table 3.18 Summary of Filter Media Criteria for Bioretention

Soil Media Criterion	Description	Standard(s)
General Composition	Filter media must have the proper proportions of sand, fines, and organic matter to promote plant growth, drain at the proper rate, and filter pollutants.	80%–90% sand; 10%–20% soil fines; maximum of 10% clay; and 3%–5% organic matter
Sand	Silica based coarse aggregate	Based on final filter media particle size
Top Soil	Loamy sand or sandy loam	USDA Textural Triangle
Organic Matter	Well-aged, clean compost	Appendix J
P-Index or Phosphorus (P) Content	Soil media with high P levels will export P through the media and potentially to downstream conveyances or receiving waters.	P-Index of 10–30 or P content = 5 to 15 mg/kg (Mehlich I) or 18 to 40 mg/kg (Mehlich III)
Cation Exchange Capacity (CEC)	The CEC is determined by the amount of soil fines and organic matter. Higher CEC will promote pollutant removal.	CEC > 5 milliequivalents per 100 grams

In cases where greater removal of specific pollutants is desired, additives with documented pollutant removal benefits, such as water treatment residuals, alum, iron, or other materials, may be included in the filter media if accepted by D~~D~~OEE.

Description of Change	Page	Date Published	Type
Significant revisions are made to the Filter Media subsection to create filter media requirements that are easier to abide by and better align with DDOT's bioretention soil specifications. The main revisions involve less stringent sand requirements, and more focus on the particle size composition of the final product rather than the individual components. To improve legibility, a "clean" version is provided here: **Filter Media.** The filter media of a bioretention practice consists of an engineered soil mixture that has been carefully blended to create a soil media that maintains long-term permeability while also providing enough nutrients to support plant growth. The final filter media shall consist of a well-blended mixture of medium to coarse **sand**, **base loam soil** (soil fines), and an **organic amendment** (compost). The sand maintains a desired long-term permeability of the media while the limited amount of soil fines and organic amendments are considered adequate to help support initial plant growth. It is anticipated that the gradual increase of organic material through natural processes will continue to support plant growth without the need to add fertilizer, and the root structure of maturing plants and the biological activity of the media will maintain sufficient long-term permeability. The following is the recommended composition of the three media ingredients: ▪ **Sand (Fine Aggregate).** Sand shall consist of silica-based medium to coarse sand, angular or round in shape. The materials shall not be derived from serpentine and shall be free of loam or clay, diabase, surface coatings, or any other deleterious materials and shall contain less than 0.5% mica by weight when tested with ASTM C295, Petrographic Examination of Aggregates for Concrete. ASTM C-33 concrete sand will typically meet the requirements for the sand to be used in filter media. However, some samples of ASTM C-33 sand may have too high a fraction of fine sand and silt- and clay-sized particles to allow the final filter media particle size distribution requirements to be met. In general, coarser gradations of ASTM C-33 will better meet the filter media particle size distribution and hydraulic conductivity requirements. Any other materials, such as limestone-based sands or crushed glass, shall meet the required particle size distribution and be demonstrated as adequately durable when tested by AASHTO T-103 or T-104.			

Description of Change	Page	Date Published	Type

- **Base Loam Soil.** Base loam soil is generally defined as the combination of sand-sized material, fines (silt and clay), and any associated soil organic matter. Since the objective of the specification is to carefully establish the proper blend of these ingredients, the designer (or contractor or materials supplier) must carefully select the topsoil source material in order to not exceed the amount of any one ingredient.

  Generally, a natural loamy sand, sandy loam, or loam (per the USDA Textural Triangle) A-horizon topsoil free of subsoil, large stones, earth clods, sticks, stumps, clay lumps, roots, viable noxious weed seed, plant propagules, brush, or other objectionable, extraneous matter or debris is suitable for the base loam (soil fines) source material.

- **Organic Amendments.** Organic amendments shall consist of stable, well-decomposed, natural, carbon-containing organic materials such as peat moss, humus, or yard waste (consistent with the material specifications found in Appendix J. The material shall be free of debris such as plastics, metal, concrete, stones larger than 1/2 inch, larger branches and roots, and wood chips over 1 inch in length or diameter.

Complete Filter Media. The complete filter media soil mix shall consist of a pug milled or mechanically blended mix of the three source materials resulting in a filter media that meets the following particle size composition, as well as the grain size distribution indicated in Table 3.19.

- 80%–90% sand (at least 75% of which must be classified as coarse or very coarse sand)
- 10%–20% soil fines (silt and clay)
- Maximum 10% clay

Note: The above percentages are based on weight rather than volume. The particle size analysis must be conducted on the mineral fraction only or following appropriate treatments to remove organic matter before particle size analysis. The DDOT Green Infrastructure Standards include a bioretention soil specification based on volume, not weight, so the percentages listed there do not match those listed here, even though the two specifications are substantially equivalent.

Table 3.17 Filter Media Grain Size Distribution

Sieve Type	Particle Size (mm)	Percent Passing (%)

Description of Change	Page	Date Published	Type

	8.0	100
No. 5	4.0	92–100
No. 10	2.0	72–100
No. 18	1.0	43–95
No. 35	0.5	20–65
No. 60	0.25	11–37
No. 140	0.105	10–25
No. 270	0.053	10–20
	0.002	0–10

The filter media shall also meet the following criteria:

- Organic content shall be between 3.0% and 5.0% by weight;
- pH shall be between 6.0 and 7.2;
- Cation exchange capacity (CEC) shall be a minimum of 5 meq/100g or cmol+/kg;
- Phosphorus content shall meet one of the following:
  - P-Index between 10 and 30;
  - 5–15mg/kg Mehlich I Extraction;
  - 18–40mg/kg Mehlich III Extraction; and
- Soluble salts shall be less than 500 ppm/0.5 mmhos/cm.

Notes:

1. P-Index is an agronomic test used in North Carolina to indicate the potential for P leaching from soil. The test method has been revised to add P concentration to facilitate local lab testing. The value of the P-Index is the correlation between the CEC and P concentrations: higher CEC indicates greater adsorption sites within the media, thus increasing the ability to fix P within the soil, thereby allowing higher P concentrations without leaching. While P-Index may be a better overall representation of P, the test method may not be readily available.
2. Tests for organic content, CEC, soluble salts, and pH are referenced to be in accordance with Recommended Soil Testing Procedures for the Northeastern United States, Current Edition, Northeastern Regional Publication No. 493.

Table 3.18 Summary of Filter Media Criteria for Bioretention

Soil Media Criterion	Description	Standard(s)

Description of Change	Page	Date Published	Type

General Composition	Filter media must have the proper proportions of sand, fines, and organic matter to promote plant growth, drain at the proper rate, and filter pollutants.	80%–90% sand; 10%–20% soil fines; maximum of 10% clay; and 3%–5% organic matter
Sand	Silica based coarse aggregate	Based on final filter media particle size
Top Soil	Loamy sand or sandy loam	USDA Textural Triangle
Organic Matter	Well-aged, clean compost	Appendix J
P-Index or Phosphorus (P) Content	Soil media with high P levels will export P through the media and potentially to downstream conveyances or receiving waters.	P-Index of 10–30 or P content = 5 to 15 mg/kg (Mehlich I) or 18 to 40 mg/kg (Mehlich III)
Cation Exchange Capacity (CEC)	The CEC is determined by the amount of soil fines and organic matter. Higher CEC will promote pollutant removal.	CEC > 5 milliequivalents per 100 grams

In cases where greater removal of specific pollutants is desired, additives with documented pollutant removal benefits, such as water treatment residuals, alum, iron, or other materials, may be included in the filter media if accepted by DOEE.

