

# Greenville County Contractor and CEPSCI Training Construction BMPs and SCDHEC Audit Results

March 6, 2018

9:00 am – 11:00 am



# Acknowledgements and Introductions

- Judy Wortkoetter, PE, Greenville County Engineer
- Josh Fisher, Greenville County Chief Inspector
- Jacob Burkey, PE, Woolpert Inc.



# Presentation Agenda

- 2016 Construction BMP Audit
  - Audit Process
  - BMP Observations
- Updated Specs and Details
- 2017 SCDHEC Audit
  - General Comments
  - Specific BMPs



# 2016 Greenville County Construction BMP Audit

# Background and Previous Audits

- Greenville County is required by its NPDES Permit to develop and implement a Construction Site Program to reduce erosion and sedimentation.
- Construction BMP Audits performed every 4-6 years to assess and improve the Program.
  - Internal audit process, not a regulatory compliance audit
  - 2001, 2006, 2010, 2016





# Audit Process

## Data Collection:

- February of 2016
- Two team members walked entirety of each site
- Panasonic Toughbook computer with GPS and digital camera
- Data gathered about each site in general and each BMP on site
- Data fields were the same as previous audits when possible
  - Consistency
  - Comparison
- New fields created for new BMPs as necessary



# Audit Process

## Data Collection:

- General site data
- BMP specific data
  - 753 BMPs total
  - 24 BMPs/site average
- Most common BMPs:
  - Silt Fence
  - Construction Entrance
  - Rock Ditch Check
  - Storm Drain Inlet Protection
  - Seeding/Stabilization
  - Sediment Basin
    - Floating Skimmer
    - Porous Baffles

BMP Name	Number Audited
SC-01 Surface Outlet and Baffle Sediment Basin (or Multipurpose Basin)	28
SC-02 Temporary Sediment Trap	8
SC-03 Silt Fence*	180
SC-04 Rock Ditch Check	41
SC-05 Sediment Tube Ditch Check	9
SC-06 Construction Entrance	43
SC-07 Storm Drain Inlet Protection*	230
SC-08 Rock Sediment Dike	0
SC-09 Construction DeWatering*	1
SC-10 Floating Skimmer	26
SC-11 Porous Baffles	29
SC-12 Perimeter Control for Small Sites	0
SC-13 Polymer/Coagulant/Flocculant	0
SC-14 Concrete Washout	4
SC-XX Sediment Controls- Other	12
EC-01 Surface Roughening*	6
EC-02 Bench Terracing	0
EC-03 Seeding Stabilization*	33
EC-04 Rolled Erosion Control Products (RECPs)*	16
EC-05 Hydraulic Erosion Control Products (HECPs)	6
EC-06 Riprap or Aggregate	6
EC-07 Outlet Protection	34
EC-08 Dust Control	0
EC-09 Transition Mats	0
EC-10 Slope Interruption Devices	2
EC-11 Compost	0
EC-12 Biological Growth Stimulant	0
EC-XX Mulching	0
RC-01 Pipe Slope Drain	3
RC-02 Subsurface Drain	0
RC-03 Runoff Conveyance Measures*	34
RC-04 Stream Crossing	1
RC-XX Pump Around	0
WQ-13 Level Spreader	1
<b>Total</b>	<b>753</b>

# Database and Scoring

## Individual BMP Data Collection:

- Specific data collected varied as appropriate for each BMP.
- General criteria:
  - Installation
    - Is the BMP installed correctly per Greenville County specs?
    - Specific critical dimensions were recorded and scored.
  - Maintenance
    - Is sediment accumulation acceptable?
    - Has BMP been maintained properly?
  - Function
    - Has the BMP been damaged or failed?
    - Is the BMP functioning to protect water quality?



# Database and Scoring

## Individual BMP Scoring:

- Example: Rock Ditch Check



Field	Points	Value	Max Points
Geotextile Layer	1	Yes	1
	0	No	
Maximum Height OK	1	Yes	1
	0	No	
Correct Installation	1	Yes	1
	0	No	
Sed Accumulation OK	1	Yes	1
	0	No	
Maintenance	1	Yes	1
	0	No	
Damage	0	Yes	1
	1	No	
Recent Failure	0	Yes	1
	1	No	
Working Properly	1	Yes	1
	0	No	
Total Points			<b>8</b>

Individual Rock Ditch Check Score

$$= \_ \div 8 = \_ \%$$

# Database and Scoring

## Individual BMP Scoring:

- Example: Silt Fence



Individual Silt Fence Score  
 =     ÷ 13 =     %

Field	Points	Value	Max Points
Plan Length	1	Yes	
	0	No	
	1	NA	
Fabric Height OK	1	Yes	
	0	No	
Fabric Depth OK	1	Yes	
	0	No	
Stable Posts	1	Yes	
	0	No	
Standard Posts	1	Yes	
	0	No	
Post Spacing OK	1	Yes	
	0	No	
Staple/Tie OK	1	Yes	
	0	No	
Correct Installation	1	Yes	
	0	No	
Sed Accumulation OK	1	Yes	
	0	No	
Maintenance	1	Yes	
	0	No	
Damage	0	Yes	
	1	No	
Recent Failure	0	Yes	
	1	No	
Working Properly	1	Yes	
	0	No	
<b>Total Points</b>			<b>13</b>

