Post Construction Water Quality Training: New Regulations

Understanding and Complying with New Water Quality Regulations for Development and Redevelopment Projects

December 6, 2017

Agenda

9:15	Check-in / Registration
9:40	Introduction
9:50	Reedy River Water Quality Group Update and Effects on County Requirements
10:20	Context of New Water Quality Regulations
10:50	**BREAK**
11:05	Modeling Study Results and Implications
11:30	New Water Quality Regulation Roll Out
12:00	**LUNCH**
12:45	Revisions to the Stormwater Management Design Manual
1:15	Updates from Land Development Staff
2:45	Questions & Answers

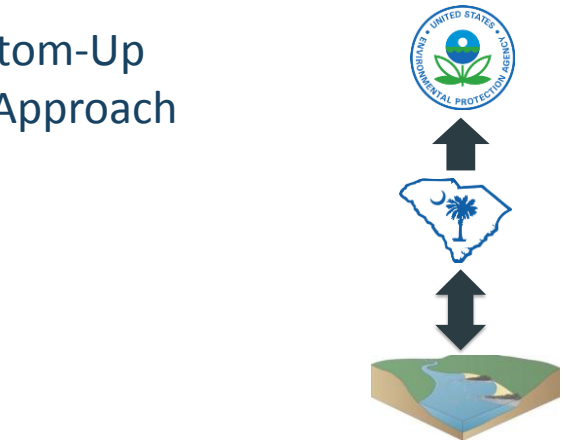
Reedy River – Recent Landmark Events/Regulations

1. 1996 - Colonial Oil pipeline failure
2. 1999 - Lake Greenwood algal bloom
3. 2000 - Greenville County becomes MS4 permittee
4. 2006 - City of Greenville becomes MS4 permittee
5. 2008 - DHEC issues draft nutrient TMDL
6. 2015 - Upstate stakeholders form the RRWQG

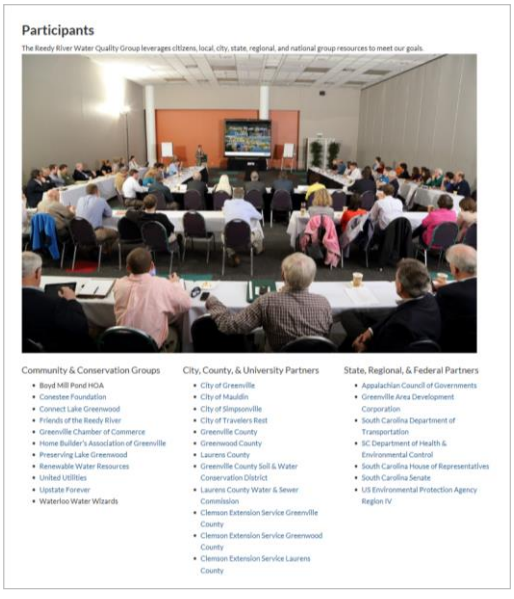
Concepts Driving 5R Process

1. Recognize and encourage local watershed restoration efforts
2. Builds partnerships and encourages collaboration
3. Empowers those with a responsibility to reduce loading and decide how WQS will be achieved
4. Acquire practical information for water quality advancements
5. Expedites implementation of watershed restoration

Bottom-Up
5R Approach



Reedy River Water Quality Group



Greenville County

city of greenville

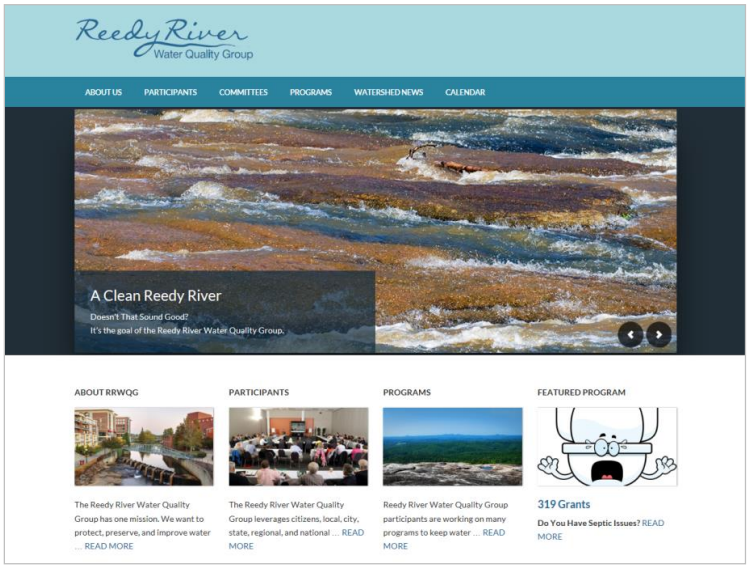
ReWa renewable water resources

RRWQG- Organizational Structure

Watershed Plan Components

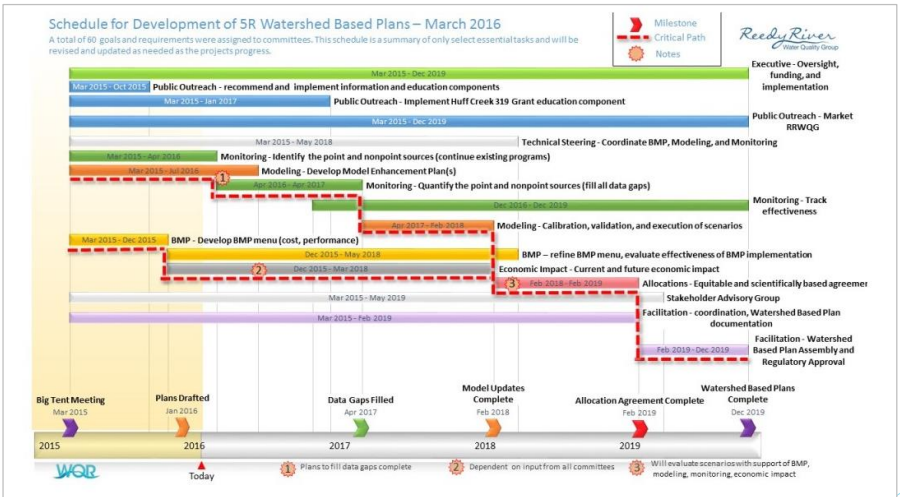
1. Description of waterbody and statement of the problems causing the impairment (point and non-point sources)
2. Anticipated pollutant load reductions necessary to meet water quality standards
3. Water quality restoration activities expected to achieve WQS
4. Cost estimates and funding commitments
5. Anticipated schedule for implementing each activity and expected completion date
6. Monitoring plan to track effectiveness of restoration activities
7. Estimated date for achieving WQS

Reedy River Water Quality Group



cleanreedy.org

Project Schedule

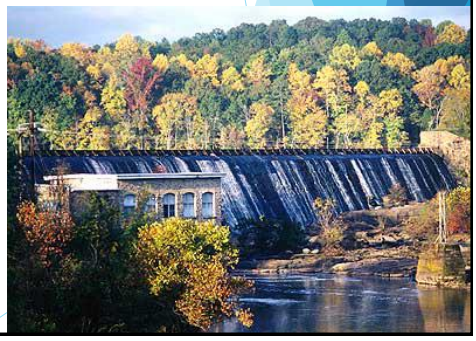


Draft Schedule for Development of Watershed Based Plans –October 2015

RRWQG- Current Status

1. Regular sub-committee and executive committee meetings
2. Public education/outreach, primarily through social media
3. Revised watershed-wide model development
4. On-going monitoring and sampling/data collection
5. Economic impact evaluation
6. BMP implementation and planning

Primary focus on TN with secondary focus on TP…



Context of New Water Quality Regulations

Why not Nitrogen?

