E&SC PLAN REVIEW

Investigating common challenges and possible field solutions

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GOALS OF THIS PRESENTATION

- Highlight big picture challenges that often contribute to violations
- Discuss possible solutions
- Re-evaluate some entrenched (problematic?) approaches

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- **Going "above and beyond"**
- **Improper application of control measures**

WHAT ARE THE RULES?

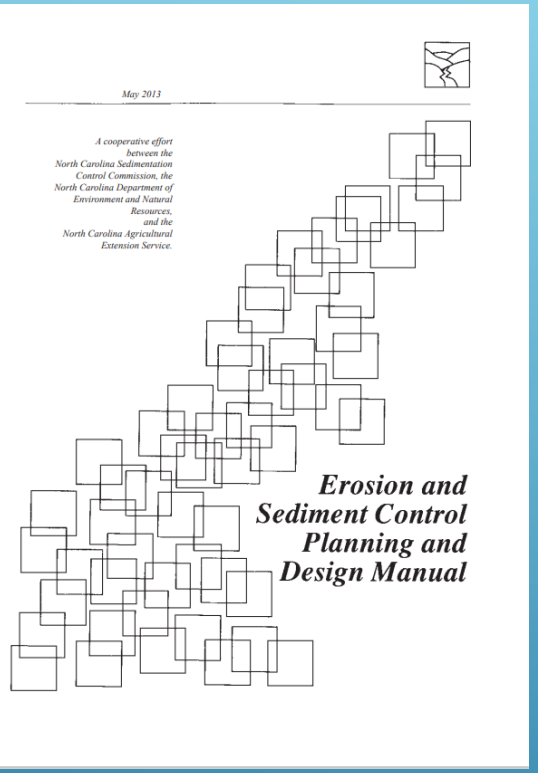
Sedimentation Pollution Control Act of 1973

- Enabling legislation that **gives authority** to NC DEQ (and Gaston County)
- Performance-oriented law
- Created to prevent pollution by sedimentation while still allowing development in our state

Chapter 4 of Title 15A of the NC Administrative Code

- Provides the administrative overview of **how to** enforce the SPCA
- Provide performance standards: Provide protection for the 10 year storm event
- Gaston County SE&SC ordinance was adopted per NC DEQ guidance and review

NC DEQ SE&SC PLANNING & DESIGN MANUAL



Chapter 6 contains Standards and Specifications for structural and vegetative erosion and sediment control practices. **Specifications given in this section are guidelines, and are intended to minimize the time required to design practices for use under typical site conditions. Unusual conditions may dictate that specifications be modified and practices specially designed. Exceptions to these guidelines may be made based on best professional judgement.** Additional guidelines on the design and use of practices are contained in the appendices. Erosion and Sediment Control Planning and Design Manual | NC DEQ

Developed collaboratively (NC DEQ, NCDOT, NCSU, etc.)

Sets design parameters (application, limitations, etc.) for studied and tested sediment & erosion control measures

This law is performance oriented: it prohibits visible off-site sedimentation from construction sites but permits the owner and developer to determine the most economical, effective methods for erosion and sedimentation control. This flexibility in the law allows for innovation and considers the uniqueness of each construction site; however, it also requires the developer to plan his activities carefully in light of their erosion potential. To control erosion and

At least as protective as comparable measure in manual?

SPCA PERFORMANCE ORIENTED LAW

The Act is performance-oriented; that is, the measures used at a construction site *must be effective in controlling erosion and preventing off-site sedimentation for the site to be in compliance*. Following an approved plan and installing the control measures may not be enough. If erosion and sediment damage occurs, the person responsible must install additional measures to correct the problem.