Chapter 3 (continued)

Section 3.6.4 Bioretention Design Criteria	110	05/01/2014	**E**

Description of Change	Page	Date Published	Type
▪ **Filter Media Depth**. The filter media bed depth must be a minimum of 18 inches for the Standard Design. The media depth must be 24 inches or greater to qualify for the Enhanced Design, unless an infiltration-based design is used. The media depth must not exceed 6.5 feet. Turf, perennials, or shrubs should be used instead of trees to landscape shallower filter beds. See Table 3.23 and Table 3.24 for a list of recommended native plants. Add ".5" after "6" to correspond with the updated values in Table 3.2.1 on page 111.			
Section 3.6.4 Bioretention Design Criteria During high intensity storm events, it is possible for the bioretention to fill up faster than the collected stormwater is able to filter through the soil media. This is dependent upon the surface area of the BMP (*SA*) relative to the contributing drainage area (CDA) and the runoff coefficient (*Rv*) from the CDA. To ensure that the design runoff volume is captured and filtered appropriately, a maximum filter media depth must not be exceeded (see Table 3.24). The maximum filter media depth is based on the runoff coefficient of the CDA to the BMP (Rv_{CDA}) and the bioretention ratio of BMP surface area to the BMP CDA (SA:CDA) (in percent). The Rv_{CDA} is an average of runoff coefficients of land cover types in the BMP's CDA. The land cover runoff coefficient types can be selected from Table H.1, Runoff Coefficient Factors for Typical District of Columbia Land Uses, or using the three categories established for calculating the SWRv (natural, compacted, and impervious cover). The applicable filter media depth from Table 3.21 should be used as d_{media} in Equation 3.5. Note: In the gray cells, overflow is not likely to occur for the design storm, so no maximum filter media depth is specified. Add "The Rv_{CDA} is an average of runoff coefficients of land cover types in the BMP's CDA. The land cover runoff coefficient types can be selected from Table H.1, Runoff Coefficient Factors for Typical District of Columbia Land Uses, or using the three categories established for calculating the SWRv (natural, compacted, and impervious cover)." to explain how to calculate Rv_{CDA} and to refer to values provided in Table H.1. Also add "Note: In the gray cells, overflow is not likely to occur for the design storm, so no maximum filter media depth is specified." to clarify the reason that some cells in Table 3.21 now have null values.	111	05/01/2014	**O**
Chapter 3 (continued)			
Table 3.21 Determining Maximum Filter Media Depth (feet)	111	05/01/2014	**E**

Description of Change	Page	Date Published	Type

▶ *SA:CDA (%)* | ~~RvCDA~~Rv_{CDA}

SA:CDA (%)	0.25	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95
0.5	~~6.0~~6.5	~~6.0~~6.5	~~6.0~~6.5	~~6.0~~6.5	~~6.0~~6.5	~~6.0~~6.5	~~6.0~~6.5	~~6.0~~6.5	~~6.0~~6.5
1.0	5.	5.5	6.0	~~6.0~~6.5	~~6.0~~6.5	~~6.0~~6.5	~~6.0~~6.5	~~6.0~~6.5	~~6.0~~6.5
1.5	3.5	4.0	5.0	6.0	6.0	~~6.0~~6.5	~~6.0~~6.5	~~6.0~~6.5	~~6.0~~6.5
2.0	~~2.5~~	3.0	4.0	~~5.0~~4.5	5.5	6.0	6.0	~~6.0~~6.5	~~6.0~~6.5
2.5	~~2.0~~	~~2.5~~	3.5	4.0	4.5	5.0	5.5	6.0	6.0
3.0	~~1.5~~	~~2.0~~	~~3.0~~	3.5	4.0	4.5	5.0	5.5	5.5
3.5	~~1.5~~	~~1.5~~	~~2.5~~	~~3.0~~	3.5	4.0	4.5	5.0	5.0
4.0	~~1.5~~	~~1.5~~	~~2.0~~	~~2.5~~	3.0	3.5	4.0	4.5	4.5
4.5	~~1.5~~	~~1.5~~	~~2.0~~	~~2.5~~	~~3.0~~	3.5	3.5	4.0	~~4.5~~4.0
5.0	~~1.5~~	~~1.5~~	~~1.5~~	~~2.0~~	~~2.5~~	~~3.0~~	3.5	4.0	4.0
5.5	~~1.5~~	~~1.5~~	~~1.5~~	~~2.0~~	~~2.5~~	~~2.5~~	~~3.0~~	3.5	3.5
6.0	~~1.5~~	~~1.5~~	~~1.5~~	~~1.5~~	~~2.0~~	~~2.5~~	~~3.0~~	3.0	3.5
6.5	~~1.5~~	~~1.5~~	~~1.5~~	~~1.5~~	~~2.0~~	~~2.5~~	~~2.5~~	~~3.0~~	3.0
7.0	~~1.5~~	~~1.5~~	~~1.5~~	~~1.5~~	~~1.5~~	~~2.0~~	~~2.5~~	~~3.0~~	~~3.0~~
7.5	~~1.5~~	~~1.5~~	~~1.5~~	~~1.5~~	~~1.5~~	~~2.0~~	~~2.5~~	~~2.5~~	~~2.5~~
8.0	~~1.5~~	~~1.5~~	~~1.5~~	~~1.5~~	~~1.5~~	~~2.0~~	~~2.0~~	~~2.5~~	~~2.5~~
8.5	~~1.5~~	~~1.5~~	~~1.5~~	~~1.5~~	~~1.5~~	~~1.5~~	~~2.0~~	~~2.0~~	~~2.5~~
9.0	~~1.5~~	~~1.5~~	~~1.5~~	~~1.5~~	~~1.5~~	~~1.5~~	~~2.0~~	~~2.0~~	~~2.0~~
9.5	~~1.5~~	~~1.5~~	~~1.5~~	~~1.5~~	~~1.5~~	~~1.5~~	~~1.5~~	~~2.0~~	~~2.0~~
10.0	~~1.5~~	~~1.5~~	~~1.5~~	~~1.5~~	~~1.5~~	~~1.5~~	~~1.5~~	~~2.0~~	~~2.0~~ ◀

In the header of Table 3.21, remove "RvCDA" and replace with "Rv_{CDA}" to correct a typographical error. In the body of the table, remove or change several maximum filter media depth values (as indicated above), and shade the cells with null values. Further design event simulation looking at the relationship between effective storage depth and overflow supported less restrictive depths overall.

Chapter 3 (continued)

Section 3.6.4 Bioretention Design Criteria	112	05/01/2014	**O**

Description of Change	Page	Date Published	Type
► **Underdrains**. Many bioretention designs will require an underdrain (see Section 3.6.1 Bioretention Feasibility Criteria). The underdrain should be a 4- or 6-inch perforated schedule 40 PVC pipe, or equivalent corrugated HDPE for small bioretention BMPs, with 3/8-inch perforations at 6 inches on center. The underdrain must be encased in a layer of clean, double washed ASTM D448 No.57 or smaller (No. 68, 8, or 89) stone. The maximum depth for the underdrain stone layer is 12 inches. The underdrain must be sized so that the bioretention BMP fully drains within 72 hours or less.◄ ► **Underground Storage Layer (optional)**. For bioretention systems with an underdrain, an underground storage layer consisting of chambers, perforated pipe, stone, or other acceptable material can be incorporated below the filter media layer and underdrain to increase the infiltration sump volume or the storage for larger storm events. To qualify for the Enhanced Design, this storage layer must be designed to infiltrate in 72 hours, at ½ the measured infiltration rate. The underground storage layer may also be designed to provide detention for the 2-year, 15-year, or 100-year storms, as needed. The depth and volume of the storage layer will then depend on the target storage volumes needed to meet the applicable detention criteria. Suitable conveyance must then be provided to ensure that the storage is fully utilized without overflow of the bioretention area.◄ Add a sentence to the "Underdrains" paragraph stating that "The maximum depth for the underdrain stone layer is 12 inches." to align the text with revisions to Table 3.21. In the "Underground Storage Layer" paragraph, add "underground storage layer" to clarify a concept that was implied but not fully stated and add "Suitable conveyance must then be provided to ensure that the storage is fully utilized without overflow of the bioretention area." to clarify the engineering obligation associated with this choice.			
Chapter 3 (continued)			
Section 3.6.4 Bioretention Design Criteria	117	05/01/2014	**O**

Description of Change	Page	Date Published	Type
BMP Sizing. Bioretention is typically sized to capture the SWRv or larger design storm volumes in the surface ponding area, soil media, and gravel reservoir layers of the BMP. Total storage volume of the BMP is calculated using Equation 3.5a. **Equation 3.5a Bioretention Storage Volume** $$Sv = SA_{bottom} \times [(d_{media} \times \eta_{media}) + (d_{gravel} \times \eta_{gravel})] + (SA_{average} \times d_{ponding})$$ where: Sv = total storage volume of bioretention (ft^3) SA_{bottom} = bottom surface area of bioretention (ft^2) d_{media} = depth of the filter media (ft) η_{media} = effective porosity of the filter media (typically 0.25) d_{gravel} = depth of the underdrain and underground storage gravel layer (ft) η_{gravel} = effective porosity of the gravel layer (typically 0.4) $SA_{average}$ = average surface area of bioretention (ft^2) (typically, where SA_{top} is the top surface area of bioretention, $SA_{average} = \frac{SA_{bottom} + SA_{top}}{2}$) $d_{ponding}$ = maximum ponding depth of bioretention (ft) Equation 3.5a can be modified if the storage depths of the filter media, gravel layer, or ponded water			

