GUILFORD COUNTY ADDENDA

These addenda shall be used in conjunction with the latest addition of the North Carolina Division of Water Quality Stormwater Best Management Practices Manual and both will further be known as the latest addition of the Guilford County Water Quality Protection Manual as referenced in the Development Ordinance for County of Guilford, North Carolina. The latest edition of the North Carolina Division of Water Quality Stormwater Best Management Practices Manual can be downloaded at the following web address: http://h2o.enr.state.nc.us/su/bmp_forms.htm

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CHAPTER 1 INTRODUCTION

- Section 1.3 – Guilford County re-emphasizes this manual does not cover every aspect of civil engineering and structural design necessary for proper BMP system design and construction. The design professional is responsible for the design and construction of a properly functioning stormwater BMP.
- Section 1.3 – Guilford County's Development Ordinance only allows a North Carolina Professional Engineer to prepare the stormwater management/watershed development plan(s) when permanent runoff control structures are required for development /redevelopment.

CHAPTER 2 NORTH CAROLINA'S STORMWATER REQUIREMENTS

- Section 2.2 – Contrary to submittal directions, all NPDES plan submittals shall be submitted directly to the County.
- Section 2.6.1 – 50% built-upon area is the maximum amount allowed in the Lower Randleman Lake Watershed

CHAPTER 3 STORMWATER CALCULATIONS

- Section 3.2 – Rainfall intensity can be taken from Table 8.03c of the North Carolina Erosion and Sediment Control Planning and Design Manual as well. A five minute storm duration shall be used unless calculations demonstrate a longer time of concentration.
- Section 3.3.2 – For a one inch (1") rainfall, there will be no runoff from an area with a CN of 70 or less.
- Section 3.3 – In accordance with 15A NCAC 02B .0104(t), an additional 15% built-upon area shall be added to the calculated built-upon area for single family residential developments. The following built-upon areas shall be used for each building lot in the specified zoning district unless justification can be demonstrated for less.
  RS-5 thru RS-15: 3000 SF
  RS-20: 3400 SF
  RS-30: 5500 SF
  RS-40: 6500 SF

CHAPTER 4 SELECTING THE RIGHT BMP

- Table 4-3 – Sand filter construction cost is variable depending upon the type; ranges from low to high.

CHAPTER 5 COMMON BMP DESIGN ELEMENTS

- Section 5.5 – The forebay shall provide a means of drawdown for maintenance. A ten foot (10') rip rap section has been successfully utilized on many wet detention ponds in Guilford County.
- Section 5.6 – An additional five percent (5%) of the design height of an earthen embankment dam shall be added to the top of dam elevation during fill placement to negate future settlement.
- Section 5.7 – Other type of underdrain pipe can be utilized as long as pipe less than 10 inches in diameter has an equivalent area of openings (0.884 in^2/ft) and will handle all anticipated loading conditions.
- Section 5.7 – Choking stone is basically pea gravel. Choking stone is recommended in Chapter 12 to be #8 or #89 washed stone. Refer to Chapter 26 "Gradation Design of Sand and Gravel Filters, National Engineering Handbook Part 633 published by the Natural Resources Conservation Service for guidance in selecting the proper gravel type.
- Section 5.8 – If the outlet structures are anchored by dead weight alone, the buoyant weight shall be used for analysis and the minimum factor of safety shall be 1.15. If structures are anchored to soil or rock, the minimum factor of safety for that portion of the resistance provided by soil or rock anchorage shall be 2.0.
- Section 5.8.8 - An underflow type trash guard is preferred over conical type trash guards. Experience has shown underflow type trash guards to be highly effective in preventing clogging and superior in preventing litter and debris from being transported downstream.

CHAPTER 6 LANDSCAPE AND SOIL COMPOSITION SPECIFICATIONS

- Section 6.4.1 – Landscape plans shall be prepared by a licensed North Carolina Landscape Architect.
- Section 6.4.1 – A one year (1 yr.) warranty period is customary and acceptable.
- Section 6.4.2 – Trees or shrubs shall not be planted on any portions of water impounding embankments.

CHAPTER 7 BMP INSPECTION AND MAINTENANCE

- Section 7.2.1 – A minimum of twenty feet (20') around the BMP is required in lieu of the ten feet specified. A twenty feet (20') wide access easement, traversable by construction equipment (i.e. tandem dump truck), from public right-of-way shall be provided for access to the access and maintenance easement over and around the BMP. A blanket access easement can be provided in lieu of an explicit one.