- Nitrogen accounts for 78% of the atmosphere making it ubiquitous
- It comes to the aquatic ecosystem from everywhere
  - Wet fall
  - Dry fall
  - Point sources
  - Non-point sources
  - Surface exchanges

Why Phosphorus?

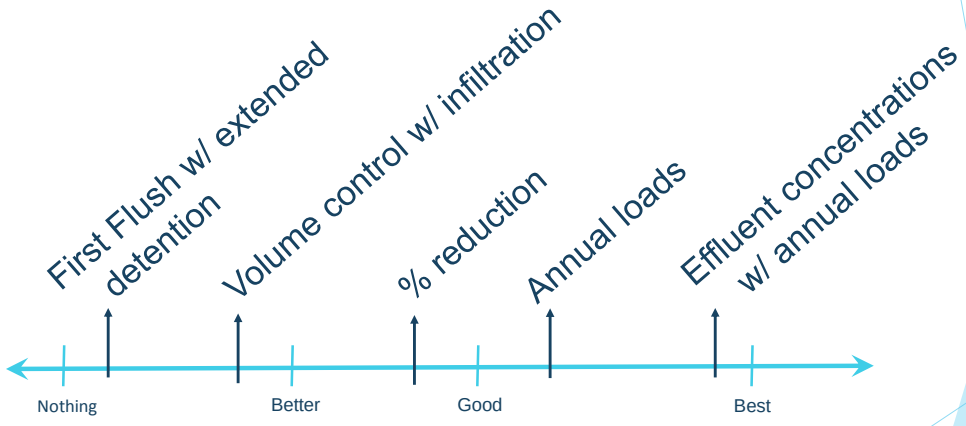
- It is a fundamental element that is essential for life
- Limiting nutrient for growth due to excess availability of other constituents
- More controllable
- An excess amount of phosphorus in aquatic ecosystems could result in eutrophication
  - Eutrophication could result in excessive production of autotrophs, especially algae and cyanobacteria
  - The high productivity leads to bacterial activities and high respiration rates, leading to hypoxia and stratification of dissolved oxygen downstream lakes
  - Low dissolved oxygen causes loss of aquatic life
  - Degradation of the aquatic life causes further decrease in dissolved oxygen and release of phosphorus which further exacerbates the eutrophication process

Post Development Standards

EPA's Stated Goal

- Reduce, through regulation, the impacts of new development and redevelopment storm water runoff to the Nation's waters. – *EPA NPDES website*
- How?
  - "Require completed projects to be designed, built, and maintained so as to retain the sites' pre-development hydrologic characteristics to the extent technically feasible" – *NRC publication - "Urban Stormwater Management in the United States", October 15, 2008*
- What?
  - Make the developed site act like it did before it was developed

Regulatory Approaches



Basis for Performance Standard	*Description*	*Performance Standard*
Rainfall	*Minimum storm volume to be retained on site.*	*Design, construct, and maintain stormwater management practices that manage rainfall on-site, and prevent the off-site discharge of the precipitation from [insert standards, such as "the first one inch of rainfall from a 24-hour storm preceded by 48 hours of no measurable precipitation"]. Discharge volume reduction can be achieved by canopy interception, soil amendments, evaporation, rainfall harvesting, engineered infiltration, extended filtration and/or evapotranspiration and any combination of the aforementioned practices. This first one inch of rainfall must be 100% managed with no discharge to surface waters, except when the permittee chooses to implement the conditions in Part 5.2.5.d below*
Rainfall	*Minimum storm size to be retained on site.*	*Design, construct, and maintain stormwater management practices that manage rainfall on-site, and prevent the off-site discharge of the precipitation from all rainfall events less than or equal to [insert standards, such as "the 95th percentile rainfall event"]. This objective must be accomplished by the use of practices that infiltrate, evapotranspire and/or harvest and reuse rainwater. The 95th percentile rainfall event is the event whose precipitation total is greater than or equal to 95 percent of all storm events over a given period of record.*
Recharge/Runoff	*Hydrologic analysis.*	*Design, construct, and maintain stormwater management practices that preserve the pre-development runoff conditions following construction. The post-construction rate, volume, duration and temperature of discharges must not exceed the pre-development rates and the pre-development hydrograph for 1, 2, 10, 25, 50 and 100 year storms must be replicated through site design and other appropriate practices. These goals must be accomplished through the use of infiltration, evapotranspiration, and/or rainwater harvesting and reuse practices. Defensible and consistent hydrological assessments and modeling*

		methods must be used and documented.
Recharge	*Groundwater recharge requirement.*	*Any "major development" project, which is one that disturbs [insert standards, such as at least one (1) acre of land or creates at least 0.25 acres of new or additional impervious surface], must comply with one of the following two groundwater recharge requirements:* • *Demonstrate through hydrologic and hydraulic analysis that the site and its stormwater management measures maintain 100 percent of the average annual pre-construction groundwater recharge volume for the site; or* • *Demonstrate through hydrologic and hydraulic analysis that the increase of stormwater discharges volume from pre-construction to post-construction for the two-year storm is infiltrated.*
Annual Pollutant Load	*Hydrologic Analysis Loading Calculations*	*Design, construct and maintain stormwater management practices that preserve the pre-development runoff conditions following development. Post construction annual pollutant loads are not allowed to exceed pre-development levels. Whenever and wherever appropriate, runoff volume and peak discharge rates for specific design storms should be taken into account as well. These goals will be accomplished through low impact development practices (LID) including impervious cover limitations and treatment means. Water quality modeling methods used to support establishment of this standard must be defensible and be consistent with the MEP standard, to protect water quality and to satisfy the appropriate water quality requirements of the CWA[2].*

EPA Performance Standard Examples

- Minimum storm volume to be treated on site (first flush approach)
  - *"…the first one inch of runoff from a 24-hour storm…"*
- Example: SC Reg. 72-300