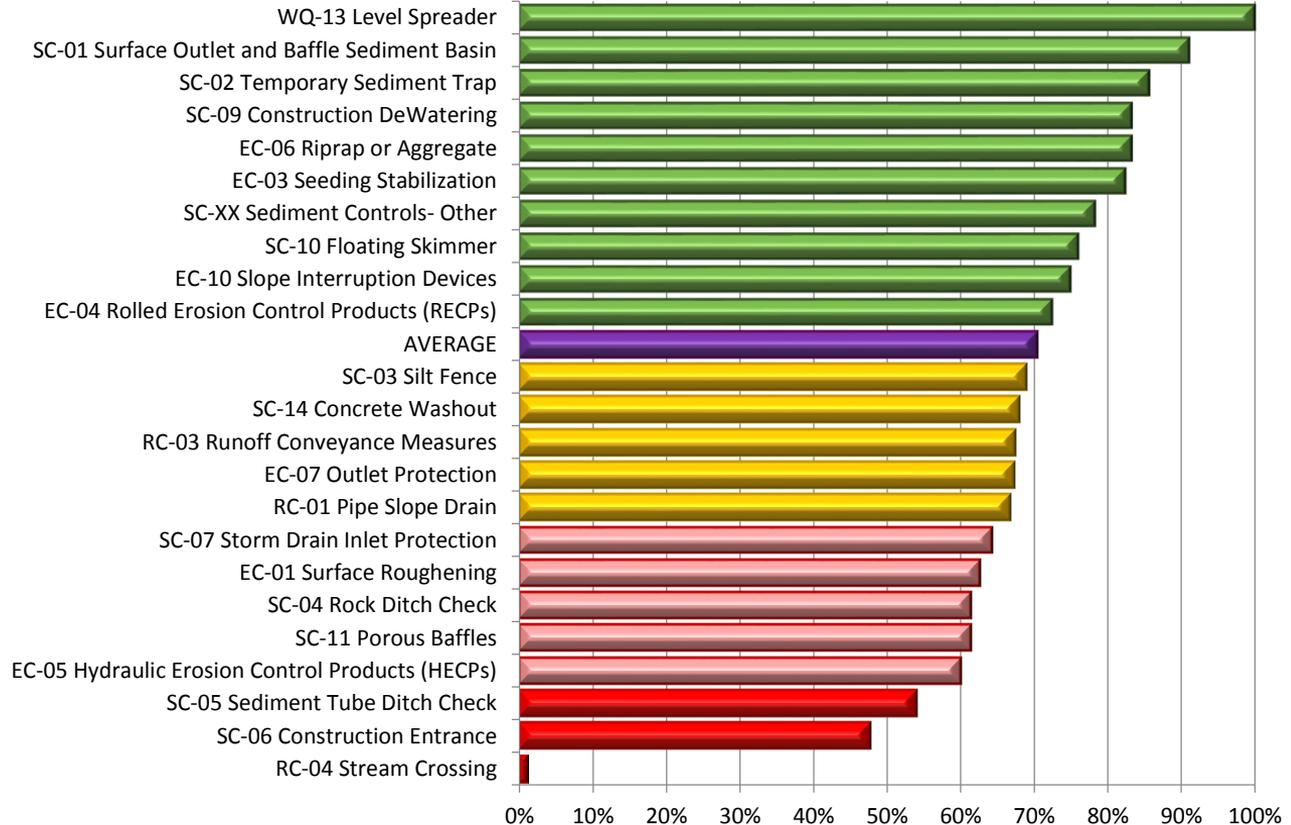
# Results: Overall Individual BMP Scores

- **Overall Individual BMP Score**
  - Average score for each type of BMP across entire Audit
  - BMPs from all sites combined
- 753 Total BMPs with overall average score of 70%



# Results: Overall Individual BMP Scores

Overall BMP Score:  
Average score for  
each type of BMP  
audited



# Results and Recommendations:

## The Good, The Bad, and The Ugly

### The Good:

- Correct application, installation, and maintenance
- Functioning to protect water quality

### The Bad:

- Incorrect application, installation, or maintenance
- Potential for off-site impacts

### The Ugly:

- Serious problems with application, installation, or maintenance
- Failure of BMP or off-site impacts



# Results and Recommendations: The Good



SC-01 Surface Outlet and Baffle Sediment Basin

# Results and Recommendations: The Good



SC-02 Sediment Trap

# Results and Recommendations: The Good



EC-06 Riprap Aggregate

# Results and Recommendations: The Good



EC-03 Seeding/Stabilization

# Results and Recommendations: The Good



EC-03 Seeding/Stabilization

# Results and Recommendations: The Good



EC-04 Rolled Erosion Control Products

# Results and Recommendations: The Good



EC-04 Rolled Erosion Control Products

# Results and Recommendations:

## The Bad



EC-04 Rolled Erosion Control Products

# Results and Recommendations:

## The Good



SC-10 Floating Skimmer

# Results and Recommendations: The Good



SC-10 Floating Skimmer

# Results and Recommendations:

## The Bad



SC-10 Floating Skimmer

# Results and Recommendations: The Ugly



SC-10 Floating Skimmer

# Results and Recommendations: The Ugly



SC-10 Floating Skimmer

# Results and Recommendations: The Good



SC-11 Porous Baffles

# Results and Recommendations: The Good



SC-11 Porous Baffles

# Results and Recommendations:

## The Bad



SC-11 Porous Baffles

# Results and Recommendations: The Bad



SC-11 Porous Baffles

# Results and Recommendations: The Ugly



SC-11 Porous Baffles

# Results and Recommendations: The Ugly



SC-11 Porous Baffles

# Results and Recommendations: The Good



SC-07A Type A Inlet Protection – Filter Fabric

# Results and Recommendations:

## The Bad



SC-07A Type A Inlet Protection – Filter Fabric

# Results and Recommendations:

## The Bad



SC-07A Type A Inlet Protection – Filter Fabric

# Results and Recommendations: The Ugly



SC-07A Type A Inlet Protection – Filter Fabric

# Results and Recommendations:

## Example of Good



SC-07A Type A Inlet Filter – Sediment Tube

# Results and Recommendations:

## The Bad



SC-07A Type A Inlet Filter – Sediment Tube

# Results and Recommendations: The Ugly



SC-07A Type A Inlet Filter – Sediment Tube

# Results and Recommendations: The Good



EC-01 Surface Roughening

# Results and Recommendations:

## The Bad



EC-01 Surface Roughening

# Results and Recommendations: The Good



SC-03 Silt Fence

# Results and Recommendations:

## The Bad



SC-03 Silt Fence

# Results and Recommendations:

## The Bad



SC-03 Silt Fence

# Results and Recommendations: The Ugly



SC-03 Silt Fence

# Results and Recommendations:

## The Ugly



SC-03 Silt Fence

# Results and Recommendations: The Good



SC-06 Construction Entrance

# Results and Recommendations:

## The Bad



SC-06 Construction Entrance

# Results and Recommendations: The Bad



SC-06 Construction Entrance

# Results and Recommendations: The Ugly



SC-06 Construction Entrance

# Results and Recommendations: The Good



SC-04 Rock Ditch Check

# Results and Recommendations:

## The Bad



SC-04 Rock Ditch Check

# Results and Recommendations:

## The Bad



SC-04 Rock Ditch Check

# Results and Recommendations: The Ugly



SC-04 Rock Ditch Check

# Results and Recommendations: The Good



SC-05 Sediment Tube Ditch Check

# Results and Recommendations:

## The Bad



SC-05 Sediment Tube Ditch Check

# Results and Recommendations: The Ugly



SC-05 Sediment Tube Ditch Check

# Conclusions

- EPSC practices have generally improved over time since the first audit in 2001.
- There is room for improvement:
  - Porous Baffles and Floating Skimmers in Ponds
  - Inlet Protection
  - Ditch Checks
    - Rock
    - Sediment Tube
  - Construction Entrances
  - Silt Fence
- Update specifications and details
- Provide training





# BMP Audit Questions?



# Updated BMP Specifications and Details

# Specification/Detail Updates

- Does this page look familiar?