DEMLR Publications | NC DEQ

“ABOVE AND BEYOND”

ABOVE AND BEYOND

Large / oversized sediment basins

- *Surface Area*

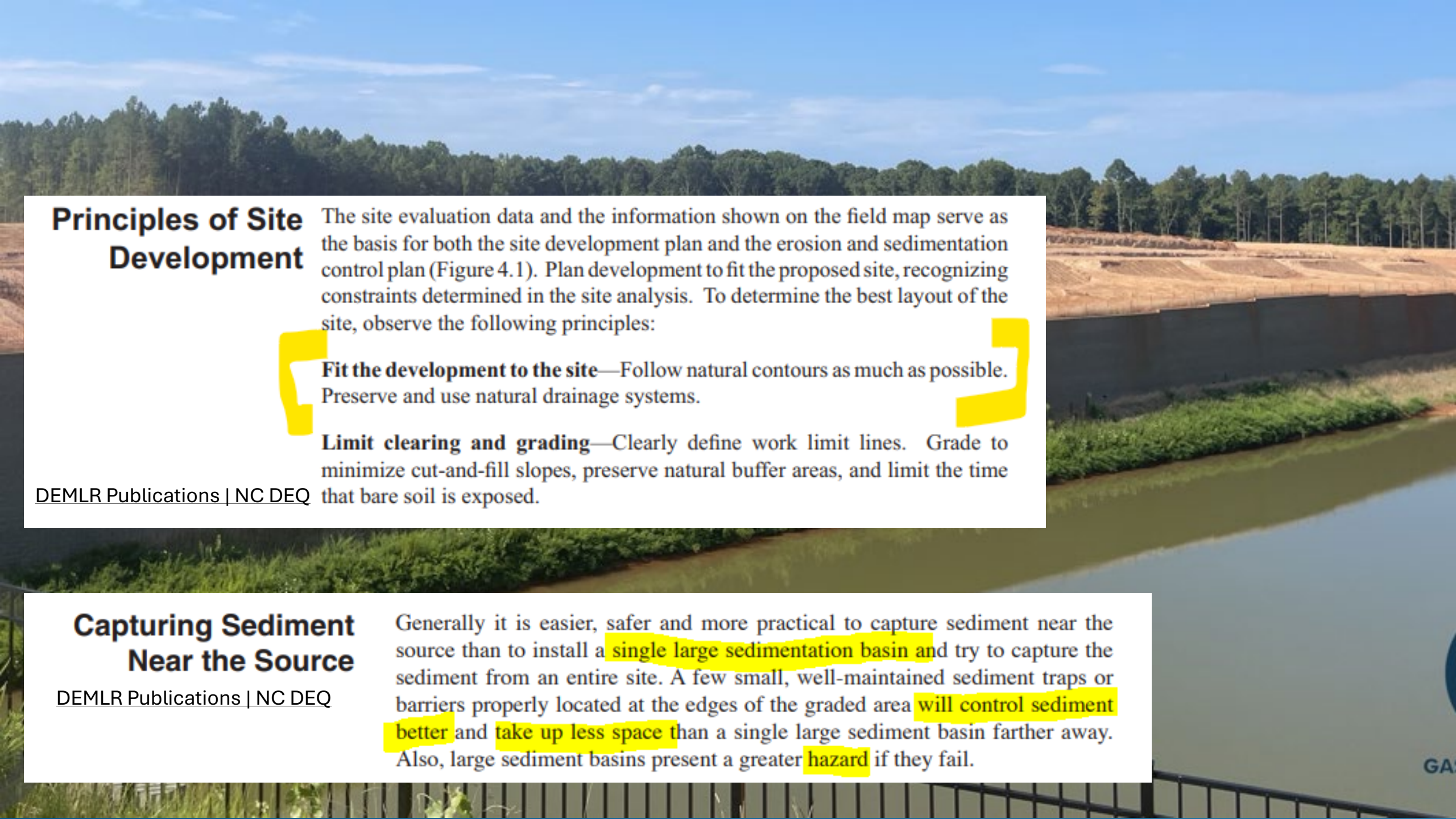
- *Based on field experience:*
- Oversized sediment basin can be beneficial, but there is a threshold at which this creates a net negative impact

ABOVE AND BEYOND

Large / oversized sediment basins

- Basin dewaters from bottom for a longer period of time which increases turbidity levels

- Extended install times (needs its own phase)
- *Mass grade site to install phase 1?*



Principles of Site Development

The site evaluation data and the information shown on the field map serve as the basis for both the site development plan and the erosion and sedimentation control plan (Figure 4.1). Plan development to fit the proposed site, recognizing constraints determined in the site analysis. To determine the best layout of the site, observe the following principles:

Fit the development to the site—Follow natural contours as much as possible. Preserve and use natural drainage systems.

