North Carolina Department of Environment and Natural Resources

Pat McCrory
Governor

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Secretary

MEMORANDUM

TO: ENVIRONMENTAL REVIEW COMMISSION
The Honorable Brent Jackson, Chairman
The Honorable Ruth Samuelson, Co-Chairman
The Honorable Mike Hager, Co-Chairman

FROM: Neal Robbins
Director of Legislative Affairs

SUBJECT: Report on Minimum Design Criteria for Stormwater Management

DATE: September 3, 2014

Pursuant to S.L. 2013-82 and amended by Senate Bill 734, the Department shall submit interim reports on its progress in developing the Minimum Design Criteria to the Environmental Review Commission no later than September 1, 2014 and December 1, 2014. The attached report satisfies the first interim reporting requirement.

If you have any questions or need additional information, please contact me by phone at (919) 707-8618 or via e-mail at neal.robbins@ncdenr.gov.

cc: Mitch Gillespie, Assistant Secretary for Environment
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Tracy Davis, Director, Division of Energy, Mineral, and Land Resources

NC Department of Environment and Natural Resources

Division of Energy, Mineral, and Land Resources

Progress Report on the Development of Minimum Design Criteria for Stormwater Management Pursuant to the Requirements of S.L. 2013-82 and SB 734

September 1, 2014

Since March 2014, the Minimum Design Criteria (MDC) Team has worked diligently to meet the regulatory requirements associated with Session Law 2013-82 (House Bill 480). This law requires DENR to convene a stakeholder team that includes industry experts, engineers, environmental consultants, faculty from the University of North Carolina and other stakeholders to develop MDC for stormwater management.

In summary, the Session Law 2013-82 tasks the MDC Team with the following:

1. To consult with DENR in developing MDCs that encompass all requirements for siting, design, construction and maintenance of stormwater BMPs. The MDCs shall be developed with the goal of generating state stormwater permits that comply with state water quality standards. DENR shall submit its recommendations to the Environmental Review Commission by September 1, 2014.

2. To consult with the N.C. Environmental Management Commission (EMC) in developing a fast-track permitting process for issuing state stormwater permits without a technical review when all best management practices comply with all MDCs and the permit application is prepared by a qualified individual. The EMC shall adopt a fast-track permitting rule no later than July 1, 2016.

The MDC stakeholder team is comprised of 25 members who represent environmental consultants, the construction industry, local governments, university faculty, environmental groups, soil scientists, landscape architects, DOT and DENR. (See Appendix A for a list of team members.) The team has met for three hours once a month since March 2014 and has invested time between each meeting reading and preparing comments.

Despite the broad composition of the team, team members have been successful in reaching consensus and it has been a great opportunity to review and update stormwater design standards with a diverse and knowledgeable group of experts. In many cases, the work products of the MDC Team remove outdated design standards that are no longer believed to protect water quality. The efforts of the MDC Team are documented on the MDC Team web site at: http://portal.ncdenr.org/web/lr/state-stormwater/mdc-team.

Achievements of the MDC Team to Date

The first achievement of the MDC Team was the approval of a charter to establish procedures and protocols. The second was to define "Minimum Design Criteria" (MDC) and several other terms that clarify the role that a design practice might have in addressing water quality standards:

- *Minimum Design Criteria (MDC):* Design standards that must be met to ensure that a stormwater treatment system functions in perpetuity to protect water quality standards and achieves the pollutant removal rates associated with the system. The MDC apply to stormwater treatment systems regardless of the geographical location of the system, the stormwater program requirements to which it is subject or whether the system is being reviewed under the fast-track or regular review process. Additional supplemental design standards (described below) may also be implemented to address watershed-specific concerns. The design standards to be adhered by are to be based on state statute or NC Administrative Code.
- *Recommendation:* Design standards that the MDC Team considers to be a good idea but are not required by statute or rule to obtain a stormwater plan approval. Recommendations do not play any part in permitting decisions; they are just suggestions for designers to consider and use or discard as they deem appropriate.
- *Nutrient Design Criteria:* Supplemental design standards in addition to the MDC to increase the Total Nitrogen (TN) and Total Phosphorus (TP) pollutant removal rates associated with the device. Each nutrient design criteria will have an associated increase in TN and TP reduction for the device.
- *Bacteria Design Recommendation:* Supplemental voluntary design recommendations in addition to the MDC to optimize the device's effectiveness in reducing bacteria concentrations in stormwater. (Note: The larger design storm required for SA waters is one means for addressing removal of bacteria.)