**DEPARTMENT MENU**

- Home
- Funding
- Education
- Industrial
- Road Construction
- Storm Water
- Water Quality
- Design Manual
- Permitting/Forms
- Subdivision
- Administration

### Appendix F / Erosion Prevention Specifications and Details

Specification Number	BMP Type	Standard Specification (pdf)	Detail (pdf)	Detail (dxf)
EC-01	Surface Roughening	<a href="#">pdf</a>	-	-
EC-01A	Tracking	-	<a href="#">pdf</a>	<a href="#">dxf</a>
EC-01B	Stairstep Grading	-	<a href="#">pdf</a>	<a href="#">dxf</a>
EC-01C	Grooving	-	<a href="#">pdf</a>	<a href="#">dxf</a>
EC-02	Bench Terracing	<a href="#">pdf</a>	<a href="#">pdf</a>	<a href="#">dxf</a>
EC-03	Seeding/Stabilization	<a href="#">pdf</a>	-	<a href="#">dxf</a>
EC-04	RECP	<a href="#">pdf</a>	-	-
EC-04A	RECP – Channel Installation	-	<a href="#">pdf</a>	<a href="#">dxf</a>
EC-04B	RECP – Anchoring	-	<a href="#">pdf</a>	<a href="#">dxf</a>
EC-04C	RECP – Anchoring Pattern	-	<a href="#">pdf</a>	<a href="#">dxf</a>
EC-05	HECP	<a href="#">pdf</a>	-	-
EC-06	Rip Rap Aggregate	<a href="#">pdf</a>	-	-
EC-07	Outlet Protection	<a href="#">pdf</a>	<a href="#">pdf</a>	<a href="#">dxf</a>
EC-08	Dust Control	<a href="#">pdf</a>	-	-
EC-09	Transition Mat	<a href="#">pdf</a>	<a href="#">pdf</a>	<a href="#">dxf</a>
EC-10	Slope Interruption Devices	<a href="#">pdf</a>	<a href="#">pdf</a>	<a href="#">dxf</a>
EC-11	Compost	<a href="#">pdf</a>	-	-
EC-12	Biological Growth Stimulant	<a href="#">pdf</a>	-	-



# Specification/Detail Updates

- Does this page look familiar?

## Sediment Control Specifications and Details

Specification Number	BMP Type	Standard Specification (pdf)	Detail (pdf)	Detail (dxf)
SC-01	Surface Outlet and Battle Sediment Basin	<a href="#">pdf</a>	-	-
		-	<a href="#">pdf</a>	<a href="#">dxf</a>
		-	<a href="#">pdf</a>	<a href="#">dxf</a>
		-	-	<a href="#">dxf</a>
SC-02	Sediment Trap	<a href="#">pdf</a>	<a href="#">pdf</a>	<a href="#">dxf</a>
SC-03	Silt Fence	<a href="#">pdf</a>	-	-
SC-03A	Silt Fence	-	<a href="#">pdf</a>	<a href="#">dxf</a>
SC-03B	Reinforced Silt Fence	-	<a href="#">pdf</a>	<a href="#">dxf</a>
SC-04	Rock Ditch Check	<a href="#">pdf</a>	<a href="#">pdf</a>	<a href="#">dxf</a>
SC-05	Sediment Tube Ditch Check	<a href="#">pdf</a>	<a href="#">pdf</a>	<a href="#">dxf</a>
SC-06	Construction Entrance	<a href="#">pdf</a>	<a href="#">pdf</a>	<a href="#">dxf</a>
SC-07	Storm Drain Inlet Protection	<a href="#">pdf</a>	-	-
SC-07A	Inlet Filter Type A	-	<a href="#">pdf</a>	<a href="#">dxf</a>
SC-07B	Inlet Filter Type B	-	<a href="#">pdf</a>	<a href="#">dxf</a>
SC-07C	Inlet Filter Type C	-	<a href="#">pdf</a>	<a href="#">dxf</a>
SC-07E	Inlet Filter Type E	-	<a href="#">pdf</a>	<a href="#">dxf</a>
SC-07F	Inlet Filter Type F	-	<a href="#">pdf</a>	<a href="#">dxf</a>
SC-07G	Inlet Filter Type G	-	<a href="#">pdf</a>	<a href="#">dxf</a>
SC-08	Rock Sediment Dike	<a href="#">pdf</a>	<a href="#">pdf</a>	<a href="#">dxf</a>
SC-09	Construction DeWatering	<a href="#">pdf</a>	-	-
SC-09A	Dewatering Bag	-	<a href="#">pdf</a>	<a href="#">dxf</a>
SC-09B	Dewatering by Pumping	-	<a href="#">pdf</a>	<a href="#">dxf</a>
SC-10	Floating Skimmer	<a href="#">pdf</a>	<a href="#">pdf</a>	<a href="#">dxf</a>
SC-11	Porous Baffles	<a href="#">pdf</a>	<a href="#">pdf</a>	<a href="#">dxf</a>
SC-12	Perimeter Control for Small Sites	<a href="#">pdf</a>	<a href="#">pdf</a>	-
SC-13	Polymer/Coagulant/Flocculant	<a href="#">pdf</a>	-	-
SC-14	Concrete Washout	<a href="#">pdf</a>	<a href="#">pdf</a>	<a href="#">dxf</a>