Limit clearing and grading—Clearly define work limit lines. Grade to minimize cut-and-fill slopes, preserve natural buffer areas, and limit the time that bare soil is exposed.

DEMLR Publications | NC DEQ

Capturing Sediment Near the Source

DEMLR Publications | NC DEQ

Generally it is easier, safer and more practical to capture sediment near the source than to install a single large sedimentation basin and try to capture the sediment from an entire site. A few small, well-maintained sediment traps or barriers properly located at the edges of the graded area will control sediment better and take up less space than a single large sediment basin farther away. Also, large sediment basins present a greater hazard if they fail.

ABOVE AND BEYOND

Turbidity monitoring

Can be beneficial, however…

What do we do with the data?

- Clay particles take more than <u>two weeks</u> to settle
- Sediment basins are required to dewater within <u>5 days</u>

ABOVE AND BEYOND

Turbidity Monitoring

What Can Be Done?

- Increase number of discharge points
- Detailed construction sequence
- Focus on stabilization
- Take a close look at retaining walls?
- Chemical Treatment

ABOVE AND BEYOND

Blanket Application of Control Measure(s)

Real Life Example:

"Double row, high hazard or 'super silt fence' is required along the limits of any required undisturbed stream buffer"

Will this require plans to be submitted in violation of the design standards?

YES

IMPROPER APPLICATION

Why does a measure consistently fail?

Incorrectly Installed?

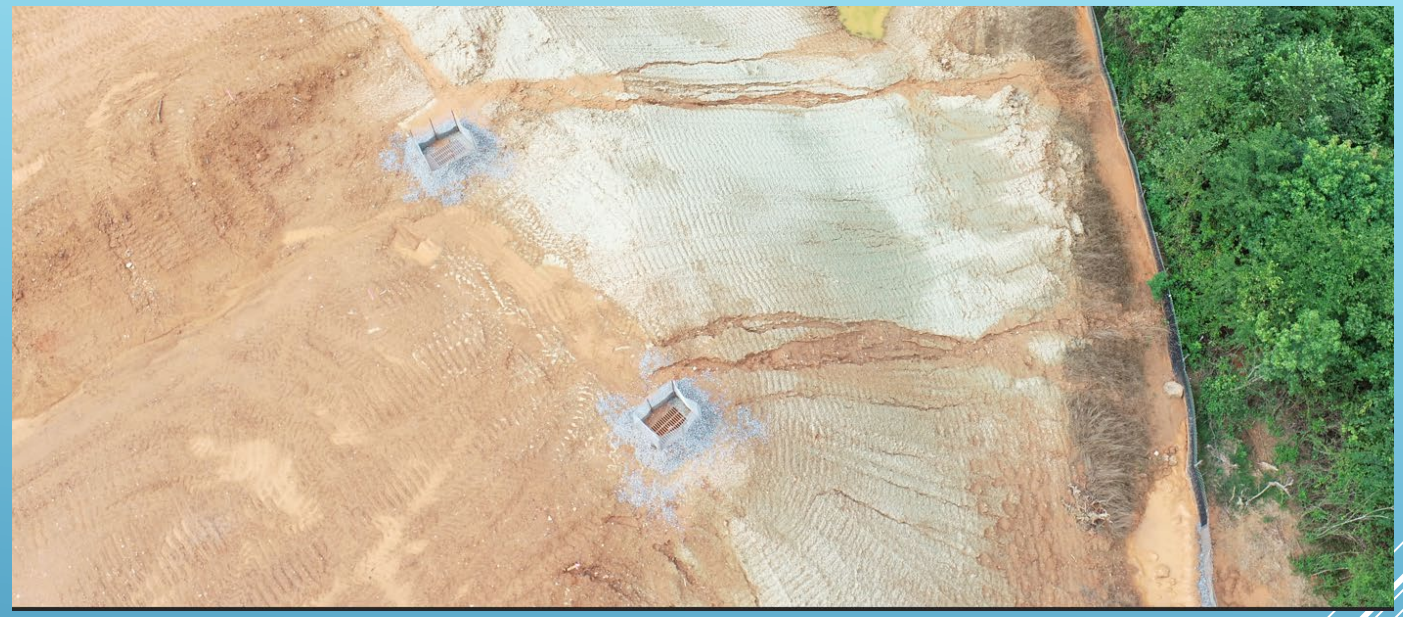
Improperly maintained?