Strengths
Simple to calculate
Better than nothing

Weaknesses
No direct connection to pollutants of concern
No accounting of pollutant removal
No incentive to reduce impervious area
Doesn't allow TMDL restrictions
Oversimplified approach to a complicated problem

EPA Performance Standard Examples

- Minimum storm size to be retained on site
  - *"…the 95th percentile rainfall event…"*
- Examples: EISA, Beaufort County, SC, State of Maryland, Georgia Blue Book

Strengths
Not complicated to calculate
Incentivizes the reduction of impervious area

Weaknesses
No published 95th percentile rainfall depths
No direct connection to pollutants of concern
No accounting of pollutant removal
Doesn't allow TMDL restrictions
Oversimplified approach to a complicated problem
Assumes the 95th percentile storm infiltrates in pre-developed conditions for all sites - steep and rocky areas - high groundwater table - clay soils

EPA Performance Standard Examples

- Post-development hydrology ≤ pre-development hydrology
  - *"…preserve pre-development runoff conditions for rate, volume, duration, and temperature of discharges for the 1, 2, 10, 25, 50, and 100-year storms…"*
- Examples: Church Creek watershed in Charleston, SC

Strengths
Acknowledges direct connection between pre-development and post-development hydrologic conditions
Incentivizes the reduction of impervious area
Incentivizes redevelopment
Good flood mitigation approach

Weaknesses
No direct connection to pollutants of concern
No accounting of pollutant removal
Doesn't allow TMDL restrictions
Ignores pollutants from most storm events because water quality BMPs designed for large storm events do not necessarily work for small storm events

EPA Performance Standard Examples

- Groundwater recharge
  - *"…demonstrate through H&H analysis that the site maintains 100% of the average annual pre-construction groundwater recharge volume…"*
- Examples: Connecticut and New Jersey

Strengths
Acknowledges direct connection between pre-development and post-development hydrologic conditions
Incentivizes the reduction of impervious area
Promotes groundwater recharge

Weaknesses
No direct connection to pollutants of concern
No accounting of pollutant removal
Nearly impossible to calculate percentage of infiltrated runoff contributing to groundwater recharge
Doesn't allow TMDL restrictions
Promotes recharging the groundwater table with polluted water

Other Approaches

- % Removal of Sediment (TSS)
  - On an annual weight basis
- Example: Greenville County

Strengths
Numerically based reduction calculated
Allows for site specific conditions to be taken into account
Allows design characteristics of BMPs to be taken into account
Allows use of Manufactured Treatment Devices (MTDs) in site design
Promotes Low Impact Development (LID) techniques & practices

Weaknesses
No direct connection to other pollutants
Arbitrary reduction of varying loads
Does not incentivize reduction of pollutant generation
Doesn't allow additional TMDL restrictions

Other Approaches

- Annual loading
  - Annual loading requirement with predefined BMP removal rates
- Examples: Virginia's Runoff Reduction Method (Chesapeake Bay TMDL), State of NC (Jordan Lake and Falls Lake Rules), Florida's Harper Method

Strengths
Direct connection to pollutants of concern
Numerically based reduction (spreadsheet)

Weaknesses
Restricts design alternatives
Doesn't take BMP or individual site characteristics into account
Can't be used for complex sites
Requires extensive design criteria
Doesn't allow additional TMDL restrictions

EPA Performance Standard Examples

- Post-development POC loading ≤ pre-development POC loading
  - *"…post-construction annual pollutant loads are not allowed to exceed pre-development levels for pollutants of concern…"*
- Examples: OCRM and SCDHEC Antidegradation Policy, Greenville County (beginning 2018)

Strengths
Deals directly with pollutants of concern
Allows for site specific conditions to be taken into account
Less controversial (policy driven)
Allows design characteristics of BMPs to be taken into account
Overly prescriptive design standards are not needed
Facilitates TMDL restrictions

Weaknesses
More complicated to calculate
More complicated to regulate

Feasibility Study

Study Method

10 randomly-chosen project sites that were permitted meeting the 85% TSS Trapping Standard or Alternative TSS Standard

Development Type	Greenville County Project Number	Area Disturbed	Area Modeled
Commercial	1307	1.4	1.4
	1218	1.6	1.6
	1229	1.3	1.3
	1276	17.4	17.4
Residential	1296	46.9	81.2
	1264	7.9	7.9
	1261	47.7	196.5
	1288	23.4	23.4
	1294	6.2	6.2
Institutional	1231	3.3	3.3

Study Method

- Proposed Standard: no net increase in TP loading from predevelopment conditions
- Built pre-development and post-development IDEAL models based on original design submittals
- Used incremental modifications, but did not try everything possible. A skilled designer may be able to improve on proposed design modifications.

Level of Difficulty	Description	Number of Sites
No Modifications Required	The site met the proposed TP standard as permitted	2 / 10
Minimal Modifications	The existing BMPs were modified by expanding surface area up to 25% or converting to a more effective BMP	2 / 10
Moderate Modifications	At least one additional BMP was required, but that BMP fit within the site footprint and was relatively small	5 / 10
Major Modifications	More than one additional BMP was required, and/or the additional BMP(s) were relatively large and costly	1 / 10

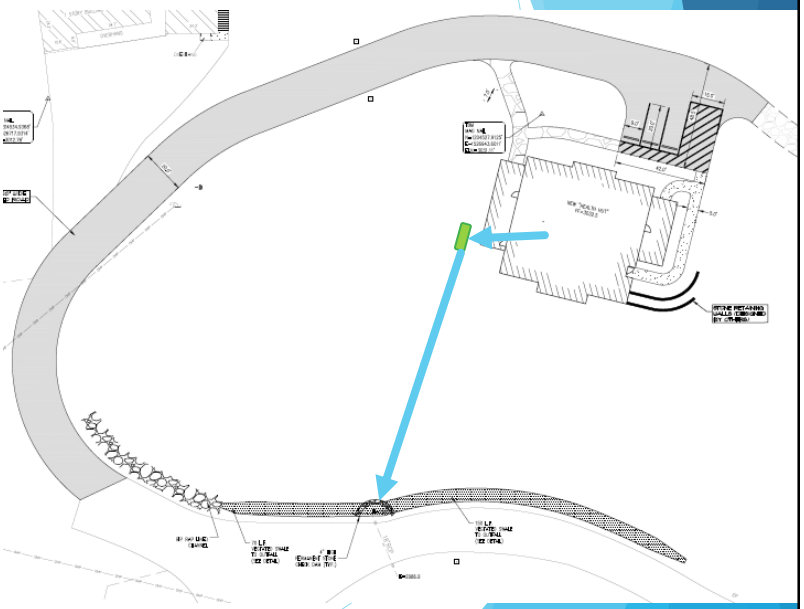
PN 1218 (Commercial)

Permitted

- New building to replace slightly smaller building
- 1.55 acres disturbed
- Two bioswales (<3% of disturbed area)