- *Temperature Design Recommendation:* Supplemental voluntary design recommendations in addition to the MDC to optimize the device's effectiveness in reducing temperature impacts from stormwater.

The third, fourth and fifth achievements of the MDC Team to date are:

- **MDC that apply to all BMPs** (Appendix B)
- **MDC for wet ponds** (Appendix C)
- **MDC for infiltration systems** (Appendix D).

Goals for the Future

The MDC Team still has 11 stormwater practices for which to develop MDC, including:

1. Level Spreader & Vegetated Filter Strip
2. Stormwater Wetland
3. Sand Filter
4. Bioretention
5. Disconnected Impervious Surface
6. Swales
7. Dry Detention Basin
8. Permeable Pavement
9. Rainwater Harvesting Systems
10. Green Roof
11. Proprietary Systems

Each of these devices has its own set of siting, design, construction and maintenance concerns. With the passage of Senate Bill 734 that extends the deadline for completing the MDC for every BMP to February 1, 2015, the MDC Team has decided to lengthen its meetings from three hours to six hours in order to complete its work on the MDC by the deadline. DEMLR will continue to work closely with the MDC Team and will provide an update in its next progress report due December 1, 2014.

DEMLR staff is incorporating the MDC into two very important products:

- Updates to the DENR Stormwater Guidance Manual so that it is consistent with the MDC developed by the MDC Team.
- Rule-making to codify the MDC into the 15A NCAC 2H .1000 rules, which govern the design, construction and maintenance requirements for stormwater control measures.

The MDC Team is aware of DEMLR's efforts to update the Stormwater Guidance Manual and the 15A NCAC 2H .1000 rules. Team members have been invited to provide input in both of these processes.

After the MDC for every practice are complete, the MDC Team will commence with developing a fast-track permitting process for issuing state stormwater permits without a technical review when all best management practices comply with all MDCs and the permit application is prepared by a qualified individual. It is anticipated that the MDC team will begin drafting rules, immediately following the completion of the MDC. DEMLR's goal is to present draft fast track permitting rules, and revisions to the 15A NCAC 2H .1000 rules as noted above, to the Environmental Management Commission in November 2015 for approval to begin the rule making process.

Appendix A: MDC Team Membership

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Eng = Engineering/design community
Con = Construction
Env = Environmental Group
Ac = Academia
HBA = Home Builder's Association
LG = Local government
LA = Landscape Architect
Soil = Soil Scientist

Appendix B: MDC that Apply to all BMPs (May 19, 2014)