OR

Is it being asked to do something it was never designed to do?

IMPROPER APPLICATION

Inlet Protection



6.51

HARDWARE CLOTH & GRAVEL INLET PROTECTION

Definition A temporary measure of wire-mesh hardware cloth around steel posts supporting washed stone placed around the opening of a drop inlet.

Conditions Where Practice Applies

To be placed around a catch basin or a drop inlet and where the flow is light to moderate. If heavy flow is anticipated, use the rock doughnut inlet protection method (Practice 6.54, *Rock Doughnut Inlet Protection)*. It is also used where storm drain inlets are to be made operational before permanent stabilization of the disturbed drainage area. This method of inlet protection is effective where the inlet is expected to drain shallow sheet flow. The immediate land area around the inlet should be relatively flat (less than 1 percent) and located so that accumulated sediment can be easily removed.

This practice must not be used near the edge of fill material and must not divert water over cut or fill slopes.

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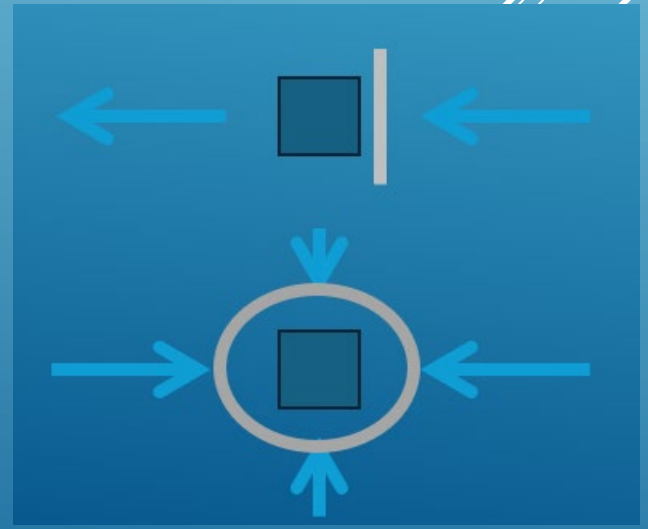

IMPROPER APPLICATION

Inlet Protection

IMPROPER APPLICATION

Silt Fence

Non-compliant **silt fence** application has consistently caused erosion and sedimentation issues

SILT FENCE DESIGN STANDARDS

Practice Standards and Specifications

6.62

SEDIMENT FENCE

Definition

A temporary sediment control measure consisting of fabric buried at the bottom, stretched, and supported by posts.

Purpose

To retain sediment from small disturbed areas by reducing the velocity of sheet flows to allow sediment deposition.

Conditions Where Practice Applies

Below small-disturbed areas that are less then ¼ acre per 100 feet of fence.

Where runoff can be stored behind the sediment fence without damaging the fence or the submerged area behind the fence.

Do not install sediment fences across streams, ditches, or waterways, or other areas of concentrated flow.

Sediment fence should be placed along topographic elevation contours, where it can intercept stormwater runoff that is in dispersed sheet flow. Sediment fence should not be used alone below graded slopes greater than 10 feet in height.

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the drainage area would be 25ft X 100ft = 2500sq.ft., or 0.06 acres.