Proposed (Moderate)

- Added a 50 square foot bioretention cell (BMPs total <3% of area)



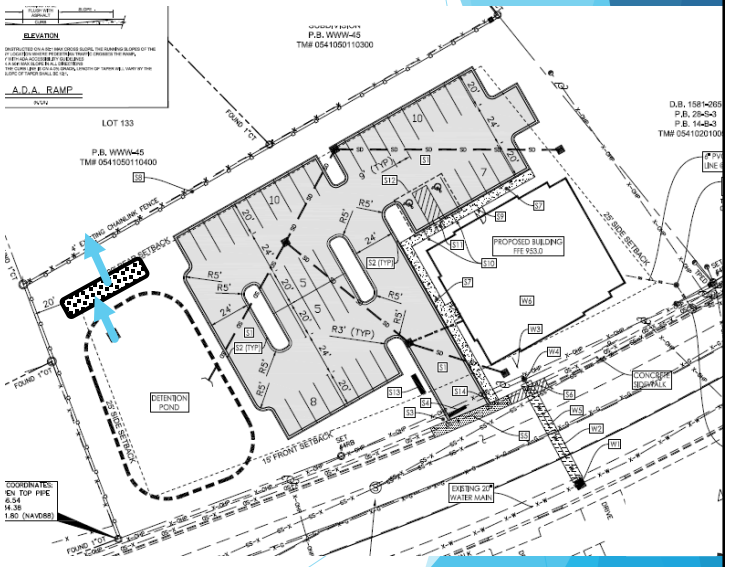
PN 1229 (Commercial)

Permitted

- Single building and parking lot
- 1.3 acres disturbed
- Single dry pond (11% of disturbed area)

Proposed (Moderate)

- Added 360 sq-ft infiltration trench downstream of pond
- Pond size reduced to accommodate infiltration trench w/n property setbacks (BMPs total 11% of area)



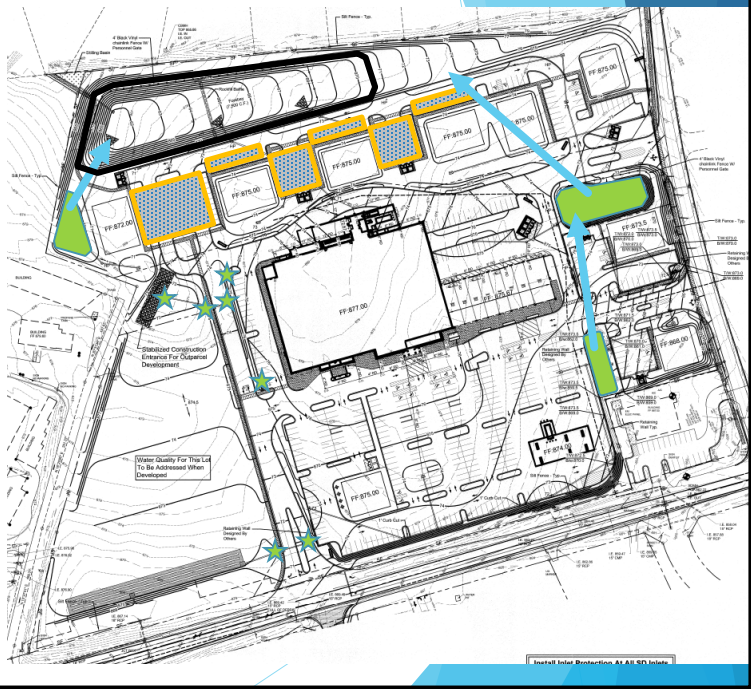
PN 1276 (Commercial)

Permitted

- Multi-building commercial & office development
- 17.4 acres disturbed
- 3 dry ponds, 7 catch basin filter inserts (6% of disturbed area)

Proposed (Major)

- 2 ponds were converted to BRCs
- Added 1,300 sq-ft BRC upstream of 3rd pond
- Proprietary biofiltration units replaced filter inserts in 7 catch basins
- 1 ac of parking lot was converted to porous pavement (11% including porous pavement)



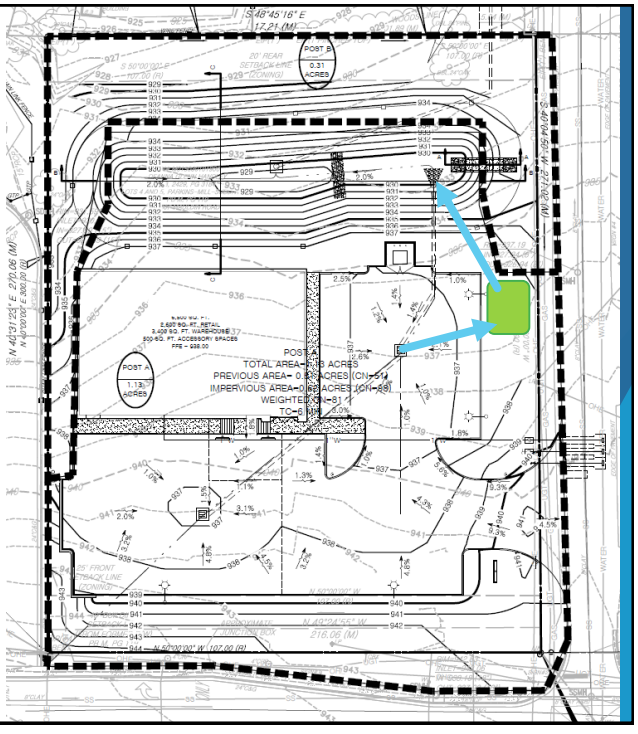
PN 1307 (Commercial)

Permitted

- Single building and parking lot
- 1.28 acres disturbed
- One dry detention pond (12% of disturbed area)

Proposed (Moderate)

- Met proposed standard by diverting runoff into 440 sq-ft bioretention cell before planned dry pond (BMPs total 12.5% of area)



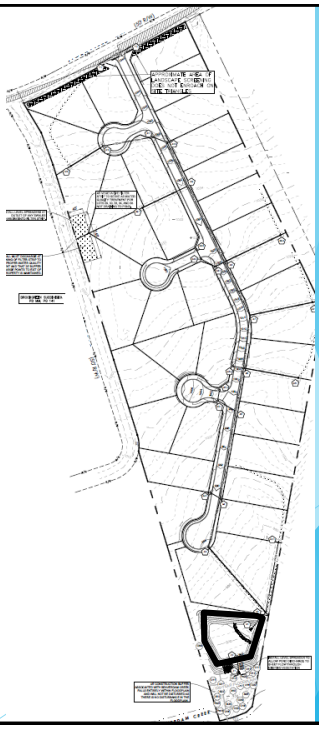
PN 1288 (Residential)

Permitted

- 37 lot single family subdivision
- 23.4 acres disturbed
- 2 VFS and dry pond (3% of disturbed area)