CHAPTER 8 LEVEL SPREADER

- Section 8.3.6 –The Randleman Lake Water Supply Watershed does not allow the outfall to be routed directly through the riparian buffer.

CHAPTER 9 STORMWATER WETLANDS

- Section 9.3.2 – The minimum volume of 3630 ft^3 (1 ac.-in.) shall be based upon the runoff from a one inch (1") rainfall.

CHAPTER 10 WET DETENTION BASIN

- Section 10.3.4 – The length used to calculate the minimum length to width ratio shall be the shortest distance between any inlet and the primary outlet of the pond.
- Section 10.4 – Anti-seep collars can be utilized on all impoundments with very low head at normal water level, six feet (6') or less. All anti-seep collars shall form a watertight connection with the principal spillway barrel. The anti-seep collars shall extend a minimum of two feet (2') beyond the outlet barrel and increase the hydraulic length of travel by at least fifteen percent 15%. A minimum of one collar shall be located downstream of centerline of dam. Where filter diaphragms are required, they must be designed specific to the adjacent soils used within the embankment and in accordance with current accepted engineering practices. A multi-stage sand and gravel filter which outlets through an internal drainage system is the industry standard. The use of filter fabrics to replace graded filters is not allowed in any location within a dam except where repairs can be made easily, safely, and inexpensively such as a downstream toe drain. Eliminating a conduit through the embankment eliminates the requirement for seepage control.
- Section 10.3.9 – Eliminate the screw type plug in the top of the "T" type trash guard for the low flow orifice.
- Additional Design Criteria

  - Spillway Design

  All impoundments shall have a spillway system with the capacity to pass the 100-year storm flow while providing one foot (1') of freeboard between the theoretical water surface elevation and the top of the dam. The spillway system can range from a single overflow channel (weir) to multiple inlet structures with conduits used in conjunction with an emergency spillway. In any case, the principal spillway shall be sized to convey the ten-year design storm. If separate principal spillway and emergency spillway devices are used then adequate vertical head shall be provided such that the 10-year design storm is conveyed through the principal spillway before the emergency spillway operates. Guilford County requires a minimum eight foot (8') width emergency spillway be incorporated into the design if it can be placed in in-situ soil regardless whether the calculations indicate the principal spillway will pass the flow from a 100-year storm event. The separate spillway provides an additional factor of safety that can be incorporated in the grading of the pond at a small cost and allows storm flow if a problem occurs with the riser/barrel assembly. The minimum diameter of the principal spillway barrel section (horizontal pipe) shall be fifteen inches (15") if it is a single wall corrugated pipe. The minimum cross-sectional area of the riser section (vertical pipe) shall be 1.5 times that of the barrel section. All materials used within the construction of the wet detention pond shall have a minimum design life of no less than 50 years. Reinforced concrete pipe, ductile iron, and corrugated aluminum pipe have all been used successfully. All joints shall be specified and constructed to be watertight under anticipated site conditions for the life of the pipe material.

- Dam and Embankment Construction

The pond and dam area shall be cleared, grubbed and stripped of all vegetative material and topsoil prior to dam construction. The disposal of trees, stumps, construction debris, vegetative material, etc. shall not be permitted in the dam or pool area of the pond. When blasting is used to remove rock from the pool area, the blasted area shall be over-excavated to a depth of at least two feet (2') below finish grade and brought back to finish grade with clean relatively impervious soil material compacted in place or an alternate method can be submitted for approval.

- Earth Fill Dams

Soil materials used for earth fill which are highly permeable or which exhibit significant shrink/swell, or dispersion shall not be used in the embankment unless specific detailed design report from a soils engineer is submitted as part of the plan approval. A cutoff trench (core trench) shall be provided to stable soil with a minimum width of four feet (4') and a minimum depth of 2 feet. The centerline of the cutoff trench shall be aligned with the centerline of the dam. The cutoff trench shall be carefully back-filled with highly impermeable material and compacted to at least ninety-five percent (95%) of standard proctor density. The minimum top width of the dam shall be ten feet (10'). It is recommended from the standpoint of safety, ease of maintenance, and aesthetics that slopes flatter than 3:1 be used around the pond when possible. All disturbed ground areas and embankments surrounding the pond shall have permanent ground cover established in accordance with Guilford County guidelines prior to final approval. Sericea Lespedeza, Weeping Lovegrass and Crown Vetch should not be used for the dam embankment, as these types of vegetation are difficult to maintain, encourage burrowing animal habitats, and prevent a thorough inspection of the dam embankment.