Table 6.62a Maximum Slope Length and Slope for which Sediment Fence is Applicable

Slope	Slope Length (ft)	Maximum Area (ft^2)
<2%	100	10,000
2 to 5%	75	7,500
5 to 10%	50	5,000
10 to 20%	25	2,500
>20%	15	1,500

Make the fence stable for the 10-year peak storm runoff.

Ensure that the depth of impounded water does not exceed 1.5 feet at any point along the fence.

If non-erosive outlets are provided, slope length may be increased beyond that shown in Table 6.62a, but runoff from the area should be determined and bypass capacity and erosion potential along the fence must be checked. The velocity of the flow at the outlet or along the fence should be in keeping with Table 8.05d, Appendix 8.05.

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- Silt fences should never be placed across streams, drainage channels or areas of concentrated flow. The flowing water will collapse or undermine the fence.

Deposition occurs as the storage pool forms behind the fence. The designer can direct flows to specified deposition areas through appropriate positioning of the fence or by providing an excavated area behind the fence. Plan deposition areas at accessible points to promote routine cleanout and maintenance. Show deposition areas in the erosion and sedimentation control plan. A sediment fence acts as a diversion if placed slightly off the contour. A maximum slope of 2 percent is recommended. This technique may be used to control shallow, uniform flows from small disturbed areas and to deliver sediment-laden water to deposition areas. The anchoring of the toe of the fence should be reinforced with 12 inches of NC DOT #5 or #57 washed stone when flow will run parallel to the toe of the fence.

Sediment fences serve no function along ridges or near drainage divides where there is little movement of water. Confining or diverting runoff unnecessarily with a sediment fence may create erosion and sedimentation problems that would not otherwise occur.

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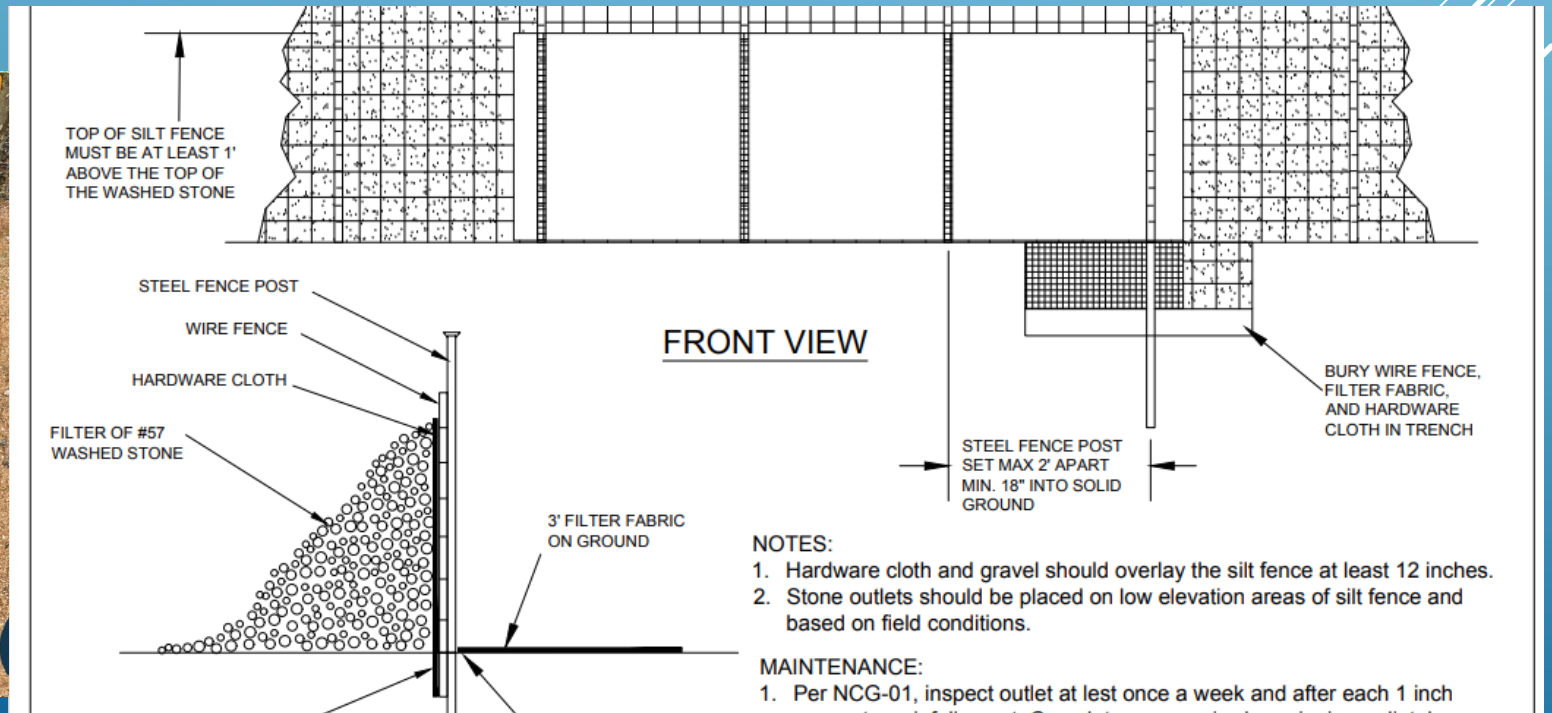
Design for silt fence outlet?