Proposed (No modification)

- Met proposed standard with no modifications



PN 1294 (Residential)

Permitted

- 5 building multifamily development expansion
- 6.2 acres disturbed
- Single dry pond (6% of disturbed area)

Proposed (Minimal)

- Pond was unnecessarily deep and was improved by having larger bottom area to promote infiltration (total 6% of area)

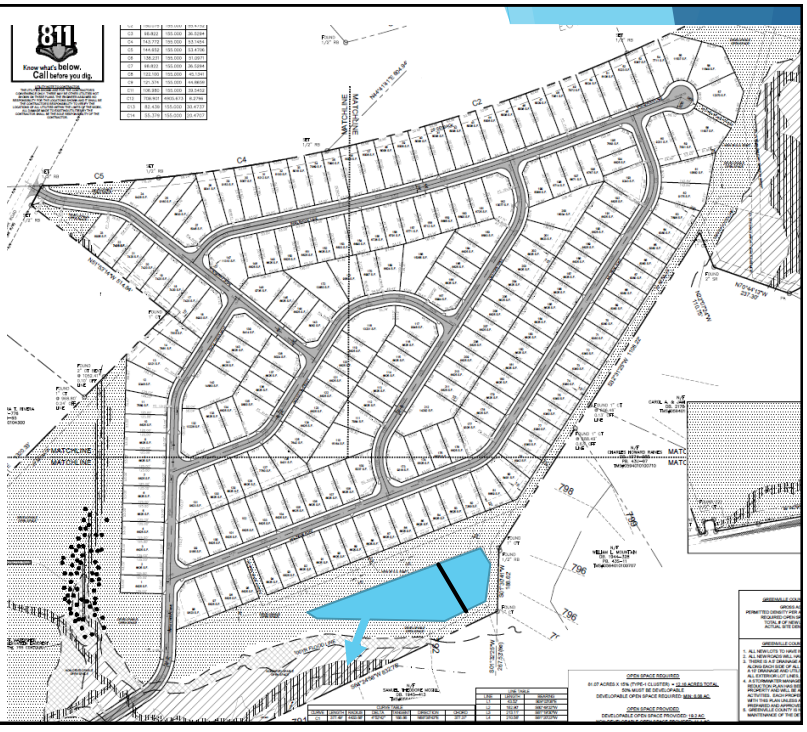
PN 1296 (Residential)

Permitted

- 212 lot single-family subdivision
- 47 acres disturbed
- Wet pond and 2 VFSs (5% of disturbed area)

Proposed (Minimal)

- Converted wet pond to dry pond with impervious forebay section (total 5% of area)



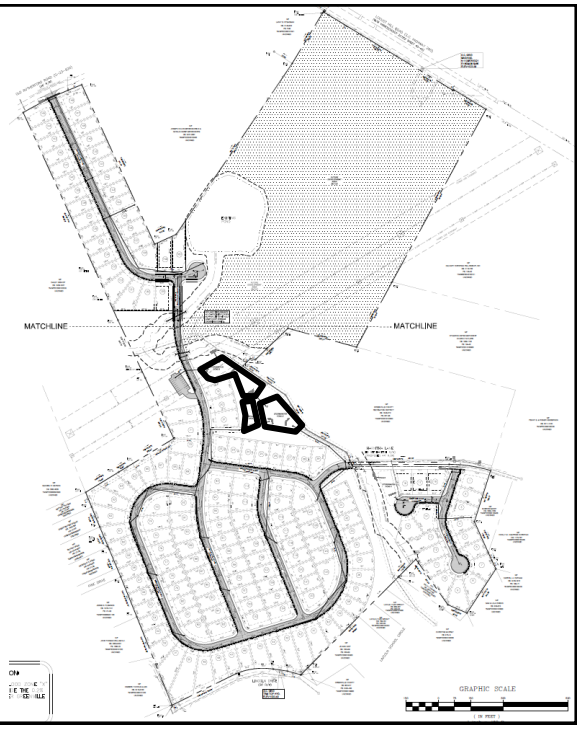
PN 1261 (Residential)

Permitted

- 128 lot single-family residential subdivision
- 46 acres disturbed
- 3 dry detention ponds (1% of disturbed area)

Proposed (No modification)

- Met proposed standard with no modifications



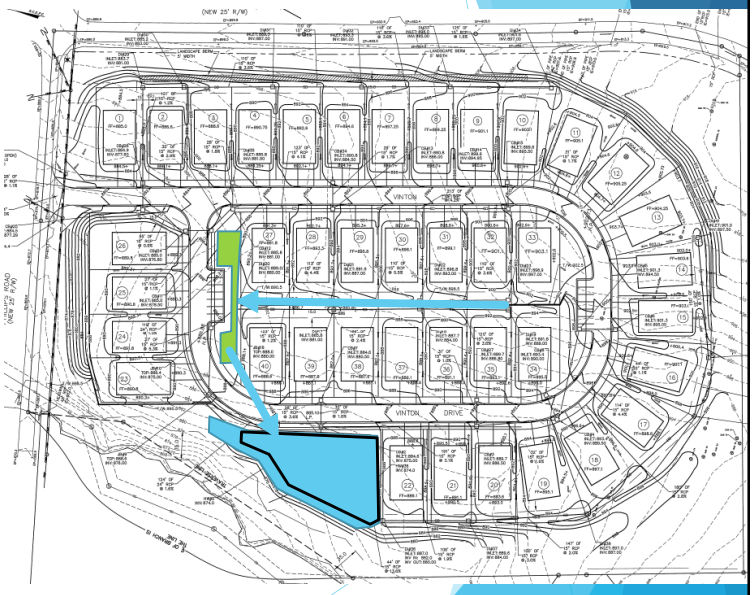
PN 1264 (Residential)

Permitted

- 40 lot single family subdivision
- 7.9 acres disturbed
- Single dry pond (3% of disturbed area)

Proposed (Moderate)

- Added 2,700 sq-ft BRC to grassed area
- Dry pond size increased 25% (BMPs total 4% of area)



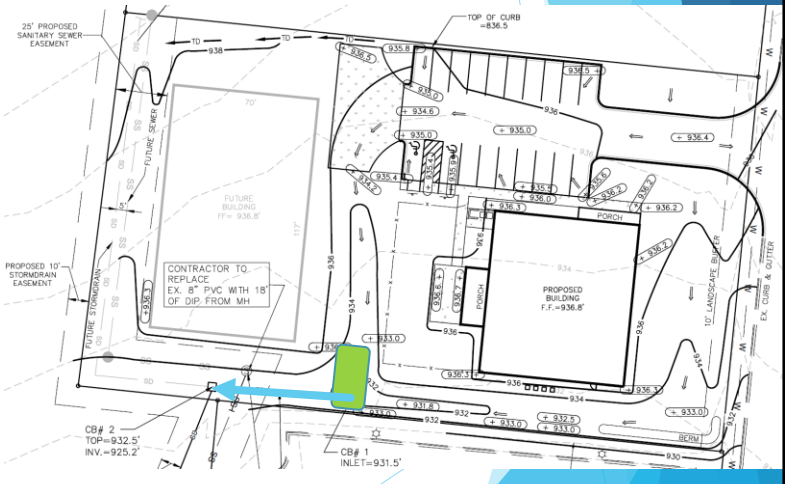
PN 1231 (Institutional)