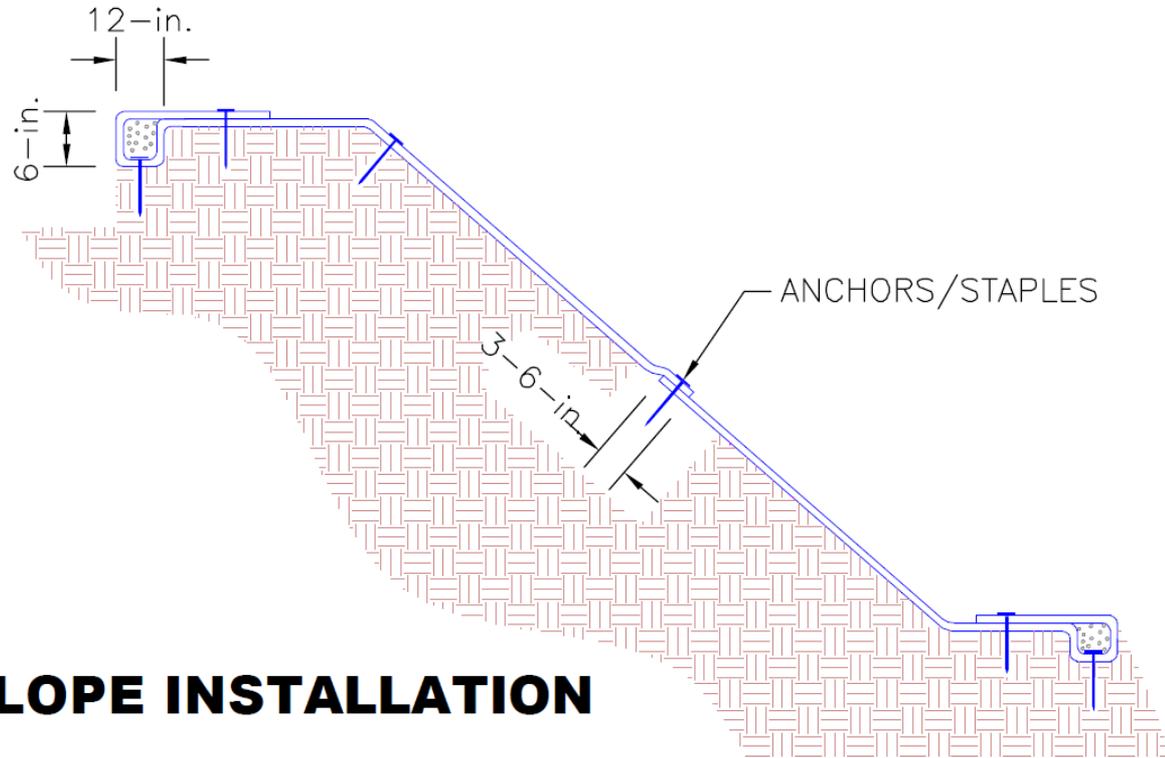
# Specification/Detail Updates

- Greenville County Design Manual contains specs and details for **30 Erosion Prevention and Sediment Control BMPs for use during construction.**
- 6 BMPs received updates after the BMP Audit
  - EC-04 Rolled Erosion Control Products (RECPs)
  - EC-10 Slope Interruption Devices (SIDs)
  - SC-03 Silt Fence
  - SC-06 Construction Entrance
  - SC-07 Storm Drain Inlet Protection
  - SC-11 Porous Baffles
- To be released with updated 2018 Design Manual as Appendix E



# EC-04 Rolled Erosion Control Products (RECPs)

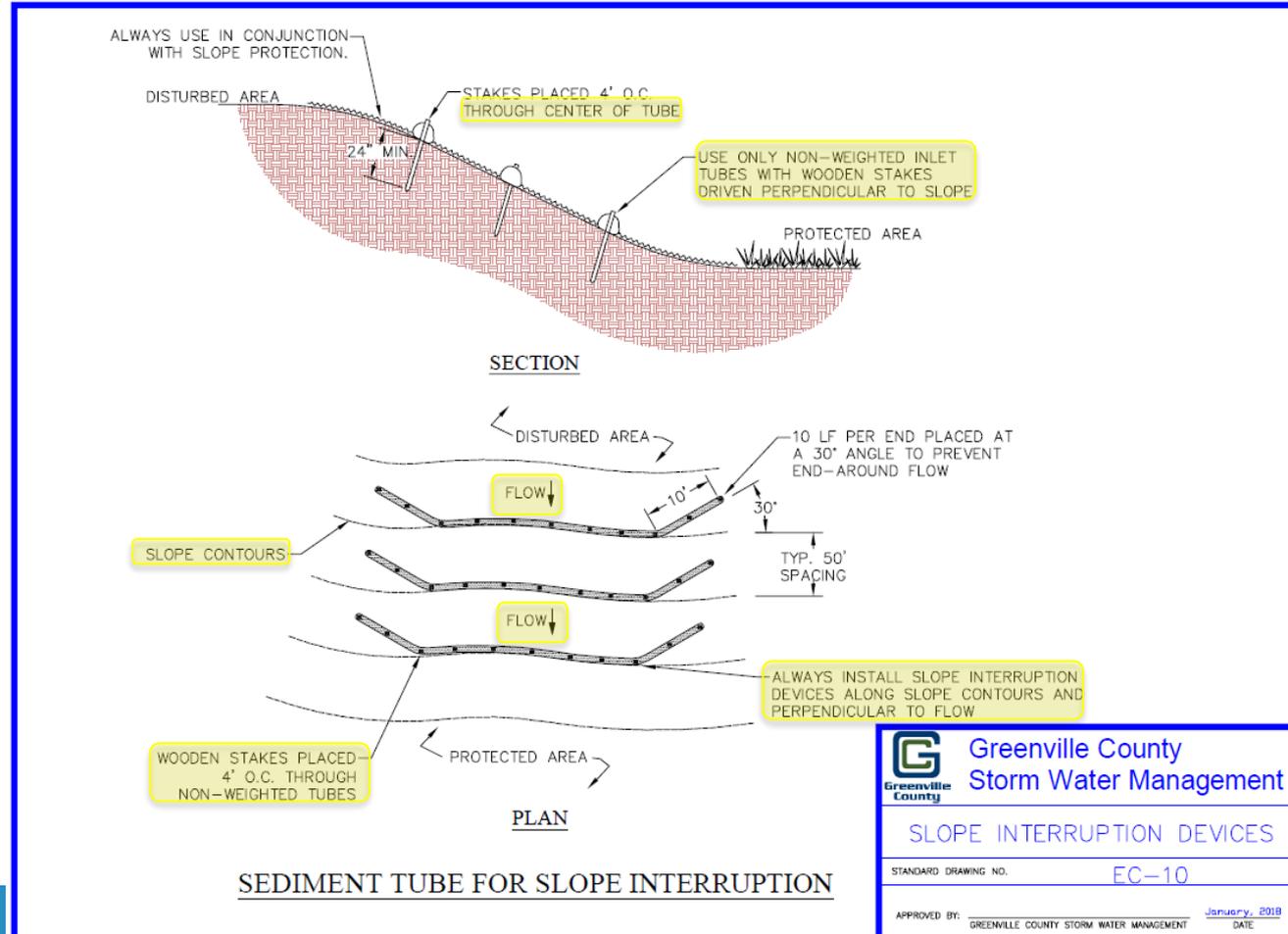
- Observed problems with installation on slopes
- Renamed Detail Drawing for clarity
  - EC-04B: RECP – Slope Installation



 <b>Greenville County</b>	<b>Greenville County Storm Water Management</b>
RECP – SLOPE INSTALLATION	
STANDARD DRAWING NO.	EC-04B
APPROVED BY: _____	January, 2018 DATE
GREENVILLE COUNTY STORM WATER MANAGEMENT	