Description of Change	Page	Date Published	Type
vary in the actual design or with the addition of any surface or subsurface storage components (e.g., additional area of surface ponding, subsurface storage chambers, etc.). The maximum depth of ponding in the bioretention must not exceed 18 inches. If storage practices will be provided off-line or in series with the bioretention area, the storage practices should be sized using the guidance in Section 3.12. For enhanced bioretention areas, the volume that will be infiltrated (the sump volume for underdrained designs or the entire volume for non-underdrained designs) must infiltrate within 72 hours. Measured infiltration rates must exceed 0.1 inches per hour to qualify for the enhanced design retention value. The depth of the infiltration sump for underdrained designs can be determined using Equation 3.5b. **Equation 3.5b Bioretention Infiltration Sump Depth** $$d_{sump} = \frac{\left(\frac{i}{2} \times t_d\right)}{\eta_r}$$ where: d_{sump} = depth of the infiltration sump (in) i = field-verified (actual) infiltration rate for the native soils (in./hr) (must exceed 0.1 in./hr) t_d = drawdown time (hr) (within 72 hr) η_r = available porosity of the stone reservoir (typically 0.4) For non-underdrained designs, a check must be performed to ensure that the entire *Sv* infiltrates within 72 hours, as in Equation 3.5c.			

Description of Change	Page	Date Published	Type
Equation 3.5c Bioretention Infiltration Rate Check $$Sv_{\text{infiltrate}} = \frac{SA_{bottom}\left(\frac{i}{2} \times t_d\right)}{12}$$ where: $Sv_{infiltrate}$ = storage volume that will infiltrate within 72 hours (ft^3) SA_{bottom} = bottom surface area of bioretention (ft^2) i = field-verified (actual) infiltration rate for the native soils (in./hr) t_d = drawdown time (hr) (within 72 hr) If $Sv_{infiltrate}$ is greater than or equal to Sv, then the entire Sv will infiltrate within 72 hours. If it is not, the storage volume of the bioretention area should be reduced accordingly. Change "Equation 3.5" (Bioretention Storage Volume) to "Equation 3.5a" and add Equation 3.5b Bioretention Infiltration Sump Depth and Equation 3.5c Bioretention Infiltration Rate Check, which were inadvertently omitted from the text. Before equation 3.5b, add the following explanatory text: "For enhanced bioretention areas, the volume that will be infiltrated (the sump volume for underdrained designs or the entire volume for non-underdrained designs) must infiltrate within 72 hours. Measured infiltration rates must exceed 0.1 inches per hour to qualify for the enhanced design retention value. The depth of the infiltration sump for underdrained designs can be determined using Equation 3.5b." Before Equation 3.5c, add the following explanatory text: "For non-underdrained designs, a check must be performed to ensure that the entire Sv infiltrates within 72 hours, as in Equation 3.5c."			
Chapter 3 (continued)			
Section 3.6.6 Bioretention Construction Sequence	122	05/01/2014	**E**

Description of Change	Page	Date Published	Type
♦ Alternatively, if it is infeasible to keep the proposed ~~permeable pavement~~ bioretention areas outside of the limits of disturbance, and excavation of the area cannot be restricted, then infiltration tests will be required prior to installation of the bioretention to ensure that the design infiltration rate is still present. If tests reveal the loss of design infiltration rates then deep tilling practices may be used in an effort to restore those rates. In this case further testing must be done to establish design rates exist before the permeable pavement can be installed. Remove "permeable pavement" and replace with "bioretention" to correct a typographical error.			
Section 3.10 Ponds ► ~~P~~C-1 Micropool extended detention pond ~~P~~C-2 Wet pond ~~P~~C-3 Wet extended detention pond◄ ►Stormwater ponds ~~do not receive any~~receive only 10% stormwater retention value and should be considered ~~only~~mainly for management of larger storm events. Stormwater ponds have both community and environmental concerns (see Section 3.10.1 Pond Feasibility Criteria) that should be considered before choosing stormwater ponds for the appropriate stormwater practice on site.◄ Remove "P-1," "P-2," and "P-3" and replace with "C-1," "C-2," and "C-3" to prevent duplication of the codes for BMP Group 4 when incorporating the General Retention Compliance Calculator in DDOE's new Stormwater BMP Tracking Database. Remove "do not receive any" and replace with "receive only 10%" and remove "only" and replace with "mainly" to be consistent with the value listed in Table 3.46 "Pond Retention Value and Pollutant Removal."	187	05/01/2014	**E**
Chapter 3 (continued)			
Section 3.11 Wetlands	205	05/01/2014	**E**

Description of Change	Page	Date Published	Type
Stormwater wetlands ~~do not receive any~~receive only 10% stormwater retention value and should be considered ~~only~~mainly for management of larger storm events. Stormwater wetlands have both community and environmental concerns (see Section ~~3.10.1Pond~~3.11.1 Wetland Feasibility Criteria) that should be considered before choosing stormwater ponds for the appropriate stormwater practice on site. Remove "do not receive any" and replace with "receive only 10%" and remove "only" and replace with "mainly" to be consistent with the value listed in Table 3.49 "Wetland Retention Value and Pollutant Removal." Also, remove "3.10.1 Pond" and replace with "3.11.1 Wetland." to correct a typographical error.			
Section 3.13 Proprietary Practices **3.13 Proprietary Practices** **Definition.** Proprietary practices are manufactured stormwater treatment practices that utilize settling, filtration, absorptive/adsorptive materials, vortex separation, vegetative components, and/or other appropriate technology to manage the impacts stormwater runoff. The design includes: M-1 Proprietary practices Add ". The design includes: M-1 Proprietary practices" to create consistent codes for incorporating the General Retention Compliance Calculator in DDOE's new Stormwater BMP Tracking Database.	237	05/01/2014	**O**
Chapter 3 (continued)			
Section 3.14 Tree Planting and Preservation	241	05/01/2014	**O**

Description of Change	Page	Date Published	Type
Definition. Existing trees can be preserved or new trees can be planted to reduce stormwater runoff. The design includes: T-1 Tree planting T-2 Tree preservation Add "The design includes T-1 Tree planting" and "T-2 Tree Preservation" to create consistent codes for incorporating the General Retention Compliance Calculator in DDOE's new Stormwater BMP Tracking Database.			
Section 3.14.1 Preserving existing Trees During Construction **Protect Trees and Soil During Construction.** Physical barriers must be properly installed around the Critical Root Zone (CRZ) of trees to be preserved. The CRZ shall be determined by a licensed forester or ISA certified arborist, and in general includes a circular area with a radius (in feet) equal to ~~15~~1.5 times the diameter of the trunk (in inches). The barriers must be maintained and enforced throughout the construction process. Tree protection barriers include highly visible, well-anchored temporary protection devices, such as 4-foot fencing, blaze orange plastic mesh fencing, or snow fencing (Greenfeld and others, 1991). Remove "15" and replace with "1.5" to correct a typographical error.	242	05/01/2014	**E**
Chapter 4			
Section 4.6 Location and Permitting Considerations Revise the Location and Permitting Guidance for BMPs in the 100-year floodplain in the third row of	263	11/17/17	**E**

Description of Change	Page	Date Published	Type
Table 4.6. **100 Year Floodplain** District of Columbia Homeland Security and Emergency Management Agency ~~District~~ Department of ~~the~~ Energy and Environment ▪ When other on-site locations are available, DOEE discourages construction of BMPs in the floodplain because they may require more intensive maintenance. ~~Grading and fill for BMP construction is strongly discouraged within the 100 year floodplain, as delineated by FEMA Flood Insurance Rate Maps (FIRM).~~ ▪ Significant grading and fill for BMP construction within the 100 year floodplain, as delineated by FEMA Flood Insurance Rate Maps (FIRM)~~Floodplain fill~~ may be restricted with respect to impacts on surface elevation (DCMR 20, Chapter 31 Flood Hazard Rules. These revisions are made to clarify that BMP construction is allowable in the floodplain but not the preferred location and to provide more detail on the floodplain impact regulations.			
Chapter 5			
Section 5.1.1 Submittal and Review Process of Stormwater Management Plans	269	05/01/2014	**O/E**