Permitted

- Single building and parking
- 3.3 acres disturbed
- Part of LCP for detention
- Catch basin filter insert (0% of disturbed area)

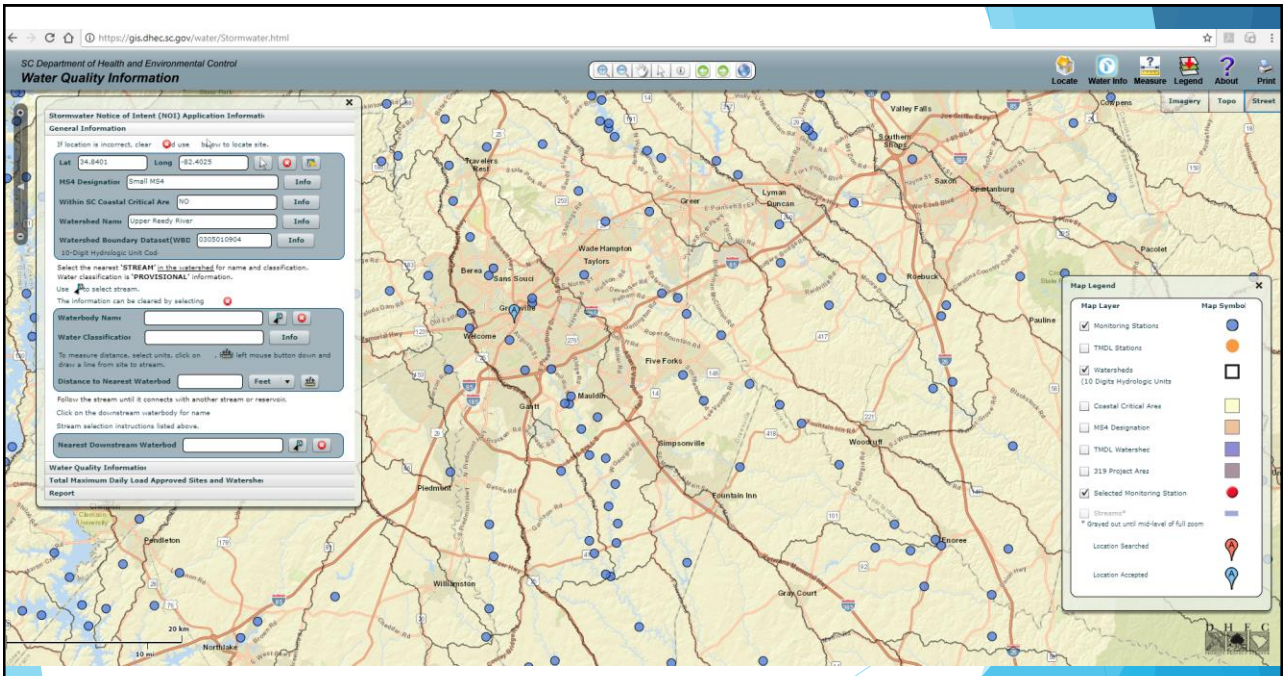
Proposed (Moderate)

- Added 1,200 sq-ft BRC and removed filter insert (1% of area)



New Water Quality Requirements

Development/ Redevelopment Location	Development/ Redevelopment Characteristics*	Water Quality Requirement
Any Development in Greenville County < 10,000 sf		None**
Sites 10,000 square feet – 0.99 acres OR other sites meeting criteria for Alternative TSS Standard (as described in Section 9.1.4)		Ensure annual TSS load is ≤ 600 pounds per acre
Not within the Reedy River watershed	1 – 25 acres OR ≥ 25 acres and NOT discharging to impaired waterbody (TMDL or 303d)	Trap 85% of annual Total Suspended Solids (TSS) load
	≥ 25 acres AND Discharging to impaired waterbody	Trap 85% of annual TSS load AND Anti-degradation Rules for Pollutant of Concern (POC)
Within the Reedy River watershed	1 - 25 acres OR ≥ 25 acres and NOT discharging to impaired waterbody	Trap 85% of annual TSS load AND No Increase in Annual Loading for Total Phosphorus (TP)
	≥ 25 acres AND Discharging to impaired waterbody	Trap 85% of annual TSS load AND Anti-degradation Rules for TP and POC



https://gis.dhec.sc.gov/water/Stormwater.html

D H E C
PROMOTE PROTECT PROSPER
South Carolina Department of Health and Environmental Control

12/4/2017

Watershed and Water Quality Information

Genaral Information

Applicant Name:	Testing	**Permit Type:**	Construction
Latitude:	34.6965	**Longitude:**	-82.2557
MS4 Designation:	Medium MS4	**Monitoring Station:**	RS-10394
Within Coastal Critical Area:	NO	**Water Classification (Provisional):**	FW
Waterbody Name:	Unnamed Trib	**Entered Waterbody Name:**	

Parameter Descriptions

NH3N	Ammonia	FC	Fecal Coliform
CR	Chromium	FCB	Fecal Coliform (Shellfish)
CU	Copper	BIO	Macroinvertebrates (Bio)
HG	Mercury	TP	(Lakes) Phosphorus
NI	Nickel	TN	(Lakes) Nitrogen
PB	Lead	CHLA	(Lakes) Chlorophyll a
ZN	Zinc	ENTERO	(Beach) Enterococcus
DO	Dissolved Oxygen	HGF	Mercury (Fish)
PH	pH	PCB	PCB (Fish)

Impaired Status (downstream sites)

Station	NH3N	CR	CU	HG	NI	PB	ZN	DO	PH	TURBIDITY	ECOLI	FCB	BIO	TP	TN	CHLA	ENTERO	HGF	PCB
RS-10394	X	X	X	X	X	X	X	F	F	F	T	A	X	X	X	X	X	X	X

F = Standards Fully Supported
N = Standards Not Supported
A = Assessed at Upstream Station
X = Parameter Not Assessed at Station
T = Within TMDL Approved Watershed

Parameters to be addressed (those not supporting standards)

ECOLI

Fish Consumption Advisory

TMDL Information - TMDL Parameters to be addressed

In TMDL Watershed:	Yes	**TMDL Site:**	RS-10394
TMDL Report No:	019-04	**TMDL Parameter:**	Fecal
TMDL Document Link:	http://www.scdhec.gov/HomeAndEnvironment/Docs/tmdl_rabon_fc.pdf		

Calculations

- Make separate pre-development and post-development models
- Compare load at outlet from each model
  - Model same area in both models (IDEAL now reports total project area at outlet)
  - Offsite drainage does not have to be subtracted out since it won't change

IDEAL Output Report

Pre-development

Outlet 4	
Name	Outlet 4
Description	Please enter a brief description.