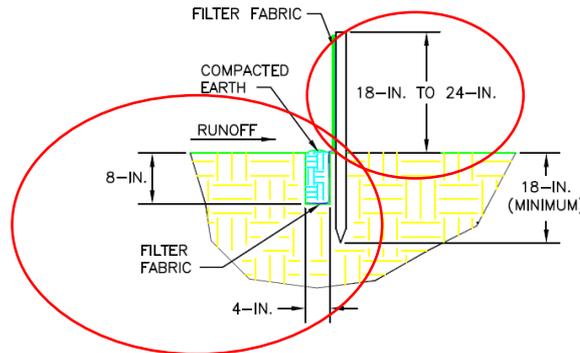
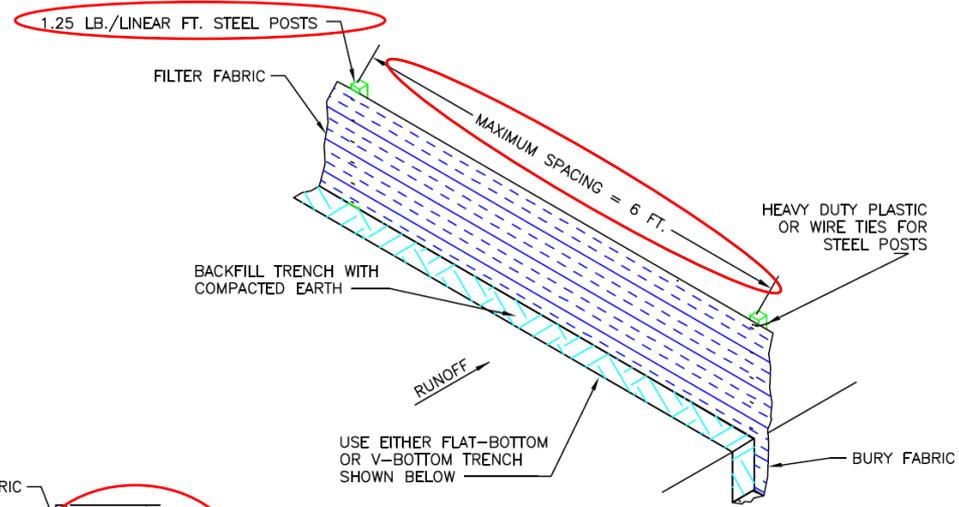
# EC-10 Slope Interruption Devices (SIDs)

- Observed need for clarification
- Spec and detail updated
- Only non-weighted tubes anchored with wood posts should be used as SIDs
- Should be used with HECF or ECB when slope length  $\geq 50$  feet
  - Or shorter slope lengths at discretion of Engineer



# SC-03 Silt Fence

- No major changes to dimensions or materials
- As a reminder...



FLAT-BOTTOM TRENCH DETAIL

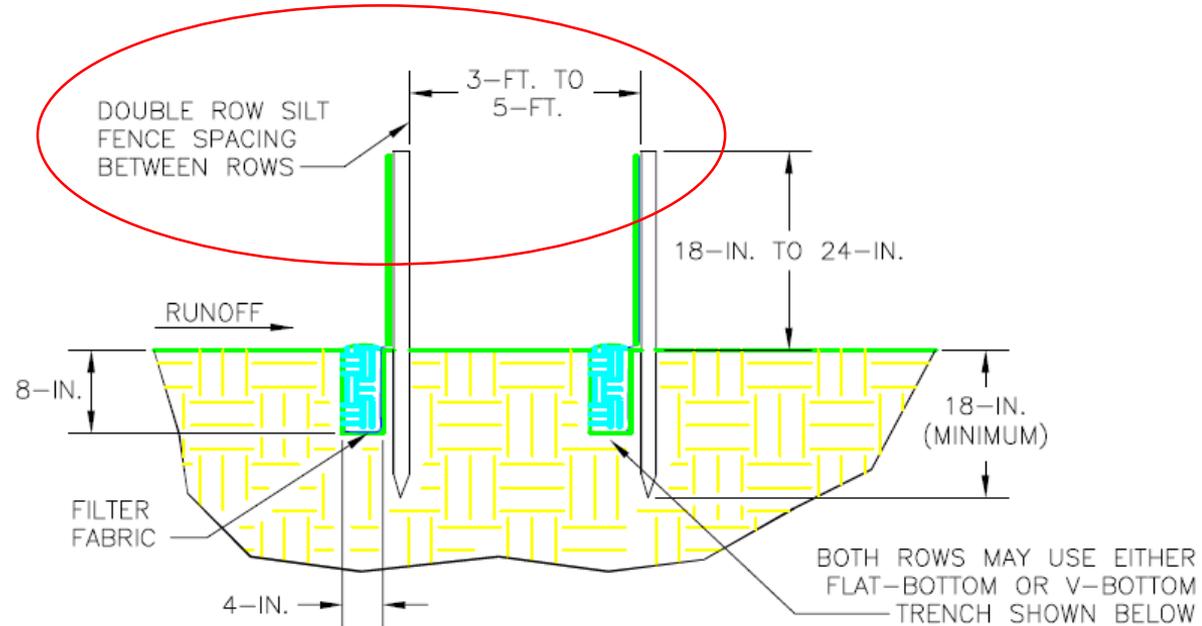
## SILT FENCE INSTALLATION

	<b>Greenville County Storm Water Management</b>
SILT FENCE	
STANDARD DRAWING NO. SC-03A Page 1 of 2	
APPROVED BY: _____	January, 2013 DATE
GREENVILLE COUNTY STORM WATER MANAGEMENT	



# SC-03 Silt Fence

- Observed double row silt fence frequently in field
- Spec and detail updated to provide guidance of 3 to 5 foot spacing



DOUBLE ROW SILT FENCE DETAIL

 <b>Greenville County</b>	<b>Greenville County</b> <b>Storm Water Management</b>
SILT FENCE	
STANDARD DRAWING NO.	SC-03A
APPROVED BY:	January, 2018 DATE
GREENVILLE COUNTY STORM WATER MANAGEMENT	

# SC-06 Construction Entrance

- Observed problems with installation and maintenance
- Sometimes incorrect stone being used
  - Too small or mix of too small with correct stone
- Old specification:

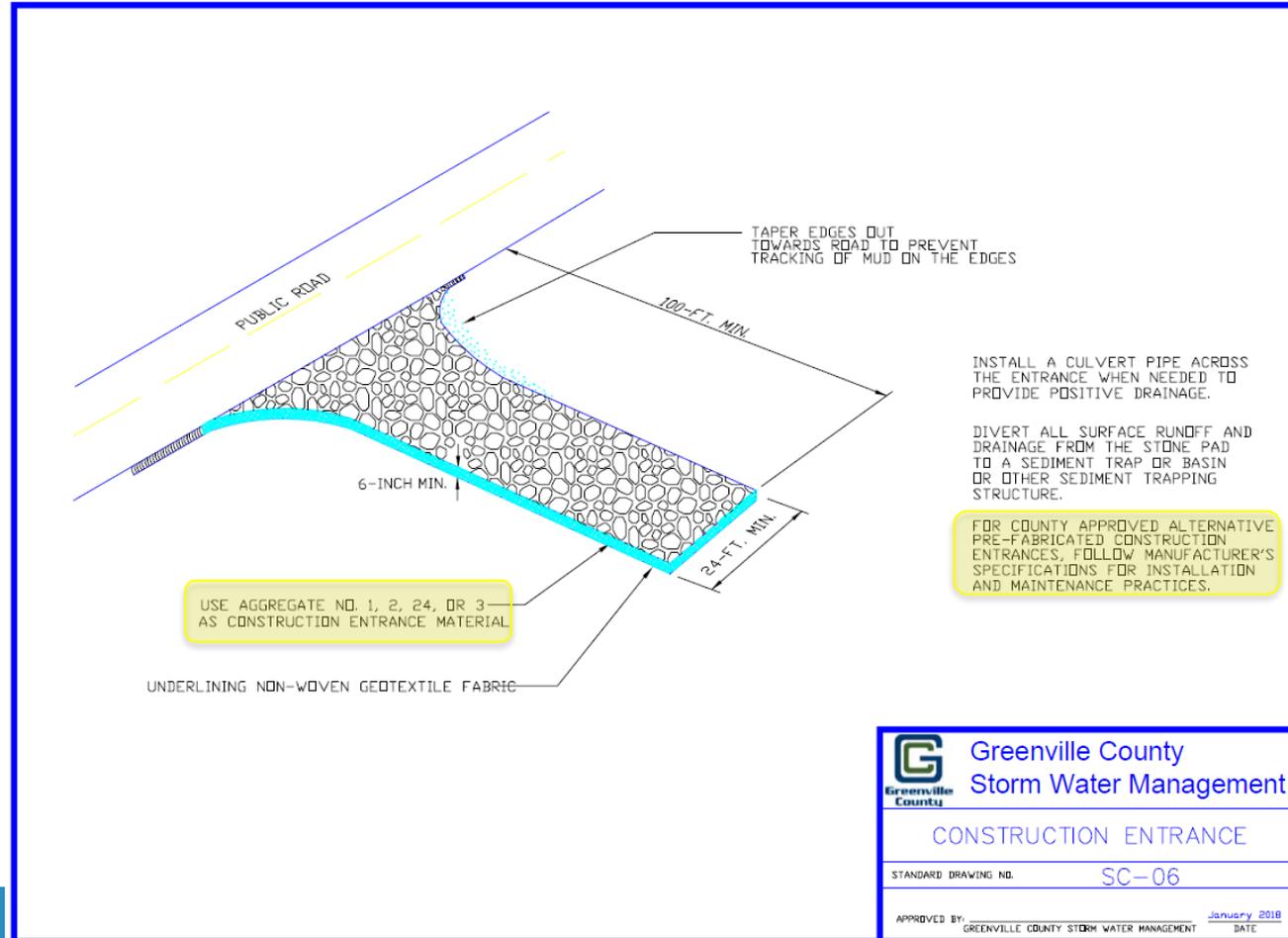
Provide a stabilized construction entrance composed of the following materials:

- Class 2 non-woven geotextile fabric and
- ~~• Aggregate stone with the gradation in the following table.~~

Nominal Size (Sieves with Square Openings)	Percent Passing
3 in.	100
1-1/2 in.	35 to 100
3/4 in.	0 to 15

# SC-06 Construction Entrance

- Updated Spec/Detail:
- Use AASHTO No. 1, 2, 24, or 3 stone
- Minimum dimensions
  - 100 ft long
  - 24 ft wide
- May use pre-fabricated alternatives with County approval



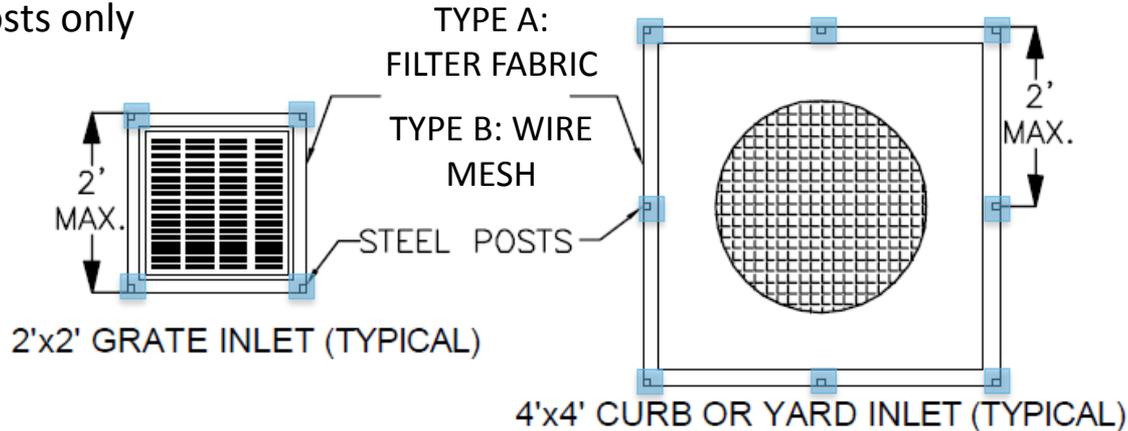
# SC-06 Construction Entrance

- Examples of pre-fabricated construction entrances



# SC-07 Storm Drain Inlet Protection

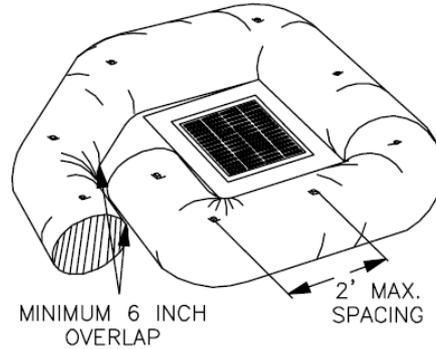
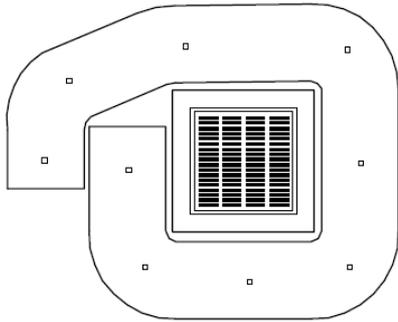
- Added clarification on materials as applicable
  - **Never use** straw bales, pine bales, leaf mulch, or grass clippings
- Observed failure due to inadequate posts
- Posts and post spacing for Type A (Filter Fabric) and Type B (Wire and Stone)
  - Steel T-posts only



POST SPACING DETAIL  
(MAXIMUM 2-FOOT SPACING)

# SC-07 Storm Drain Inlet Protection

- Observed failure due to inadequate posts
- Posts and post spacing for Type A (Sediment Tube)
  - Steel T-posts or wood posts minimum  $\frac{3}{4}$ " x  $\frac{3}{4}$ "