Description of Change	Page	Date Published	Type
The forms 1 and 2 are found in Section 5.6. Supporting Forms. Forms 3 through 10 are available at the DCRA intake counter, or they can be downloaded at ~~http://dcra.dc.gov/DC/DCRA/Permits/Building+Permit+Application+Supplemental+Documents~~http://dcra.dc.gov/sites/default/files/dc/sites/dcra/publication/attachments/permitpackage_0.pdf. Add "Forms" to correct an inadvertent omission. Also changed the link in the second sentence because the original link is no longer working. Remove "http://dcra.dc.gov/DC/DCRA/Permits/Building+Permit+Application+Supplemental+Documents" and replace with "http://dcra.dc.gov/sites/default/files/dc/sites/dcra/publication/attachments/permitpackage_0.pdf" to update a link that is no longer active.			
Chapter 5 (continued)			
Section 5.6 Supporting Forms, first paragraph	279	05/01/2014	**O**

Description of Change	Page	Date Published	Type
▪ Site Development Submittal Information Form ▪ DC Water DDOE WPD Storm Sewer Verification Form ▪ As-Built Certification Stamp ▪ Professional Engineering Design Stamp ▪ Maintenance Responsibility Stamp ▪ Off-Site Retention Responsibility Stamp ▪ Declaration of Covenants Template Add "Professional Engineering Design Stamp" and "Maintenance Responsibility Stamp" as items in the bulleted list to include two forms that were inadvertently omitted from the text. Also add "Off-Site Retention Responsibility Stamp," which was developed to conform to the revised Declaration of Covenants template issued by the Real Estate Transactions Section of the D.C. Office of the Attorney General on April 23, 2014, which was updated to reflect the 2013 Rule on Stormwater Management and Soil Erosion and Sediment Control.			
Chapter 5 (continued)			
Figure 5.3 As-built Certification Stamp. ►Within 21 days after completion of construction of the ~~Stormwater discharge facility~~ all stormwater	282	05/01/2014	**E**

Description of Change	Page	Date Published	Type
best management practices (BMPs), stormwater infrastructure, and land covers (collectively the "Facility"), please send this page to the Watershed Protection Division of the District Department of the Environment.◄ 1. ~~***Stormwater discharge f***~~***Facility information***:◄ ►I hereby certify that ~~Stormwater discharge facility has~~ all stormwater best management practices, stormwater infrastructure, and land covers (collectively the "Facility") have been built substantially in accordance with the approved plans and specifications and that any ~~substantial~~ deviations ~~(~~noted below~~)~~ will not prevent the system from functioning in compliance with the requirements of ~~Section 526 through 535 of DCMR-21,~~ Chapter 5 of Title 21 of the District of Columbia Municipal Regulations when properly maintained and operated. These determinations have been based upon on-site observation of construction, scheduled and conducted by me or by a project representative under my direct supervision. I have enclosed one set of as-built engineering drawings.◄ In the first paragraph, remove "Stormwater discharge facility" and replace with "all stormwater best management practices (BMPs), stormwater infrastructure, and land covers (collectively the "Facility")." In the heading of item 1, remove "Stormwater discharge" and capitalize "Facility." In the first sentence of item 2, remove "Stormwater discharge facility has" and replace with "all stormwater best management practices (BMPs), stormwater infrastructure, and land covers have" to be consistent with all types of compliance; remove "substantial" before deviations, since "substantial" changes will require a resubmission as stated in Chapter 5.1.2; and remove "Section 526 through 535 of DCMR-21," and add "of Title 21 of the District of Columbia Municipal Regulations" to correctly cite the 2013 Rule on Stormwater Management and Soil Erosion and Sediment control, as amended on July 19, 2013. Note: A revised version of the full As-Built Certification Stamp document is available in PDF format on DDOE's website at http://ddoe.dc.gov/node/610622.			
Chapter 5 (continued)			
Figure 5.3.1 Professional Engineering Design Stamp.	282a	05/01/2014	**O**

Description of Change	Page	Date Published	Type
STATEMENT BY PROFESSIONAL ENGINEER REGISTERED IN **THE DISTRICT OF COLUMBIA** This is to certify that the engineering features of all stormwater best management practices (BMPs), stormwater infrastructure, and land covers have been designed/examined by me and found to be in conformity with modern engineering principles applicable to the treatment and disposal of stormwater pollutants. I further certify that the stormwater system has been designed in accordance with the specification required under Chapter 5 of Title 21 of the District of Columbia Municipal Regulations. It is also stated that the undersigned has furnished the applicant with a set of instructions for the maintenance and operation of the site's stormwater system. _____ Name and Title (please type) _____ Address _____ Date_____Phone No: _____ Affix Seal:			

Description of Change	Page	Date Published	Type
 Add a figure of the Professional Engineering Design Stamp, which is currently in use but was inadvertently omitted from the text. This version includes minor revisions for consistency with rule numbering and terminology. (Insert after page 282, as page 282a.) Note: This document is also available in PDF format on DDOE's website at http://ddoe.dc.gov/node/610622.			
Chapter 5 (continued)			

Description of Change	Page	Date Published	Type
Figure 5.3.2 Maintenance Responsibility Stamp. **STATEMENT BY PERSON RESPONSIBLE FOR MAINTENANCE** The undersigned agrees to maintain and operate the stormwater best management practices (BMPs), stormwater infrastructure, and land covers in such a manner as to comply with the provisions of 21 DCMR Chapter 5. Responsibility for maintenance and operation may be transferred to another entity upon written notice to the Watershed Protection Division of the District Department of the Environment from the undersigned and the entity assuming responsibility, certifying that the transfer of responsibility for maintenance and operation in compliance with Chapter 5 of Title 21 of the District of Columbia Municipal Regulations has been accepted. _____ Signature of the person responsible for maintenance (it may be the applicant) _____ Name and Title (please type) _____ Address _____ Date_____Phone No: _____ Add a figure of the Maintenance Responsibility Stamp, which is currently in use but was inadvertently omitted from the text. This version includes minor revisions for consistency with rule numbering and terminology. (Insert after page 282, as page 282b.) Note: This document is also available in PDF format on DDOE's website at http://ddoe.dc.gov/node/610622.	282b	05/01/2014	**O**
Chapter 5 (continued)			

Description of Change	Page	Date Published	Type
Figure 5.3.3 Off-Site Retention Responsibility Stamp. STATEMENT BY PERSON RESPONSIBLE FOR ACHIEVING OFF-SITE RETENTION This site has an off-site retention volume (Offv) obligation. The Offv for this site equals _____(gallons). The undersigned agrees to satisfy the obligation to achieve Offv, in such a manner as to comply with the provisions of Chapter 5 of Title 21 of the District of Columbia Municipal Regulations (DCMR). Responsibility for achieving Offv may be transferred to another entity upon written notice to the Watershed Protection Division of the District Department of the Environment from the undersigned and the entity assuming responsibility. This notice must certify that the transfer of responsibility for Offv is in compliance with 21 DCMR Chapter 5. _____ Signature of the person responsible for achieving Offv _____ Name and Title (please type) _____ Address _____ Date_____Phone No: _____	282c	05/01/2014	**O**

Description of Change	Page	Date Published	Type
Add a figure of the Off-Site Retention Responsibility Stamp, which was developed to conform to the revised Declaration of Covenants template issued by the Real Estate Transactions Section of the D.C. Office of the Attorney General on April 23, 2014, which was updated to reflect the 2013 Rule on Stormwater Management and Soil Erosion and Sediment Control. (Insert after page 282, as page 282c.) Note: This document is also available in PDF format on DDOE's website at http://ddoe.dc.gov/node/610622.			
Chapter 5 (continued)			

Description of Change	Page	Date Published	Type
Figure 5.4 Declaration of Covenants template. **GOVERNMENT OF THE DISTRICT OF COLUMBIA** **Office of the Attorney General** Commercial Division Real Estate Transactions Section **Procedure for obtaining legal sufficiency review of the Declaration of Covenants from the Office of the Attorney General (OAG):** **DDOE must:** 1. Provide name and e-mail address of technical reviewer so that OAG may discuss technical issues. If necessary, OAG will provide a PDF of the signed Declaration of Covenants to the DDOE reviewer. 2. Provide attached template of the Declaration of Covenants to the owner/developer. **Review Engineer:** **E-mail address:** **Owner/developer must:** 1. Draft the Declaration of Covenants. 2. Subordinate all prior liens to the Declaration. 3. Produce evidence of title and all liens on the property (i.e. copy of deed and full title	283a	05/01/2014 revised on 11/17/2017 (new text in red)	**O**