(*what can it handle*)?



IMPROPER APPLICATION

Silt Fence

IMPROPER APPLICATION

Silt Fence

IMPROPER APPLICATION

Silt Fence

Accumulation Point

IMPROPER APPLICATION

Silt Fence

IMPROPER APPLICATION

Silt Fence

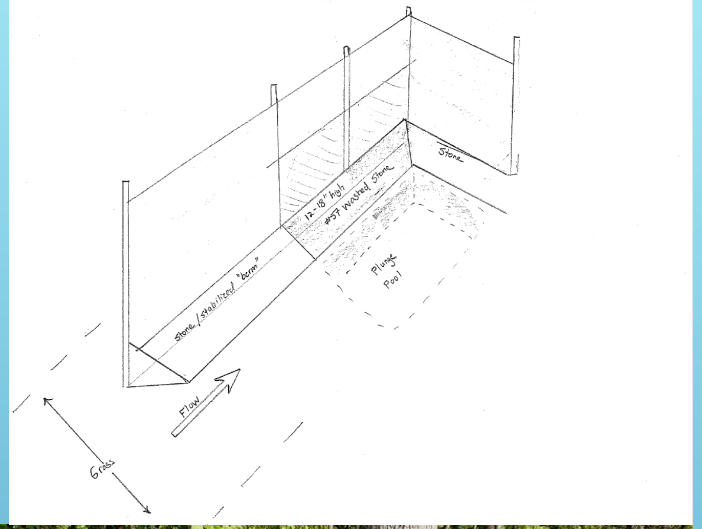
IMPROPER APPLICATION

Silt Fence

This Grading Contactor is aware of the issue

SOLUTION?

"How can we make silt fence work?"



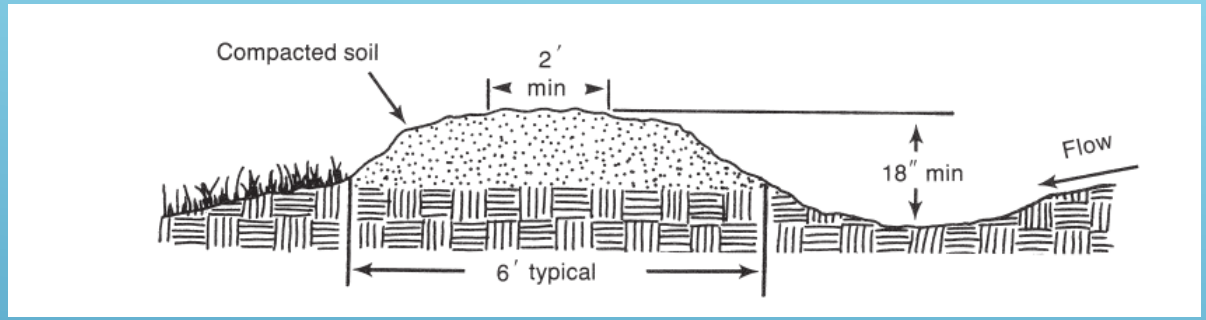
WHY IS THIS ISSUE SO PREVALENT?