Annual Loading Results		
Parameter	**Value**	**Units**
Total Runoff Volume	0.1099	ac-ft
Total Drainage Area	1.33	ac
Total Modeled Area	1.33	ac
Total Sediment Discharged	206.5	lbs
Total Sediment Discharged (Clay)	6.442	lbs
Total Sediment Discharged (Silt)	3.321	lbs
Total Sediment Discharged (Sand)	71.91	lbs
Total Sediment Discharged (Small Agg.)	42.1	lbs
Total Sediment Discharged (Large Agg.)	82.69	lbs
Total Sediment Yield Per Acre	155.2	lbs
Sediment Concentration	19.86	mg/l
Peak Sediment Concentration	52.29	mg/l
Total Nitrogen Discharged	0.2899	lbs
Total Nitrogen Discharged (Particulate)	0.1247	lbs
Total Nitrogen Discharged (Sorbed)	0.0005349	lbs
Total Nitrogen Discharged (Dissolved)	0.1647	lbs
Total Nitrogen Yield Per Acre	0.218	lbs
Nitrogen Concentration	0.04924	mg/l
Peak Nitrogen Concentration	0.1073	mg/l
Total Phosphorus Discharged	0.05978	lbs

Post-development

Outlet 5	
Name	Outlet 5
Description	Please enter a brief description.

Annual Loading Results		
Parameter	**Value**	**Units**
Total Runoff Volume	0.06407	ac-ft
Total Drainage Area	1.184	ac
Total BMP Surface Area	0.1513	ac
Total Modeled Area	1.335	ac
Total Sediment Discharged	6.859	lbs
Total Sediment Discharged (Clay)	4.771	lbs
Total Sediment Discharged (Silt)	2.076	lbs
Total Sediment Discharged (Sand)	6.922E-05	lbs
Total Sediment Discharged (Small Agg.)	0.01243	lbs
Total Sediment Discharged (Large Agg.)	1.902E-05	lbs
Total Sediment Yield Per Acre	5.793	lbs
Sediment Concentration	1.768	mg/l
Peak Sediment Concentration	2.614	mg/l
Total Nitrogen Discharged	0.975	lbs
Total Nitrogen Discharged (Particulate)	0.1319	lbs
Total Nitrogen Discharged (Sorbed)	0.0009331	lbs
Total Nitrogen Discharged (Dissolved)	0.8421	lbs
Total Nitrogen Yield Per Acre	0.8235	lbs
Nitrogen Concentration	0.6346	mg/l
Peak Nitrogen Concentration	44.64	mg/l
Total Phosphorus Discharged	0.05789	lbs

Revisions to Design Manual

Stormwater Management Design Manual

Greenville County has provided this design aid manual to assist in both streamlining the stormwater permitting application process and for guidance for evaluation and implementation of best management practices for stormwater quantity and quality.

The Design professional should be thoroughly familiar with the design manual and submit a complete package (based on the checklist) in order to minimize the number of resubmittals and total review time.

To access the Design Manual, please click on the Chapter or Appendix:

- Entire Design Manual
- Cover and Table of Contents

RECOMMENDATION – When downloading files, the user should select the "Save" file option.

Chapters

Chapter 1	Introduction
Chapter 2	Stormwater Management Requirements and Standards
Chapter 3	Plan Submittal
Chapter 4	Easements
Chapter 5	Hydrology
Chapter 6	Hydraulics
Chapter 7	Storm Water Detention Design and Downstream Analysis
Chapter 8	Erosion and Sediment Control
Chapter 9	Water Quality
Chapter 10	Low Impact Development
Chapter 11	Stream Protection and Restoration
Chapter 12	Inspection and Enforcement Procedures

Appendices

Appendix A	Stormwater Management Permit Submittal Flow Chart
Appendix B	Rainfall and Universal Soil Loss Equation Data
Appendix C	Culvert Design Nomographs
Appendix D	Soils
Appendix E	EPSC Suggested Uses and Flowchart
Appendix F	During Construction EPSC Specifications and Details
Appendix G	Post Construction Water Quality Suggested Uses
Appendix H	Post Construction WQ Specifications and Details
Appendix I	LID Features/High Density Urban Centers & Commercial Corridors
Appendix J	LID Specifications & Details
Appendix K	LID Design Charts
Appendix L	WQ Factors for Fee Credits
Appendix M	References
Appendix N	Figures

https://www.greenvillecounty.org/LandDevelopment/DesignManual.aspx

Chapter 3: Plan Submittal

- Updated section on flood control requirements for submittals
  - References newer County Floodplain Ordinance
  - Updated list of approved software

Chapter 9: Water Quality

- Complete re-write
- Removed unnecessary methods for calculating water quality compliance
- New Outline:
  - Requirements (starting with Table 9-1)
  - Tools for Compliance
  - Water Quality Background and Loading
  - Water Quality Pollutant Removal Mechanics
  - Constructed Water Quality Controls
  - Additional Water Quality Controls (non-structural design techniques)

Chapter 9: Water Quality

- Added section on infiltration testing requirements for BMPs relying on infiltration

9.5.1.2 Soil Testing for Infiltration BMPs

Soil testing for infiltration rates shall be performed by a licensed geotechnical engineer. The initial test elevation location shall be at the same contour elevation as the bottom/invert of the infiltration BMP.

Infiltration BMPs shall be designed on the basis of actual test data. Tests shall be consistent as to soil conditions, proposed BMP elevations, locations, and water table depths for the proposed infiltration BMP system. The following tests are typically allowable to determine infiltration rate for soils, though some BMP specifications only allow a subset of these (other test methods must be approved by the County):

- Laboratory Permeameter Test for saturated hydraulic conductivity on undisturbed soil samples (ASTM D 5084).
- Double Ring Infiltrometer Test to estimate the initial vertical unsaturated permeability data of the upper soil layer (ASTM D 3385).
- Constant Head Test in soils with permeability that allow keeping the test hole filled with water during the field test (AASHTO T 215).
- Falling Head Test in areas with excellent soil percolation where keeping the test hole filled with water is not feasible during the test.

The Engineer is responsible for obtaining documentation of test results and providing them to the County.

Chapter 10: Low Impact Development

- Complete re-write; used to be an extension of Ch. 9
- High-level guidance for using LID strategies to meet water quality requirements during each stage of design process
- From 2013 Chapter 10:

> Low-Impact Development is a relatively new concept. It is anticipated that over the next few years many additional best management practices and improvements to the LID approach will be introduced as local agencies and designers begin to experiment with the use of the practice.