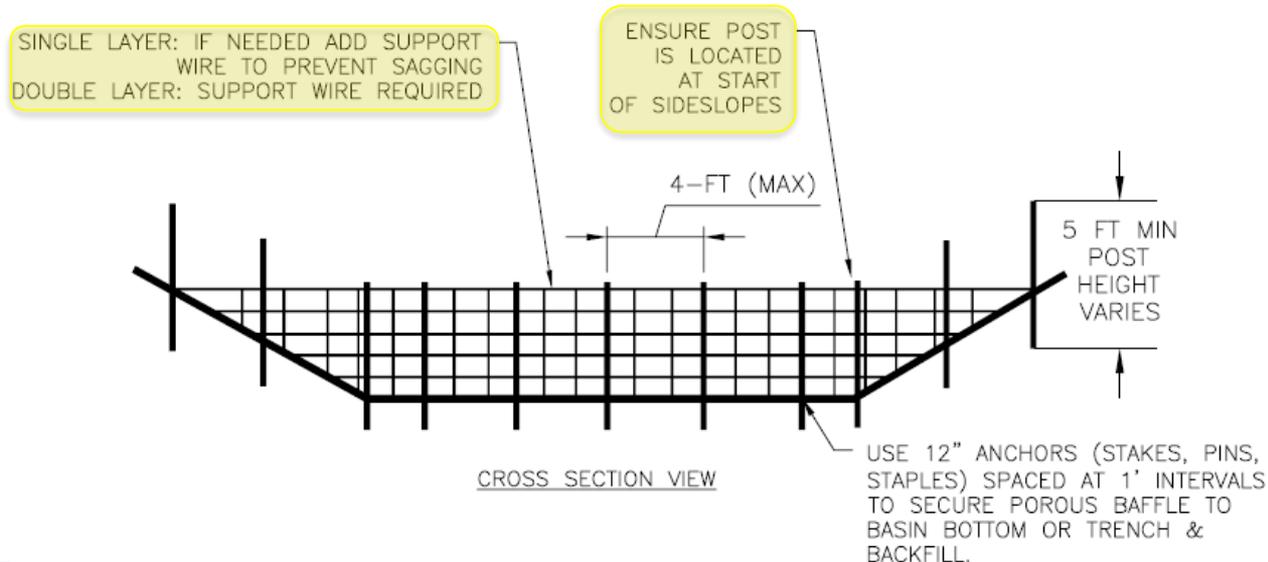


**TYPE A**  
**LOW FLOW INLET FILTERS**  
**(SEDIMENT TUBE INLET PROTECTION)**



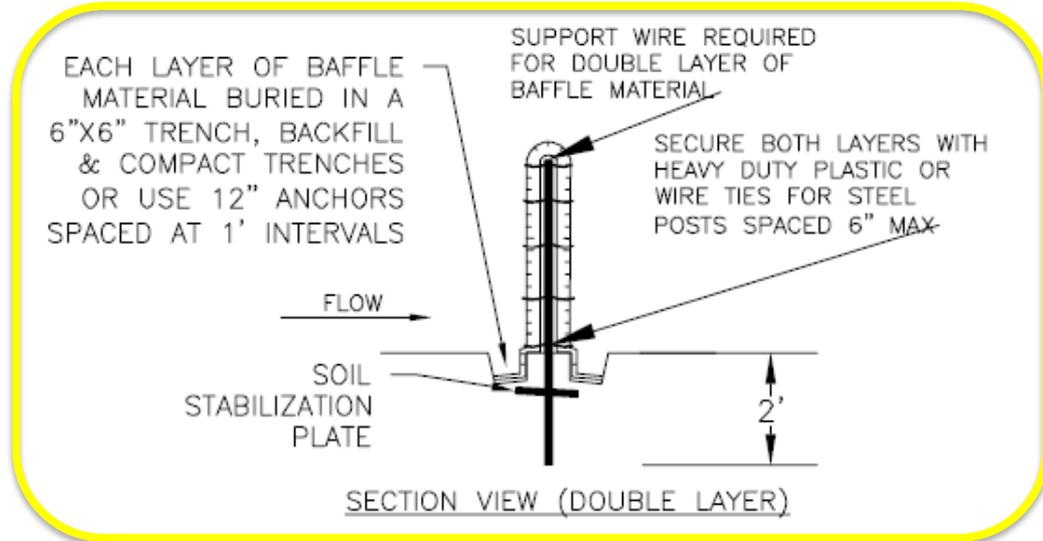
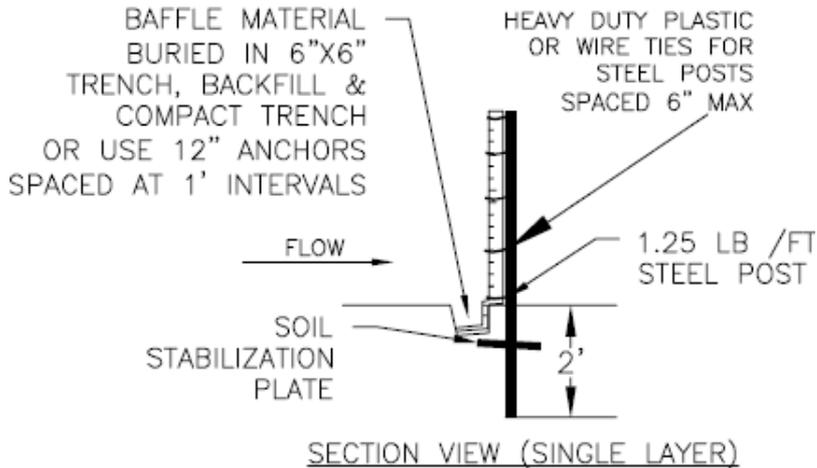
# SC-11 Porous Baffles

- Observed Porous Baffles in field that are a double layer of material folded over a wire
  - Good idea!
- Updated Spec/Detail to:
  - Show installation of double layer Porous Baffle
  - Spec materials to be used as a double layer Porous Baffle



# SC-11 Porous Baffles

- Observed Porous Baffles in field that are a double layer of material folded over a wire
  - Good idea!
- Updated Spec/Detail to:
  - Show installation of double layer Porous Baffle
  - Spec materials to be used as a double layer Porous Baffle



# SC-11 Porous Baffles

- Material with greater open space can be used as Porous Baffle in a double layer

**Table 2: Minimum Coconut / Excelsior Blanket Porous Baffle Material Performance Requirements**

Physical Property	Test Method	Required Value
Light Penetration (% openings)	ASTM D 6567 or Equivalent	10% Min 35% Max
Tensile Strength <sup>1</sup> (machine direction)	ASTM D 6818 ASTM D 4595	145 lb/ft Min