Is silt fence being approved (or worse, required) in violation of it's design standard?

SILT FENCE WILL NOT WORK HERE… WHAT DO YOU DO?

Remember, plans are to be site-specific… It will depend on your site and your project.

WHAT IS AN APPROPRIATE ALTERNATIVE? "Nothing"?



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“NOTHING” ON A SMALLER SCALE

Additional Benefits of Vegetation as a control measure

- Natural
- Less area to "control"
- Often is in place and can remain
- Easy to maintain

Surface Cover Vegetation is the most effective means of stabilizing soils and controlling erosion. It shields the soil surface from the impact of falling rain, reduces flow velocity, and disperses flow. Vegetation provides a rough surface that slows the runoff velocity and promotes infiltration and deposition of sediment.

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vegetated or removed. In the latter case, the mesh shall be cut open and the mulch spread as a soil supplement.

WOOD CHIP FILTER BERM

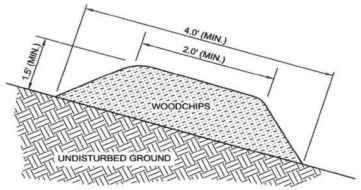
Wood Chip Filter Berms may be used on wooded or rocky slopes where staking and trenching of other BMPs is very difficult or impossible. Since they do not require trenching, Wood Chip Filter Berms disturb less soil during installation than Silt Fence and Straw Bale Barriers. However, large obstructions such as tree limbs, boulders, etc. should be removed prior to placement of the wood chips. Once the tributary drainage area is permanently stabilized, the Wood Chip Filter Berm may either be leveled or left in place.

Wood Chip Filter Berms should be aligned parallel to existing contours and located below all disturbed areas. They are not recommended for use within 50 feet of receiving surface water.

The maximum slope length above a Wood Chip Filter Berm should not exceed those shown for the Reinforced Silt Fence in Table 4.3 (on pg. 15).

Wood Chip Filter Berms should be constructed as shown in Standard Construction Detail # 4-12 (on pg. 18).

STANDARD CONSTRUCTION DETAIL # 4-12
Wood Chip Filter Berm



Prior to placement of the berm, obstructions such as tree limbs, large rocks, etc. shall be removed.

Wood Chip Filter Berms shall be placed at existing level grade. Both ends of the berm shall be extended at least 8 feet up slope at 45 degrees to the main barrier alignment (see Figure 4.1 on pg. 13). Wood Chip Berms may not be located in areas of concentrated flow or used to construct sediment traps or other impoundments.

A 6" thick layer of compost shall be added to the upslope side of any Wood Chip Filter Berm located in a Special Protection Watershed.

Berms shall be inspected weekly and after each runoff event. Sediment shall be removed when accumulations reach 1/2 the above ground height of the berm. Damaged or deteriorated portions of the berm shall be replaced immediately upon inspection.

Berms may be leveled when the tributary area has been permanently stabilized or left in place.

MULCH – MORE THAN GROUND COVER?