Description of Change	Page	Date Published	Type
search). 4. Provide a site plan (Exhibit B) as approved by DOEE, showing all required stormwater Best Management Practices (BMPs) and land covers and documenting any Off-Site Retention Volume (Offv) as well as the Required Plan Compliance Sheet generated from the Stormwater Database. 5. Provide a maintenance plan of all storm-water best management practices (BMPs) for District approval pursuant to 21 DCMR § 519 (Exhibit C). 6. Submit all of the above to: Office of the Attorney General for the District of Columbia Real Estate Transaction Section, Commercial Division 441 4th Street, NW, Suite 1010 South Washington, DC 20001 7. Return OAG approved and signed original to DDOE for technical sufficiency review and approval. 8. Provide copy of recorded Declaration of Covenants to DDOE. **Contact Person:** ~~**Jay Surabian**~~ **Lawrence Wolk** Assistant Attorney General Real Estate Transactions Section D.C. Office of the Attorney General 441 4th Street, NW, Suite 1010 South Washington, DC 20001 Tel: ~~(202) 442-9771~~ (202) 724-5094 Fax: ~~(202) 730-1844~~ (202) 741-0420 ~~jay.surabian@dc.gov~~ lawrence.wolk@dc.gov Add an introductory page to include the document "Procedure for obtaining a legal sufficiency review of the Declaration of Covenants from the Office of the Attorney General, which is currently in use but was inadvertently omitted from the text. (Insert before page 283, as page 283a.) This version includes minor revisions for consistency with the rule terminology. Note: This document is also available in PDF format on DDOE's website at http://ddoe.dc.gov/node/610622.			

Description of Change	Page	Date Published	Type
Chapter 5 (continued)			
Figure 5.4 Declaration of Covenants template. **DECLARATION OF COVENANTS** **For a ~~Storm Water~~Stormwater Management Facility** ►THIS DECLARATION OF COVENANTS (the "Declaration") is made as of this _____ day of _____, 20__, by and between ~~LIST~~ NAME OF PROPERTY OWNER, a LIST TYPE OF ~~CORPORATION/PROPERTY OWNER,~~CORPORATE ENTITY (if applicable), and its successors and assigns ("Owner"), for the benefit of the DISTRICT OF COLUMBIA, a municipal corporation (the "District").◄ ►B. In order to ~~accommodate and regulate changes in~~manage storm water flow conditions resulting from certain improvements Owner will make to the ~~property~~Property, the regulations of the District, found at Title 21, Chapter 5, of the District of Columbia Municipal Regulations ("**DCMR**") require that Owner ~~shall construct~~ develop and ~~agrees to maintain, at its sole expense, a storm water management facility and sustainable design features~~submit for approval a Stormwater Management Plan ("SWMP") for the installation and maintenance of all stormwater best management practices (BMPs), stormwater infrastructure, and land covers on the Property (collectively, the "**Facility**") ~~identified as _____, pursuant to the plans approved by the District (and as the same may be amended after District's approval) attached hereto as **Exhibit B** as the Site Plan~~and including any obligation to achieve Off-Site Retention Volume . C. Section 529 of Title 21 of the ~~District of Columbia Municipal Regulations ("**DCMR**") Sections 534.2, 534.3, and 534.4~~ DCMR requires that ~~an owner maintain any storm water management facility on its property in good condition, develop and submit for approval a maintenance schedule for any such storm water management facility, and~~ Owner execute and record ~~with the Recorder of Deeds of the District a covenant~~ with the District of Columbia Recorder of Deeds, a declaration of covenants running with the land that set ~~setting~~ forth ~~the owner's aforementioned maintenance~~ Owner's responsibilities ~~with specificity~~under the SWMP.	283	05/01/2014	**O/E**

Description of Change	Page	Date Published	Type
NOW, THEREFORE, for and in consideration of the issuance of ~~construction~~building permits and approval of Owner's plans by the District, and other good and valuable consideration the sufficiency of which is hereby acknowledged, for the benefit of and limitation upon Owner and all future owners of the Property, and for the benefit of the District, Owner for itself, its successors and assigns, does hereby acknowledge, represent, covenant, agree, and warrant to the District as follows:◄ In the document heading, change "Storm Water" to "Stormwater." In the first paragraph, remove two occurrences of "LIST," add "PROPERTY" before "OWNER," and remove "CORPORATION/PROPERTY/OWNER" and replace with "CORPORATE ENTITY." In Recital B, indent the paragraph; remove "accommodate and regulate changes in" and replace with "manage;" capitalize "Property;" add "the regulations of the District, found at Title 21, Chapter 5, of the District of Columbia Municipal Regulations ("DCMR") require that;" remove "shall construct" and replace with "develop;" remove "agrees to maintain, at its sole expense, a storm water management facility and sustainable design features" and replace with "submit for approval a Stormwater Management Plan ("SWMP") for the installation and maintenance of all stormwater best management practices (BMPs), stormwater infrastructure, and land covers on the Property;" and remove "identified as _____, pursuant to the plans approved by the District (and as the same may be amended after District's approval) attached hereto as Exhibit B as the Site Plan" and replace with "and including any obligation to achieve Off-Site Retention Volume." In Recital C, add "Section 529 of;" remove "District of Columbia Municipal Regulations ("DCMR") Sections 534.2, 534.3, and 534.4"and replace with "DCMR;" add an "s" to "require;" remove "an owner maintain any storm water management facility on its property in good condition, develop and submit for approval a maintenance schedule for any such storm water management facility, and" and replace with "Owner;" remove "with the Recorder of Deeds of the District a covenant" and replace with "with the District of Columbia Recorder of Deeds, a declaration of covenants running with the land that set;" remove "setting;" remove "the aforementioned maintenance" and replace with "Owner's;" and remove "with specificity" and replace with "under the SWMP." In paragraph 5, remove "construction" and replace with "building." These changes conform to the revised Declaration of Covenants template issued by the Real Estate Transactions Section of the D.C. Office of the Attorney General on April 23, 2014, which was updated to reflect the 2013 Rule on Stormwater Management and Soil Erosion and Sediment Control.			

Description of Change	Page	Date Published	Type
Chapter 5 (continued)			
Figure 5.4 Declaration of Covenants template (continued). 2. The Facility and any responsibility to achieve Off-Site Retention Volume (Offv), as stated in gallons, is shown on the plans approved by the District attached hereto as Exhibit B, the Site Plan, as the same may be amended pursuant to the District's approval. ~~2.~~3. Owner, at its sole expense, shall construct and perpetually operate and maintain the Facility in such manner as to comply with the provisions of Title 21, Chapter 5 of the DCMR ~~at its sole expense~~ and in strict accordance with the ~~development and maintenance plan approved by~~ ~~SWMP, including~~ the ~~District. Specifically, Owner shall be responsible for the maintenance of the Facility in accordance with the maintenance standards~~Maintenance Plan, attached hereto as **Exhibit C**, as the same may be amended pursuant to the District's approval. ~~3.~~4. Owner shall, at its sole expense, make such changes or modifications to the Facility as ~~may, in~~ the District~~'s~~, in its discretion, ~~be~~may determine~~d~~ necessary to ~~insure~~ensure that the Facility is maintained in good condition and continues to operate as designed and approved. ~~4.~~5. The District and its agents, employees, and contractors shall have the right to enter the Property for the purpose of inspecting the Facility in accordance with established inspection procedures and Section 16 of the Water Pollution Control Act of 1984 (D.C. Law 5-188; 32 DCR 919; D.C. Official Code § 8-103.01, et seq. (~~2007 Supp.~~2013 Repl.), as amended (the "Act"), at reasonable times and in a reasonable manner, in order to ensure that the Facility is being properly maintained and is continuing to perform in the manner approved by the District. ~~5.~~6. Should Owner fail to perform its ~~maintenance~~ responsibilities as ~~set forth~~required herein ~~and as contained in any and all plans submitted to and approved by the District~~, or fail to operate and~~,~~ ~~where necessary,~~ restore the Facility in accordance with ~~the~~ approved design standards, as the same may be amended from time to time~~, and in accordance with all applicable laws and regulations,~~ the District shall be entitled to pursue any and all enforcement actions available to it pursuant to the Act and Title 21, Chapter 22 of the DCMR, as the same may be amended ~~or revised~~ from time to time.	284	05/01/2014	**O/E**