1	The size of the system must take into account the runoff at the ultimate build-out potential from all surfaces draining to the system. Off-site drainage may be bypassed.
2	All stormwater systems shall be located in recorded drainage easements for the purposes of operation and maintenance and shall have recorded access easements to the nearest public right-of-way. These easements shall be granted in favor of the party responsible for operating and maintaining the stormwater management systems. Alternative agreements for protecting the footprint of stormwater systems and providing access for operation and maintenance will be considered on a case-by-case basis.
3	Stormwater systems impacted by sedimentation and erosion control during the construction phase must be cleaned out and converted to their approved design state.
4	All side slopes being stabilized with vegetative cover shall be no steeper than 3:1 (horizontal to vertical). Retaining walls or hardened slopes that are steeper are acceptable. Steeper vegetated slopes may be considered on a case-by-case basis provided that the applicant demonstrates that the soils and vegetation will remain stable in perpetuity.
5	An operation and maintenance (O&M) plan or manual shall be provided for the stormwater systems, indicating the O&M actions that shall be taken, specific quantitative criteria used for determining when those actions shall be taken and who is responsible for those actions. The plan must clearly indicate the steps that shall be taken and who shall be responsible for restoring a stormwater system to design specification if a failure occurs and must include and acknowledgment by the responsible party. Operation and maintenance agreements shall be signed and notarized.
6	Stormwater systems must be designed by an individual who meets any NC occupational licensing requirements for the type of system proposed.
7	Upon completion of construction, the designer for the type of stormwater system installed must certify that the system was inspected during construction, was constructed in substantial uniformity with plans and specifications approved by the Division and complies with the requirements of the permit. A subcommittee is reviewing and will report back to the MDC Team.
8	The required treatment volume of a volume-based BMP shall be calculated using one of the following two methods or another engineering method if it is demonstrated to provide equivalent protection of receiving streams: The Simple Method with a design storm depth of 1.5” in Coastal Counties, the 1-year, 24-hour storm depth in SA waters, and 1.0” elsewhere. The difference between the pre- and post-development runoff volume using Discrete NRCS Method, where the 90th percentile storm event is used for runoff depth for non-SA waters and the 1-year, 24-hour storm is used for runoff depth in SA waters. “Discrete”means that the SCS method is run twice: first, to yield runoff volume from the impervious surface and second, to yield runoff volume from the remainder of the site. (The total runoff volume is the sum of the two results.)

Appendix C: MDC that Apply to Wet Ponds (July 10, 2014)

1.	SITING. If the pond is within 50 feet of a jurisdictional wetland, then the design permanent pool elevation (the first outlet of the pond outlet structure) shall not be greater than six inches below the SHWT elevation. NCSU-BAE professors will be consulted to fill in the blanks.
2.	PERMANENT POOL SURFACE AREA AND VOLUME. The permanent pool shall be sized using either the Hydraulic Retention Time (HRT) Method or the SA/DA and Average Depth Method per the procedures described within this chapter.
3.	PERMANENT POOL DEPTH. The minimum depth of the permanent pool above the sediment storage elevation shall be three feet. The maximum depth of the permanent pool shall be 20 feet (to avoid thermal upwelling).
4.	SEDIMENT STORAGE. A minimum sediment storage depth of 6 inches shall be incorporated into the basin's main pool and forebay.
5.	LOCATION OF INLET AND OUTLET STRUCTURES. The inlet and outlet structures shall be located in a manner that avoids short circuiting in the pond.
6.	PRETREATMENT. Wet detention ponds shall be designed with a forebay to enhance sedimentation at the inlet to the pond. The forebay volume shall be approximately 20% of the total permanent pool volume, leaving about 80% of the design volume in the main pool. The water flowing over (or through) the separation structure must be at a nonerosive velocity.
7.	CONVEYANCE OF STORMS EXCEEDING THE DESIGN STORM. The pond shall include a method for safely conveying storm events exceeding the design storm in a manner that prevents catastrophic failure of the device.
8.	VEGETATED SHELF. The pond shall be designed to provide for a vegetative shelf around the perimeter of the basin. This shelf shall be gently sloped (6:1 or flatter) and shall consist of native vegetation. The minimum width shall be six feet.
9.	DRAWDOWN RATE. The discharge rate from the pond following the design storm shall be such that the draw down to the permanent pool level occurs within five days, but not in less than two days.
10.	DISCHARGE RATE. The pond shall discharge the storage volume at a rate equal to or less than the predevelopment discharge rate for the one-year, 24-hour storm. Dr. Bill Hunt will propose an alternative by December 1, 2014 and present it to the MDC Team.
11.	FOUNTAINS. Fountains within ponds shall follow the requirements in this chapter. Other fountain designs may also be considered if it can be shown that they will not resuspend sediment or cause erosion in the pond.
12.	VEGETATION 1. Trees and woody shrubs shall not be planted on the dam structure.