- Concrete Dams and Spillway Structures

Concrete dams and spillway structures shall be designed and built in accordance with the American Concrete Institute's (ACI) latest guidelines. Particular attention shall be paid to design and analysis, water tightness, concrete quality, and construction practices. Structures shall be designed and constructed to maintain water-tightness by controlling and limiting cracking with proper joint design and spacing.

- The Dam Safety Law of 1967 (15A NCAC 02K .0201) requires any person who proposes to construct, alter or remove a dam to file a statement with the State Dam Safety Engineer concerning the location of the dam, including the name of the stream and county, height, purpose, and impoundment capacity, 10 days before the start of construction. If the State determines that the dam is not exempt from the law, additional requirements in accordance with the Dam Safety Law of 1967 as amended will be imposed.

CHAPTER 11 SAND FILTERS

- Figures 11-1 and 11-2a - Both figures should show a perforated pipe extending the length of the sand filter chamber and not merely just a solid pipe stubbing into it.
- Since an underdrain is required to be incorporated into the device in Guilford County, the device does not require a one hundred feet (100') separation from water supply wells unless it is a community well. A community well has fifteen (15) or more connections and/or serves twenty-five (25) or more people.

CHAPTER 12 BIORETENTION

- Since an underdrain is required to be incorporated into the device in Guilford County, the device does not require a one hundred feet (100') separation from water supply wells unless it is a community well. A community well has fifteen (15) or more connections and/or serves twenty-five (25) or more people.

CHAPTER 13 FILTER STRIP

- No additions or revisions

CHAPTER 14 GRASSED SWALE

- No additions or revisions

CHAPTER 15 RESTORED RIPARIAN BUFFER

- No additions or revisions

CHAPTER 16 INFILTRATION DEVICES

- This type of BMP has no application in Guilford County based upon soil types.

CHAPTER 17 DRY EXTENDED DETENTION BASIN

- No additions or revisions

CHAPTER 18 PERMEABLE PAVEMENT

- Guilford County does recognize the use of certain categories of porous pavements for pedestrian and/or infrequent vehicular traffic. *Decks* constructed either level or elevated out of wood that bear foot traffic are considered non-built-upon area. *Soft paving* materials such as mulch, crushed shell, and other organic materials do not count as built-upon area. Lastly, *porous turf* used with modern reinforcements installed strictly in accordance with the manufactures guidelines has application for infrequent uses that allow the grass time to regenerate between events. No other permeable pavement systems receive credit as non-built-upon area or as a percent managed grass.

CHAPTER 19 ROOFTOP RUNOFF MANAGEMENT

- No additions or revisions

CHAPTER 20 PROPRIETARY SYSTEMS

- No additions or revisions

CHAPTER 21 BMP CONSTRUCTION TECHNIQUES (FUTURE CHAPTER)

- Designers are responsible to specify all material types which are permanently incorporated into a project as well as all construction techniques required to achieve an acceptable product. There are many recognized sources for this information and they include the American Society for Testing and Materials (ASTM), the North Carolina Department of Transportation (NCDOT), the Association of General Contractors (AGC), and the Construction Specifications Institute (CSI).

CHAPTER 22 SWM PLANS: SUBMITTAL REQUIREMENTS (FUTURE CHAPTER)

- Plan submittals shall include all design calculations and a completed design checklist (forthcoming) to be considered complete. All plans and calculations shall be sealed, signed, and dated by the design professional.

APPENDIX A

- See additional links for stormwater and environmental related information on the Guilford County website at the web address: www.co.guilford.nc.us/watershed_cms/links_ws.html

APPENDIX B

- No additions or revisions

APPENDIX C

- Guilford County requires the stormwater BMP along with its access and maintenance easement to be platted.

FORMS

- BMP Design Checklists – Forthcoming
- Operation & Maintenance Agreements – The North Carolina Division of Water Quality's forms can be utilized for this purpose and they can be downloaded at the following web address: http://h2o.enr.state.nc.us/su/bmp_forms.htm
- Engineer's Statement of Completion / Record of Construction – Forthcoming
- Low Impact Design Checklists – This is included since it is referenced in the Development Ordinance for County of Guilford, North Carolina, however it is obsolete and is no longer a requirement
- Deed Restrictions - The North Carolina Division of Water Quality's forms can be utilized for this purpose and they can be downloaded at the following web address: http://h2o.enr.state.nc.us/su/bmp_forms.htm