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MEMO

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SEI No. 13-060

Re: Soil Restoration standards and options for use as BMP

Several states have implemented soil preservation and/or restoration standards that may be of utility as the Stormwater Program considers how and whether to include soil restoration as a standard stormwater management practice in the revised Vermont Stormwater Management Manual. Notable examples, which are discussed in more detail below, include:

- The *Pennsylvania Stormwater Best Management Practices Manual* (2006) Soil Amendment & Restoration BMP: http://www.elibrary.dep.state.pa.us/dsweb/Get/Version-69220/
- The *New York State Stormwater Management Design Manual* (August, 2010) Soil Restoration BMP (http://www.dec.ny.gov/docs/water_pdf/swdm2010chptr5.pdf, Section 5.1.6)
- The state of Washington's "Soils for Salmon" program (http://www.soilsforsalmon.org/how.htm), the *Stormwater Management Manual for Western Washington* (2012) BMP T5.13 "Post Construction Soil Quality and Depth"(http://www.ecy.wa.gov/programs/wq/stormwater/manual.html), and implementation guidelines for builders (http://www.buildingsoil.org/tools/Soil_BMP_Manual.pdf)
- The *Metropolitan Government of Nashville and Davidson County Stormwater Management Manual, Volume 5: Low Impact Development* (2012), especially GIP07 Downspout Disconnection https://www.nashville.gov/portals/0/SiteContent/WaterServices/stormwater/docs/SWMM/vol5/GIP07_Downspout.pdf and GIP10 Reforestation https://www.nashville.gov/portals/0/SiteContent/WaterServices/Stormwater/docs/SWMM/vol5/GIP10_Reforestation.pdf

The State of Pennsylvania uses a single application for coverage under the General (PAG-02) or Individual NPDES Permits for Stormwater Discharges Associated with Construction Activities.

The single application covers both construction-phase erosion and sediment control plans and post-construction stormwater management plans and requirements. A volume reduction credit is offered for minimizing soil compaction during development(NS BMP 5.6.2), and several restoration practices (such as Landscape Restoration, BMP 6.7.2 and Soil Amendment / Restoration, BMP 6.7.3) are included as standard practices available to applicants. In contrast to New York's approach, however, there is no specific requirement to utilize these practices nor is there a penalty for not applying them.
In New York State, construction and post-construction stormwater permits are issued using a single NOI. Indicating how the applicant plans to address soil restoration is a required element of the NOI (Section 5.1.6 of the manual and question 27a on the NOI) and SWPPP. Applicants have two options:

- In all disturbed areas, compacted areas can be restored in accordance with the Soil Restoration requirements in Table 5.3 of the Design Manual (see page 5-22).
- All disturbed areas that are not restored are considered as impervious cover when calculating the WQv required, and the compacted areas are assigned a post-construction Hydrologic Soil Group (HSG) designation that is one level less permeable than existing conditions for the hydrology analysis.

In Washington State, only construction-phase stormwater permitting is administered at the state level (see the Construction Stormwater General Permit page and NOI at http://www.ecy.wa.gov/programs/wq/stormwater/construction/). Post-construction stormwater permitting is administered at the county or municipal level within Phase I or II MS4 communities (see http://www.ecy.wa.gov/programs/wq/stormwater/municipal/index.html). All projects subject to post-construction stormwater permitting (generally, those that disturb more than 7,000 square feet or create more than 2,000 square feet of impervious surface) must implement BMP T5-13 "Post Construction Soil Quality and Depth" as part of compliance with Minimum Requirement #5: On-site Stormwater Management (see Section 2.5.5 of the *Stormwater Management Manual for Western Washington*).

Tennessee's construction and post-construction stormwater permitting is similar to Washington State's, in that the Tennessee DEC issues construction-phase NOCs (notices of coverage), while local MS4 communities manage post-construction stormwater permitting. Nashville Metro's Grading Permit application requires submittal of plans for both construction and post-construction stormwater management practices. Under the voluntary design approach in Volume 5 of Nashville Metro's Stormwater Management Manual, soil restoration and/or compost amendment is integrated into any Green Infrastructure Practice that involves disturbed soils or

disconnection-based practices – particularly GIP-07 Downspout Disconnection, GIP-08 Grass Channels, GIP-09 Sheet Flow and GIP-10 Reforestation.

In addition, as an example of how soil restoration might also be included in local land development regulations, below is an amendment related to soil restoration that is currently under consideration for inclusion in the City of South Burlington's Land Development Regulations. As written, the amendment would fit in with the City's existing Construction and Erosion Control Standards, and consist primarily of procedures to ensure that soils are not excessively compacted after construction activities are complete.

ARTICLE 16 CONSTRUCTION AND EROSION CONTROL STANDARDS

16.03 Standards for Erosion Control during Construction

(C) Site Restoration.

The only requirement for site restoration following construction is that any disrupted portion of a site be graded and seeded. However, grading and seeding alone will not restore the natural permeability of previously undisturbed or minimally disturbed soils, especially where heavy earth moving equipment was used for grading and construction activities. This natural permeability can take years, or even decades, to return following the completion of construction—increasing the volume of runoff generated from formerly pervious surfaces over the long run. Although the guidance contained in Vermont's Low Risk Site Handbook represents an adequate minimum standard in terms of the other erosion and sediment control aspects of this article, it is silent with regard to the need to restore the natural infiltration capacity of soils following construction disturbance.

One way to address the need for restoration of compacted soils following construction would be to add language similar to the following: "Prior to the commencement of construction activity, compaction testing using a simple penetrometer (soil compaction tester) shall be conducted to provide a set of baseline measurement across areas to be disturbed. At minimum, compaction testing shall be performed in any areas where rooftop runoff is being directed, or any other areas proposed for disconnection. A number of tests sufficient to characterize natural variability in the areas to be disturbed shall be completed. Approximately 15-25 samples are often adequate, but results will depend on site heterogeneity. The tests should be completed when soils are at or near field capacity (meaning that the soil is holding all the moisture it can retain after draining freely under gravity, usually 2-3 days after the soil has been thoroughly wetted), to minimize the differences in compaction testing results that can result from difference in soil moisture. It is recommended that the applicant also sample an adjacent "control" or reference area which remains undisturbed during construction activities, to provide a benchmark for comparison with impacted sites both pre- and post-construction. Reference areas should be relatively close to areas of construction disturbance and have a similar soil type. Results of the pre-development testing shall be included in an Application for Site Plan (Section 14.05(D)), Master Plan Application (Section 15.07(C)(3)), or Preliminary Plat Application for Major Subdivision or PUD Approval (Section 15.08 (A)), as appropriate. Following the completion of site disturbance, post-construction compaction testing shall be completed in the same locations. If the post-construction testing results are more than 20% higher than the pre-construction compaction

testing results, soil restoration practices (such as compost amendment, tillage, or subsoiling) shall be applied to restore the subsurface's pre-construction characteristics."

For more details regarding equipment, procedures, and recommendations for sampling soil compaction using hand-held soil penetrometers, see, for example, http://www.cemml.colostate.edu/assets/PDF/TPS_04-1_Sampling_Compaction.pdf.