13.	VEGETATION 2. Wet detention basins should incorporate several (minimum of three) diverse species of shallow water emergent and shallow land herbaceous vegetation on the vegetated shelf. A minimum of 50 plants per 200 sf of shelf area shall be planted. Larry Ragland and Annette Lucas will work together to improve this MDC.
14.	VEGETATION 3. All trees and shrubs should be set back so that the branches will not extend over the basin. The team discussed removing this during the meeting, but since then one team member has expressed concern that doing so could compromise side slopes. DEMLR will check into this and get back to the team.
15.	VEGETATION 4. Turf grass shall be provided on the tops of berms and on the exterior slopes of containment berms. Centipede grass is recommended.
16.	VEGETATION 5. Weeping love grass on the vegetated side slopes because it does not provide long-term slope stabilization.
17.	TRASH RACK. A trash rack or other device shall be provided to prevent large debris from entering the outlet system.
18.	MAINTENANCE. The basin shall be maintained in accordance with Table 10-6 of this chapter.
Rec 1.	OUTLET 1. A drawdown orifice should have a turned-down elbow in order to prevent trash or other material floating on the surface from clogging the pipe.
Rec 2.	OUTLET 2. The design engineer should calculate flotation force for any outlet design subject to flotation forces.
Rec 3.	OUTLET 3. Measures should be provided along the barrel of the principal spillway to prevent piping.
Rec 4.	OUTLET 4. Durable materials, such as reinforced concrete, are preferable to corrugated metal in most instances. The riser should be placed in or at the face of the embankment such that maintenance access is facilitated and flotation forces are reduced. (BMP Manual text)
Nutrient DC 1	FLOATING WETLANDS. Floating wetlands can be added to the wet detention pond to increase the nutrient removal rates. (+? removal credit for TN and +? removal credit for TP = to be determined)
Temp Rec 1	SHADING. Trees and shrubs can be planted to maximize pond shading, primarily along the south, east, and west sides of the basin to reduce temperature impacts.
Temp Rec 2	OUTLET MODIFICATION. The outlet structure can be modified to withdraw from a deeper point in the permanent pool to reduce temperature impacts.

Appendix D: MDC that Apply to Infiltration Systems (August 25, 2014)

1.	SETBACK FROM WELLS. Infiltration systems shall be a minimum distance of 50 feet from private water supply wells and 100 feet from public water supply wells.
2.	SITING. Infiltration systems shall not be located on areas with currently contaminated soils.
3.	SEPARATION FROM THE SHWT. The bottom of infiltration systems shall typically be a minimum of two feet above the SHWT. However, the separation can be relaxed to one foot when the applicant can prove that the water table will subside to its pre-storm elevation in five days or less.
4.	SOIL SUBGRADE SURFACE. The surface of the soil subgrade shall have a slope of less than or equal to two percent (level). Terraces and baffles may be installed to achieve a level subgrade
5.	PRETREATMENT. Pretreatment devices must be provided to prevent clogging, except for stormwater conveyed from a rooftop. Pretreatment devices may include measures such as sumps in catch basins, gravel verges, screens on patio drains, filters, filter strips, grassed swales and forebays.
6.	DRAW DOWN TIME AND SOIL INVESTIGATION. Infiltration systems must be designed to completely dewater to the bottom of the infiltration device within 72 hours after the design storm. A site-specific soil investigation shall be performed to establish the hydraulic properties and characteristics of the area in which the infiltration device will be sited.
7.	PLACEMENT OF INFILTRATION MEDIA. In-situ soils may be removed and replaced with infiltration media or infiltration media may be placed on top of in-situ soils if the applicant can demonstrate that the modified soil profile allows for drainage of the infiltration device within 72 hours after the design storm.
8.	OBSERVATION WELL. For buried infiltration devices, a minimum of one inspection port shall be provided.
Rec 1	VEGETATION. Herbaceous vegetation is allowed to maintain good infiltration rates throughout the vertical profile of the infiltration basin.
Rec 2	UNDERGROUND INFILTRATION. Infiltration systems may be buried.
Rec 3	INJECTION WELL NOTIFICATION. Check with Aquifer protection to see if the infiltration device requires notification as an injection well, particularly if the device is buried or if the infiltration device's depth exceeds its width.
Rec 4	IMPACTS OF SEEPAGE. The designer should consider the potential impacts of the infiltration device on nearby structures from seepage.