Description of Change	Page	Date Published	Type
Without limiting the generality of the foregoing, in the event that a discharge or threat of discharge from the Facility poses an imminent and substantial danger to the environment or the public health or welfare, the District may take immediate action against Owner pursuant to ~~either Section 21-2207 or Section 21-2211.2 of the DCMR~~D.C. Official Code § 8-103.08(b). ~~6.~~7. If Owner's failure or refusal to maintain the Facility in accordance with the covenants and warranties contained in this Declaration ultimately results in ~~duly authorized~~ corrective action by the District, Owner shall bear all costs incurred by the District for such corrective measures, such costs may be assessed against the Property, and Owner may be fined in accordance with the Act and Title 21, Chapter 5 of the DCMR. ~~7.~~8. The provisions of this Declaration shall be deemed warranties by ~~the~~ Owner and covenants running with the land and shall bind and inure to the benefit of Owner and the District, their respective heirs, successors and/or assigns. When Owner ceases to own an interest in the Property, the rights, warranties, and obligations under this Declaration shall become the rights, warranties, and obligations of the successor-in-ownership and interest ~~as~~ to the Property. ~~8.~~9. Owner shall, at its cost and expense, properly record this Declaration with the Recorder of Deeds and ~~furnish~~provide the District's Department of the Environment~~ and Office of the Attorney General~~ with a copy of this Declaration, certified by the Recorder of Deeds as a true copy of the recorded instrument. ~~9.~~10. Owner shall indemnify, save harmless, and defend the District, and all its officers, agents, and employees from and against all claims or liabilities that may arise out of or in connection with, either directly or indirectly, any of Owner's actions or omissions with regard to the construction, operation, maintenance and/or restoration of the Facility. In the numbered list, create a new item 2, and renumber all of the items that follow. For the new item 2, add "The Facility and any responsibility to achieve Off-Site Retention Volume (Offv), as stated in gallons, is shown on the plans approved by the District attached hereto as Exhibit B, the Site Plan, as the same may be amended pursuant to the District's approval." In the first sentence of the new item 3, add ", at its sole expense," after "Owner" and add "the" before "DCMR." Also, remove "at its sole			

Description of Change	Page	Date Published	Type
expense" after "DCMR;" remove development and maintenance plan approved by SWMP, including; and remove "District." In the new item 4, remove ", may, in;" remove "'s" from "the District's" and replace with ", in its;" remove "be" and replace with "may," remove the final "d" from "determined," and remove "insure" and replace with "ensure." In the new item 5, add a comma after "employees," add a space between "§" and "8-103.01," and remove "2007 Supp." and replace with "2013 Repl." In the first sentence of the new item 6, remove "maintenance;" remove "as set forth" and replace with "required;" remove "and as contained in any and all plans submitted to and approved by the District;" remove ", where necessary;" remove "the" before "approved design;" remove ", and in accordance with all applicable laws and regulations," and remove "or revised." In the last sentence of the new item 6, add "the environment" after "danger to" and remove "either Section 21-2207 or Section 21-2211.2 of the DCMR" and replace with "D.C. Official Code § 8-103.08(b)." In the new item 7, remove "duly authorized." In the new item 8, remove "the" before "owner" and "as" after "interest." In the new item 9, remove "furnish" and replace with "provide" and remove "and Office of the Attorney General." These changes conform to the revised Declaration of Covenants template issued by the Real Estate Transactions Section of the D.C. Office of the Attorney General on April 23, 2014, which was updated to reflect the 2013 Rule on Stormwater Management and Soil Erosion and Sediment Control.			

Description of Change	Page	Date Published	Type
Chapter 5 (continued)			
Figure 5.4 Declaration of Covenants template (continued). ~~10.~~11. Owner warrants, and shall ensure, that all prior liens recorded against the Property are subordinate to this Declaration. Failure to subordinate ~~any such~~ liens ~~may~~shall, at the District's sole election, give rise to termination of any building permits and/or invalidation of any certificate of occupancy relating to the Property. ~~11.~~12. Owner shall, at its sole expense, comply with all provisions of this Declaration regardless of any conflicting requirements in any other covenant, easement, or other legal document recorded or unrecorded against the Property. Neither the entering into of this Declaration nor performance hereunder will constitute or result in a violation or breach by Owner of any other agreement or order that is binding on ~~the~~ Owner. ~~12.~~13. To the extent ~~the~~ Owner is an entity, ~~the~~ Owner warrants that it~~is~~: (i) is duly organized, validly existing and in good standing under the laws of its state of ~~jurisdiction and~~organization; (ii) is qualified to do business in, and is in good standing under, the laws of the District of Columbia~~; (ii)~~; (iii) is authorized to perform under this Declaration; and (~~iii~~iv) has all necessary power to execute and deliver this Declaration. ~~13.~~14. The form of this Declaration has been approved by the District of Columbia Office of the Attorney General ("OAG") for legal sufficiency pursuant to Title ~~12A~~21, Section ~~106.6~~529.3 of the ~~D.C.M.R~~DCMR. This Declaration, and the provisions contained herein, may not be modified, amended, or terminated without the prior written consent of the District and legal sufficiency approval by ~~the District of Columbia Office of the Attorney General~~OAG, such agreement to be evidenced by a document duly executed and delivered in recordable form and recorded with the Recorder of Deeds at no expense to the District. ~~14.~~15. The District has the right to specifically enforce this Declaration. ~~15.~~16. This Declaration shall be governed by, construed under, and enforced in accordance with, the laws of the District of Columbia.	285	05/01/2014	**O/E**

Description of Change	Page	Date Published	Type
~~16.~~17. This Declaration has been duly executed and delivered by ~~the~~ Owner, and constitutes the legal, valid, and binding obligations of ~~the~~ Owner, enforceable against ~~the~~ Owner and its successors and assigns, in accordance with its terms. ~~17.~~18. If any of the covenants, warranties, conditions or terms of this Declaration shall be found void or unenforceable for whatever reason by any court of law or of equity, then every other covenant, condition or term herein set forth shall remain valid and binding. As on page 284, renumber all of the items in the list. In the new item 11, remove "warrants and;" remove "any such;" remove "may" and replace with "shall, at the District's sole election,". In the new item12, remove "the" before "Owner." In the new item 13, remove "the" twice before "Owner;" remove "is" and replace with a colon; add "is" before "duly;" remove "jurisdiction and" and replace with "organization; (ii);" add "in," after "business;" remove ", (ii)" and replace with "; (iii)"; add a semicolon after "under this Declaration;" and remove "iii" and replace with "iv." In the first sentence of item new item 14, add "(OAG);" remove "12A" and replace with "21;" remove "106.6" and replace with "529.3;" and remove "D.C.M.R." and replace with "DCMR." In the second sentence of the new item 14, remove "the District of Columbia Office of the Attorney General" and replace with "OAG." In the new item 16, add "under," after "construed." In the new item 17, remove "the" before "Owner" three times. These changes conform to the revised Declaration of Covenants template issued by the Real Estate Transactions Section of the D.C. Office of the Attorney General on April 23, 2014, which was updated to reflect the 2013 Rule on Stormwater Management and Soil Erosion and Sediment Control.			

Description of Change	Page	Date Published	Type
Chapter 5 (continued)			
Figure 5.4 Declaration of Covenants template (continued). IN WITNESS WHEREOF, Owner has, as of the day and year first above written, caused this Declaration of Covenants to be signed by ~~LIST~~ NAME AND TITLE OF ~~OWNER, a LIST TYPE~~ PERSON SIGNING ON BEHALF OF ~~CORPORATION/PROPERTY~~ OWNER. By: _____ ~~Signature~~ ~~LIST~~ NAME, TITLE ~~LIST TYPE OF COMPANTY/PROPERTY OWNER~~ ~~NOTARIZATION~~ACKNOWLEDGMENT _____LIST STATE_____)) ss: _____LIST COUNTY_____) I, ~~LIST~~ NAME OF NOTARY, a Notary Public in and for the jurisdiction aforesaid, do hereby certify that ~~LIST~~ NAME OF PERSON SIGNING ON BEHALF OF OWNER, ~~party~~who is personally well known (or satisfactorily proven) to me, and being authorized to do so, executed the foregoing Declaration of Covenants~~, personally appeared before me and, being personally well known to me, who has been appointed its attorney-in-fact~~ and has acknowledged ~~said Declaration of Covenants~~ the same to be the act and deed of ~~LIST~~ NAME OF OWNER~~/LIST NAME OF COMPANY IN CAPACITY AS OWNER/PROPERTY OWNER~~, and that s/he delivered the same as such. GIVEN under my hand and seal this ____ day of _____, ~~2009~~20__.	286	05/01/2014	**O/E**

Description of Change	Page	Date Published	Type
Under the first paragraph, remove "Signature." Also, remove "NOTARIZATION" and replace with "ACKNOWLEDGMENT." Under the second paragraph remove "2009" and replace with "20___." to conform to the revised Declaration of Covenants template issued by the Real Estate Transactions Section of the D.C. Office of the Attorney General on April 23, 2014, which was updated to reflect the 2013 Rule on Stormwater Management and Soil Erosion and Sediment Control.			