- LID is the “new normal”

Appendix F: During Construction EPSC Specs & Details

- Minor changes resulting from 2015 Construction BMP Audit
  - SC-03 Silt Fence

    1.4.4 Double Row Silt Fence

    When double row Silt Fence is specified on the Plans, the same design, material, and construction requirements are applicable. Double row Silt Fence shall have a minimum spacing of 3 feet and a maximum spacing of 5 feet between the two rows.

  - SC-06 Construction Entrance

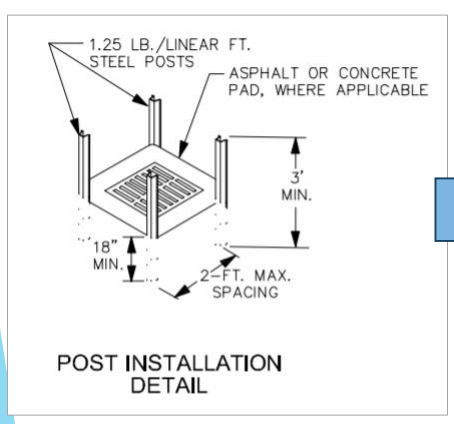
    1.2 Materials

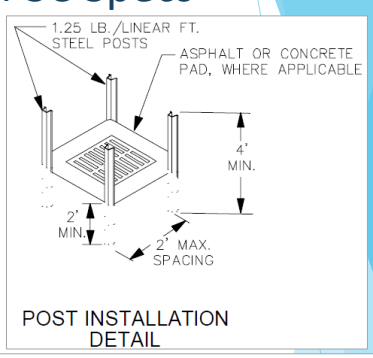
    Provide a stabilized construction entrance composed of the following materials:

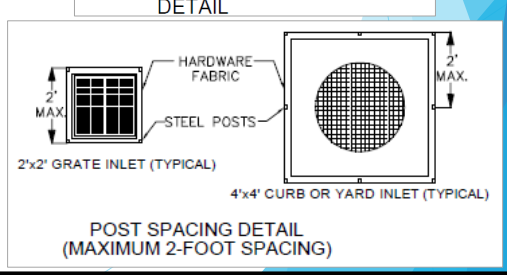
    - Class 2 non-woven geotextile fabric and
    - Aggregate stone No. 1, 2, 24, or 3 aggregate.

Appendix F: During Construction EPSC Specs & Details

SC-07B Inlet Filter Type B







Appendix G: Post Construction WQ Suggested Uses

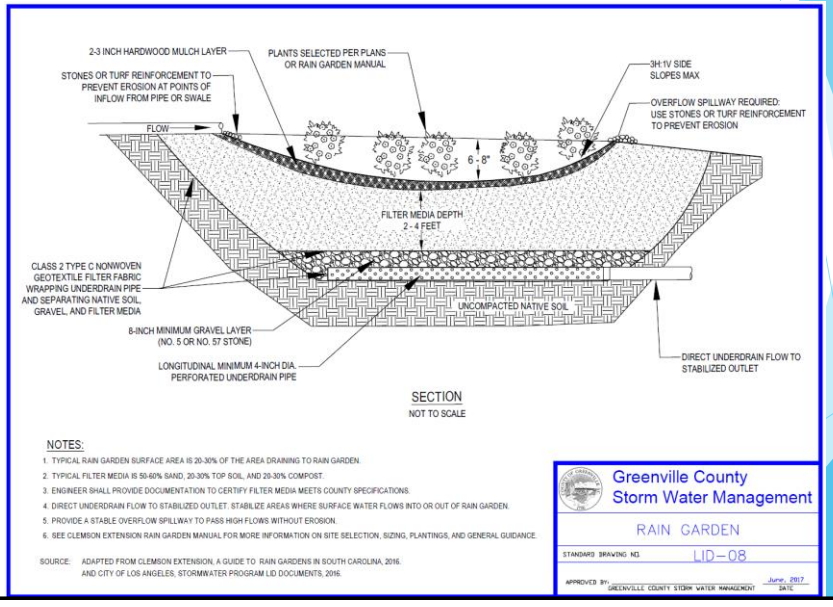
- Placed former Table 10-4 in this appendix
- Updated to include all BMPs
- Quick-reference for BMP selection and major requirements
  - Relative maintenance needs
  - Relative cost
  - Drainage area
  - Soils
  - Minimum size
  - Slope
  - Water table/bedrock clearance
  - Setback
  - Maximum depth

Appendix H: Post Construction WQ Specs & Details

- Pulled all BMP Specs & Details into one Appendix
- Minor changes to some BMPs
- Added section to each to explain how to model in IDEAL
- Added two new BMPs
  - Rain Garden
  - Regenerative Stormwater Conveyance

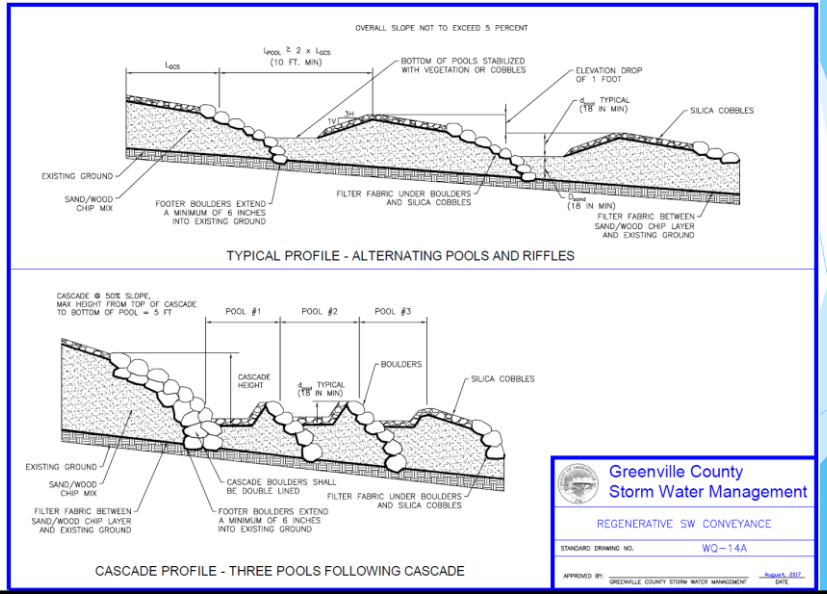
Rain Garden

Rain Garden



Regenerative Stormwater Conveyance

Regenerative Stormwater Conveyance



LDD Updates

Greenville County

Contact Info

For Design Manual and permitting questions:

- GC Land Development Division: 864-467-4610

For IDEAL software installation questions:

- Becca Coulter: 803-214-5914

For IDEAL modeling questions:

- John Schooler: 757-549-5352