Single Layer

**Table 3: Minimum Coconut / Excelsior Blanket Porous Baffle Material Performance Requirements for Use as a Double Layer**

Physical Property	Test Method	Required Value
Light Penetration (% openings)	ASTM D 6567 or Equivalent	30% Min 60% Max
Tensile Strength <sup>1</sup> (machine direction)	ASTM D 6818 ASTM D 4595	145 lb/ft Min

Double Layer

# SC-11 Porous Baffles

- Material with greater open space can be used as Porous Baffle in a double layer



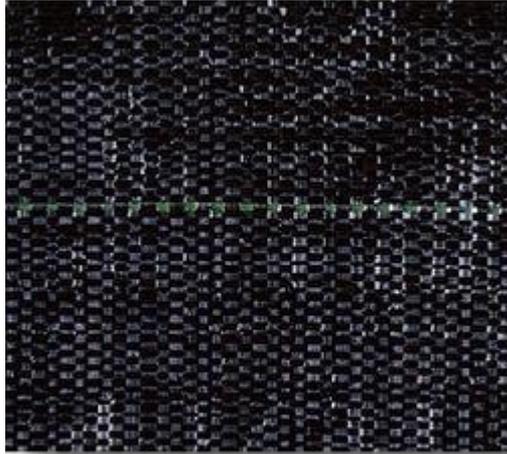
21% Open Space = Use  
as Single Layer Baffle



54% Open Space = Use  
as Double Layer Baffle

# SC-11 Porous Baffles

- Reminder: Silt Fence should **NEVER** be used as a Porous Baffle.



**DO NOT** use Silt Fence  
as a Porous Baffle



# BMP Update Questions?



# 2017 SCDHEC Stormwater Program Audit

# DHEC Audit: CEPSCI Inspections/Inspectors

- Approved plans and CEPSCI inspections must be readily available for review by EPA, SCDHEC, and local Municipality/permitting agency.
  - Ideally on-site
  - At minimum, an indication on-site of where to access off-site



# DHEC Audit: CEPSCI Inspections/Inspectors

- DHEC has requested that if the County determines any CEPSCI certified inspectors are not doing their jobs, they should be reported to DHEC and that DHEC may consider revoking their certification.

Certified Erosion Prevention and Sediment Control Inspection Report

Project Name: Timber Glen Date: 2/14/2017

Rainfall since last inspection: \_\_\_\_\_ Weather conditions: PC and cold

Document Box:  Y  N

Best Management Practices:

Y  N Construction entrance properly installed.  Y  N Perimeter controls properly installed.

Y  N Are additional BMPs needed? (If YES, describe below)  
Pipe exiting pond and pipes A1, B1, and C1 and entrance culvert (lower side) need stone energy dissipaters to wrap around pipes - install retention pond forebay basin ASAP - install rock checks on temporary swale at rear of property (ASAP) and swale (drainage ditch) from entrance to storm drain B2.

Y  N Do any BMPs require maintenance? (If YES, describe below)  
Retention pond needs silt cleaned - Storm drains A8-A8.3, A9.4 + A13 need silt cleaned from inlet protection - Storm drain A9 needs inlet protection repaired - Silt fence need put back up at retention pond outlet

Y  N Is construction following the phasing and sequencing plan?

Y  N Has construction activity ceased for 14 days or more?

Y  N Have temporary stabilization measures been installed?

Y  N Are trash, oils & other building products being properly contained/removed? (If NO, describe below)



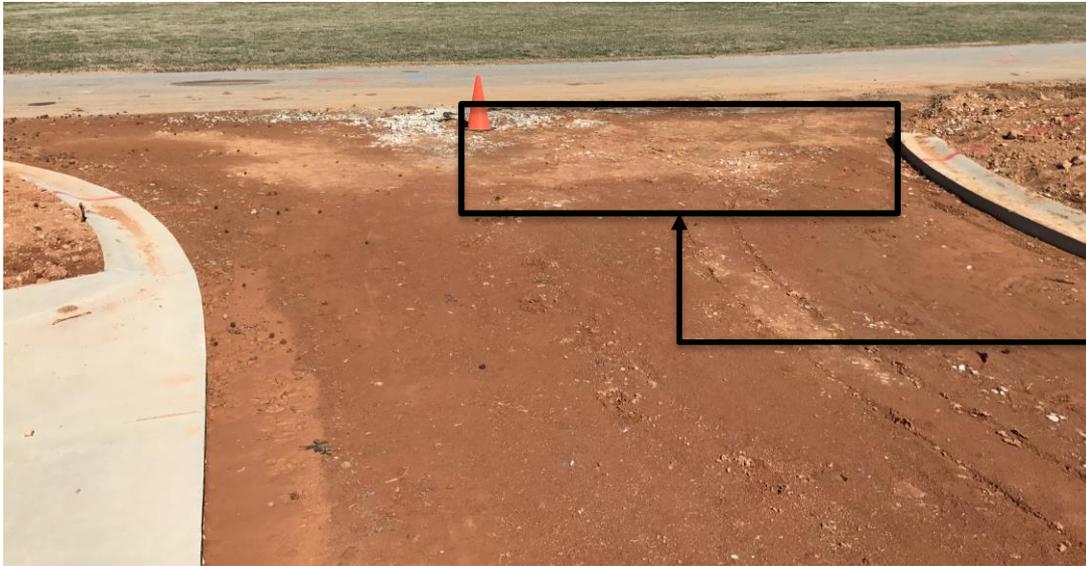
# DHEC Audit: General Comments

- Port-o-john/portable toilet must be available and properly located on ground level away from stormwater inlets (and ponds!)
- Trash and fuels/oils must be properly handled and disposed of
- Stream buffers should remain undisturbed



# DHEC Audit: Specific BMPs

- Construction Entrances
  - Geotextile is required under rock
  - Must be properly sized and maintained for the duration of project



# DHEC Audit: Specific BMPs

- Silt Fence
  - Must be properly installed and maintained for the duration of project



# DHEC Audit: Specific BMPs

- Sediment Ponds/Traps
  - Must have a clearly marked cleanout stake
  - Baffles are required
  - Floating skimmers must have a rock pad to prevent being stuck in mud



# DHEC Audit: Specific BMPs

- How is this pond doing?
  - Cleanout stake?
  - Baffles?
  - Floating skimmer?
  - What else?



# DHEC Audit: Specific BMPs

- Concrete Washout
  - Proper washout area is required



# DHEC Audit: Specific BMPs

- Temporary and Permanent Vegetation
  - Applied at proper rate
  - Soil must be properly prepared



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- Temporary and Permanent Vegetation
  - Protect your vegetation!





# DHEC Audit Questions?