Description of Change	Page	Date Published	Type
Chapter 5 (continued)			
Figure 5.4 Declaration of Covenants template (continued). ► **APPROVED AS TO TECHNICAL SUFFICIENCY:** District of Columbia Department of the Environment ~~District Department of the Environment~~ Natural Resources Administration Watershed Protection Division◄ ► **Property Address:**◄ In the first paragraph, remove "District" and move "Department of the Environment" to the first line. Under the last line on the page, add "Property Address:" to conform to the revised Declaration of Covenants template issued by the Real Estate Transactions Section of the D.C. Office of the Attorney General on April 23, 2014, which was updated to reflect the 2013 Rule on Stormwater Management and Soil Erosion and Sediment Control.	287	05/01/2014	**O/E**

Description of Change	Page	Date Published	Type
Appendix A			
Section A.2 Instructions for Compliance Calculations remove: ►$Rv = (\%N \times RvN + (\%C) \times RvC + (\%I) \times RVI$◄ replace with: ►$Rv = (Rv_I \times \%I) + (Rv_C \times \%C) + (Rv_N \times \%N)$◄ In the fourth equation of item 6, place brackets consistently around values that are multiplied to correct typographical errors and clarify the order of operations. Also remove "*RvN*," "*RvC*," and "*RVI*" and replace with "Rv_N," "Rv_C," and "Rv_I" to correct typographical errors.	A-2	05/01/2014	**E**

Description of Change	Page	Date Published	Type
Appendix A (continued)			
Section A.2 Instructions for Compliance Calculations remove: ►*WQTv* = *P*/12 × *Rv* × *SA*◄ replace with: ►*WQTv* = *P*/12 × *Rv* × *SA* - *SWRv*◄ ► where: *WQTv* = stormwater treatment volume (ft^3) *P* = regulatory rain event (1.7 in.) 12 = conversion from inches to feet *Rv* = weighted site runoff coefficient *SA* = total site area (ac) *SWRv* = Stormwater Retention Volume (ft^3)◄ In item 8, add "- *SWRv*" to the end of the equation and add "SWRv = Stormwater Retention Volume (ft^3)" at the end of the page. This text was inadvertently omitted.	A-3	05/01/2014	**O**

Description of Change	Page	Date Published	Type
Appendix A (continued)			
Section A.2 Instructions for Compliance Calculations remove: ►$Q = (P - 0.2 \times S)2/(P + 0.8 \times S)$◄ replace with: ►$Q = \frac{(P - 0.2 \times S)^2}{(P + 0.8 \times S)}$◄ In the equation "Runoff Volume with no Retention," remove "(P - 0.2 × S)2", replace with "$(P - 0.2 \times S)^2$", and set the numerator over the denominator to correct a typographical error.	A-9	05/01/2014	**E**

Description of Change	Page	Date Published	Type
Appendix A (continued)			
Section A.2 Instructions for Compliance Calculations remove: ►$CN_{adjusted}$, *so* $(P - 0.2 \times S_{adjusted}) \times 2/(P + 0.8 \times S_{adjusted}) = Q_{BMP}$ $S_{adjusted} = 1000/(CN_{adjusted} - 10)$◄ replace with: ►$CN_{\text{adjusted}}$, so $\frac{(P - 0.2 \times S_{adjusted})^2}{(P + 0.8 \times S_{adjusted})} = Q_{BMP}$ $S_{adjusted} = \frac{1{,}000}{(CN_{adjusted} - 10)}$◄ In the equations for "Adjusted Curve Number," set the numerators over the denominators, remove "× 2" and replace with an exponent of 2 to correct typographical errors.	A-10	05/01/2014 revised on 12/22/2014	**E**

Description of Change	Page	Date Published	Type
Appendix H			
Section H.6 Stormwater Retention Volume Peak Discharge, Step 1 remove: ► $CN = \frac{100_0}{\left[10 + 5P + 1_0 Q_a - 1_0\left(Q_a^2 + 1.2_5 Q_a P\right)^{0.5}\right]}$ ◄ replace with: ► $CN = \frac{1{,}000}{10 + 5P + 10Q_a - 10\left(Q_a^2 + 1.25 Q_a P\right)^{0.5}}$ ◄ Remove "100_0" and replace with "1,000" in the numerator. In the denominator, remove "1_0Qa"and replace with "10Qa"; remove "1_0" and replace with "10"; remove "1.2_5QaP" and replace with "1.25QaP"; and remove the brackets. These changes are needed to correct typographical errors.	H-7	05/01/2014	**E**

Description of Change	Page	Date Published	Type
Appendix O			
Section O.1 General Notes Pertinent to All Geotechnical Testing ▪ Testing is to be conducted by a qualified professional. This professional shall either be a registered professional engineer, soils scientist, or geologist and must be licensed in the District of Columbia. ▪ Soil boring or test pit information is to be obtained from at least one location on the site. Additional borings or test pits are required within the proposed BMP facility under three conditions: (1) when the soils or slopes vary appreciably from the findings in the initial boring or test pit, (2) when the ground water level is found to be significantly higher than initial boring or test pit indicated, and (3) when the ground water level may adversely affect the performance of the proposed BMP facilities. However, the location, number, and depth of borings or test pits shall be determined by a qualified professional, and be sufficient to accurately characterize the site soil conditions. ▪ Depth to the ground water table (with 24-hour readings) and estimated depth to the seasonally high ground water table must be included in the boring logs/geotechnical report. ▪ Laboratory testing must include grain size analysis. Additional tests such as liquid limit and plastic limit tests, consolidation tests, shear tests and permeability tests may be necessary where foundation soils or slopes are potentially unstable based on the discretion of the qualified professional. ▪ The geotechnical report must include soil descriptions from each boring or test pit, and the laboratory test results for grain size. Based upon the proposed development, the geotechnical report may also include evaluation of settlement, bearing capacity and slope stability of soils supporting the proposed structures. At the end of the first bullet, add "Additional borings or test pits are required within the proposed BMP facility under three conditions: (1) when the soils or slopes vary appreciably from the findings in the initial boring or test pit, (2) when the ground water level is found to be significantly higher than initial boring or test pit indicated, and (3) when the ground water level may adversely affect the performance of the proposed BMP facilities." In the second bullet, add "(with 24-hour readings)." In the third bullet, add "where foundation soils or slopes are potentially unstable." In the fourth bullet, add "soils supporting." These additions are needed to provide greater detail on constant head test methods and process, as requested by local geotechnical consulting practitioners.	O-1	05/01/2014	**O**

Description of Change	Page	Date Published	Type
Appendix O (continued)			
Section O.2 Initial Feasibility Assessment ►The initial feasibility assessment typically involves existing data, such as the following: ▪ On-site septic percolation testing, which can establish ~~initial~~historic percolation rates, water table, and/or depth to bedrock. Percolation tests are different than tests for coefficient of permeability or infiltration rate; ▪ Previous geotechnical reports prepared for the site or adjacent properties.; or ▪ Natural Resources Conservation Service (NRCS) Soil Mapping.◄ In the second bullet, remove "initial," replace with "historic percolation," add an "s" to "rate," and add "Percolation tests are different than tests for coefficient of permeability or infiltration rate." These changes are needed to provide greater detail on constant head test methods and process, as requested by local geotechnical consulting practitioners.	O-2	05/01/2014	**O/E**

Description of Change	Page	Date Published	Type
Appendix O (continued)			
Section O.3 Test Pit/Boring Requirements for Infiltration Tests a. Excavate a test pit or drill a standard soil boring to a depth of 2 feet below the proposed facility bottom. b. Determine depth to groundwater table (if within 2 feet of proposed bottom), and the estimated seasonally high groundwater table. c. Determine Unified Soil Classification (USC) System and/or United States Department of Agriculture (USDA) textures at the proposed bottom and 4 feet below the bottom of the BMP. d. Determine depth to bedrock (if within 2 feet of proposed bottom). e. The soil description must include all soil horizons. Perform the infiltration test at the proposed bottom of the practice. If any of the soil horizons below the proposed bottom of the infiltration practice (within 2 feet) appear to be a confining layer, additional infiltration tests must be performed on this layer (or layers), following the procedure described below. f. The location of the test pits or borings shall correspond to the BMP locations; a map or plan that clearly and accurately indicates the location(s) of the test pits or soil borings must be provided with the geotechnical report.~~test pit/soil boring stakes are to be left in the field for inspection purposes and shall be clearly labeled as such.~~ In item c, add "and/or United States Department of Agriculture (USDA)." In item e, add "Perform the infiltration test at the proposed bottom of the practice." and "(within 2 feet)." In item f, remove "test pit/soil boring stakes are to be left in the field for inspection purposes and shall be clearly labeled as such" and add "a map or plan that clearly and accurately indicates the location(s) of the test pits or soil borings must be provided with the geotechnical report." These changes are needed to provide greater detail on constant head test methods and process, as requested by local geotechnical consulting practitioners.	O-2	05/01/2014	**O/E**

Description of Change	Page	Date Published	Type
Appendix O (continued)			
Section O.4 Infiltration Requirements Testing Changes on 11/17/2017: Replace the Double-Ring Infiltrometer test bullet with a description of an acceptable falling head test (changes shown in red font). The following tests are acceptable for use in determining soil infiltration rates. The geotechnical report shall include a detailed description of the test method and published source references: ▪ ~~Well Permeameter Method (USBR 7300-89)~~Constant Head Bore-Hole Infiltration Tests (also referred to as bore-hole permeameter tests and constant-head well permeameter tests). These types of tests determine saturated hydraulic conductivity (coefficient of permeability) by measuring the rate of water flow into a borehole. Analytical solutions utilize principals of Darcy's Law, borehole geometry, and head, or multiple heads, of water in determining saturated hydraulic conductivity. Infiltration rate is determined utilizing Darcy's Law and observations of soil characteristics. Where the soil characteristics meet all of the above-described requirements for infiltration BMPs, the hydraulic gradient element of Darcy's Law is often estimated as 1 for determining infiltration rate. One published standard developed by the United States Bureau of Reclamation for this method is USBR 7300-89. Some of the commercially available equipment is listed below: ♦ Amoozemeter ♦ Guelph Permeameter ♦ Johnson Permeameter ~~▪ Tube Permeameter Method (ASTM D 2434);~~	O-3	05/01/2014 revised on 11/17/2017 (new text in red)	**O/E**

Description of Change	Page	Date Published	Type
~~▪ Double-Ring Infiltrometer (ASTM D 3385). This test method measures the rate of water infiltration into soil utilizing two concentric rings to pond water at a controlled depth at the top of the natural soil of the test area. The downward loss of water from the inner ring determines the infiltration rate while the downward loss of water from the outer ring compensates for lateral loss to the soil from the inner ring that would otherwise occur from a single ring. The details of this method, including the minimum specified diameter of the rings, must be strictly adhered to in order to maintain integrity of the test results.~~ ~~This test method requires that both concentric rings be placed simultaneously into the upper few centimeters of the natural soil. In some cases, signification excavation is required to prepare a working area at the desired elevation.~~ ▪ ~~Other constant head permeability tests that utilize in-situ conditions and are accompanied by a peer reviewed source reference.~~ ▪ Maryland Stormwater Design Manual, Appendix D.1 Testing Requirements for Infiltration, Bioretention, and Sand Filer Subsoils, as modified below. The data obtained from this infiltration testing procedure shall be used to calculate the saturated hydraulic conductivity (see Section O.5). 1. Install solid casing in the boring or test pit to the proposed BMP bottom or other required test depth (i.e., confining layer encountered within 2 feet below the BMP bottom). When installing casing, drive the casing between 3 to 5 inches below the test surface to promote good casing-to-soil seal. 2. Remove any smeared, soiled surfaces, and provide a natural soil interface into which water may infiltrate. Remove all loose material from the casing. At the tester's/registered professional's discretion, a 2-inch layer of coarse sand or fine gravel may be placed to protect the bottom from scouring and sediment. Fill the casing with clean water 24 inches above the test surface (24 inches of head), and allow to presoak for 24 hours. 3. Protect the open borehole with suitable cover such as a sanitary well cap and steel plate with surrounding sandbags to prevent the introduction of surface water runoff, trash, debris, and other pollutants.			

Description of Change	Page	Date Published	Type
4. Twenty-four hours later, refill the casing with approximately 24 inches of clean water (24 inches of head), and monitor water level for 1 hour, recording the depth of water at the beginning and end of the test. Repeat step 4 (filling the casing each time) three additional times, for a total of four observations. At the registered professional's discretion, the saturated hydraulic conductivity calculations may be performed based on the values recorded during the average of the four readings or the last observation. The testing interval can be increased at the discretion of the registered professional. All soil borings and test pits shall be properly backfilled after conclusion of tests. An infiltration test does not require groundwater quality protection approval if ▪ The test is conducted to a depth of fifteen feet or less below the ground surface, and ▪ A ~~a~~ Professional Engineer licensed in the District of Columbia certifies the ~~infiltration rate~~hydraulic conductivity and that the test was carried out in compliance with this guidance and accepted professional standards. Note: If the infiltration testing procedure reveals smells or visual indications of soil or groundwater contamination then the boring or test hole must be filled in accordance with wellhead protection best practices, unless laboratory analysis determines groundwater or soil is not contaminated, as defined in the District of Columbia Brownfield Revitalization Act of 2000, as amended (D.C. Official Code §§ 8-631 et seq). Changes on 11/17/207: Section O.4 is modified to allow a falling head infiltration test similar to that used by neighboring jurisdictions. The falling head test method was added to make infiltration tests easier to perform in the District. However, the other acceptable test methods report hydraulic conductivity, rather than infiltration rate, which is a better measure of a soil's properties. Changes on 05/01/2014: In the first bullet, remove "Well Permeameter Method (USBR 7300-89)" and replace with "Constant Head Bore-Hole Infiltration Tests" and a description of the related process and equipment. Remove the second bullet, "Tube Permeameter Method (ASTM D 2434)." In the third bullet, add a description of the Double-Ring Infiltrometer test process. In the fourth bullet, remove			

Description of Change	Page	Date Published	Type
"recognized published" and replace with "peer reviewed." After the list, add "All soil borings and test pits shall be properly backfilled after conclusion of tests." These changes are needed to provide greater detail on constant head test methods and process, as requested by local geotechnical consulting practitioners.			
Section O.5 Saturated Hydraulic Conductivity Calculations Add the equation that must be used to convert the results of the falling head test to a hydraulic conductivity value. **O.5 Saturated Hydraulic Conductivity Calculations** To convert the field infiltration measurements to a saturated hydraulic conductivity value (K_{sat}), the following calculations must be performed. $$K_{sat} = \frac{\pi D}{11(t_2 - t_1)} \times \ln\left(H_1 / H_2\right)$$ where: K_{sat} = saturated Hydraulic Conductivity (in/hr) D = casing Diameter (in) (minimum 4 inches) t_2 = recorded End Time of Test (hr) t_1 = recorded Beginning Time of Test (hr) $H1$ = head in Casing Measured at Time t1 (ft) $H2$ = head in Casing Measured at Time t2 (ft) Equation adapted by: U.S. Bureau of Reclamation in 1975 from Lambe and Whitman, 1969. Section O.5 is added to provide the calculation that must be used to determine the hydraulic conductivity from the falling head test. This equation provides equivalence between the falling head test and the other acceptable test methods.	O-3	11/17/17	**E**

Description of Change	Page	Date Published	Type
Appendix Q			
Section Q.2 "Stormwater Management Plans (SWMP) Good Housekeeping Stamp Notes **Fuels and Oils**. On-site refueling will be conducted in a dedicated location away from access to surface waters. Tanks fabricated with double walls do not require an additional bermed area. Install containment berms and, or secondary containments around refueling areas and storage tanks. Spills will be cleaned up immediately and contaminated soils disposed of in accordance with all federal and District of Columbia regulations. Petroleum products will be stored in clearly labeled tightly sealed containers. All vehicles on site will be monitored for leaks and receive regular preventive maintenance activities. Any asphalt substances used on site will be applied according to manufacturer's recommendations. Spill kits will be included with all fueling sources and maintenance activities. After the first sentence of the "Fuels and Oils" paragraph, add "Tanks fabricated with double walls do not require an additional bermed area." This addition is needed to provide clarification and align with the U.S. Environmental Protection Agency memorandum OSWER 9360.8-38 (http://www.epa.gov/osweroe1/docs/oil/spcc/contain.pdf), which clarifies 40 CFR Part 112.7(c) on secondary containment.	Q-1	12/XX/2014	**O**