Iowa SUDAS
STATEWIDE URBAN DESIGN AND SPECIFICATIONS

7E-3

Design Manual
Chapter 1 - General Provisions
7E - Design Information for ESC Measures

Filter Berms


Source: Minnesota Stormwater Manual

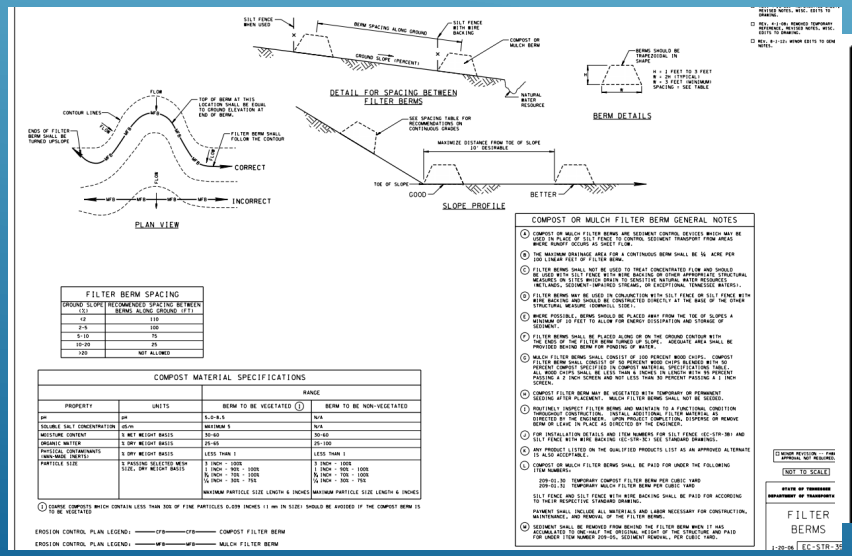
BENEFITS

	L	M	H
Flow Control	■		
Erosion Control	■		
Sediment Control	■	■	
Runoff Reduction			
Flow Diversion	■		

Description: A filter berm is a windrow-shaped structure constructed of 'filter material'; typically constructed from slash mulch generated during site clearing and grubbing, organic products used to slow flow velocity, capture and degrade chemical pollutants, and trap sediment.

Typical Uses: Perimeter control, slope length reduction, environmentally sensitive areas such as wetlands and

Iowa



COMPOST OR MULCH FILTER BERM GENERAL NOTES

(A) COMPOST OR MULCH FILTER BERMS ARE SEDIMENT CONTROL DEVICES WHICH MAY BE USED IN PLACE OF SILT FENCE TO CONTROL SEDIMENT TRANSPORT FROM AREAS WHERE RUNOFF OCCURS AS SHEET FLOW.

(B) THE MAXIMUM DRAINAGE AREA FOR A CONTINUOUS BERM SHALL BE ¼ ACRE PER 100 LINEAR FEET OF FILTER BERM.

(C) FILTER BERMS SHALL NOT BE USED TO TREAT CONCENTRATED FLOW AND SHOULD BE USED WITH SILT FENCE WITH WIRE BACKING OR OTHER APPROPRIATE STRUCTURAL MEASURES ON SITES WHICH DRAIN TO SENSITIVE NATURAL WATER RESOURCES (WETLANDS, SEDIMENT-IMPAIRED STREAMS, OR EXCEPTIONAL TENNESSEE WATERS).

(D) FILTER BERMS MAY BE USED IN CONJUNCTION WITH SILT FENCE OR SILT FENCE WITH WIRE BACKING AND SHOULD BE CONSTRUCTED DIRECTLY AT THE BASE OF THE OTHER STRUCTURAL MEASURE (DOWNHILL SIDE).

(E) WHERE POSSIBLE, BERMS SHOULD BE PLACED AWAY FROM THE TOE OF SLOPES A MINIMUM OF 10 FEET TO ALLOW FOR ENERGY DISSIPATION AND STORAGE OF SEDIMENT.

(F) FILTER BERMS SHALL BE PLACED ALONG OR ON THE GROUND CONTOUR WITH THE ENDS OF THE FILTER BERM TURNED UP SLOPE. ADEQUATE AREA SHALL BE PROVIDED BEHIND BERM FOR PONDING OF WATER.

Tennessee

Perimeter sediment Control Measure

Cheap

Often on site

Can usually be left onsite

Easy to “get right”

Easy to maintain

Quick to “install”

Instant ground cover and sediment barrier

Natural

It works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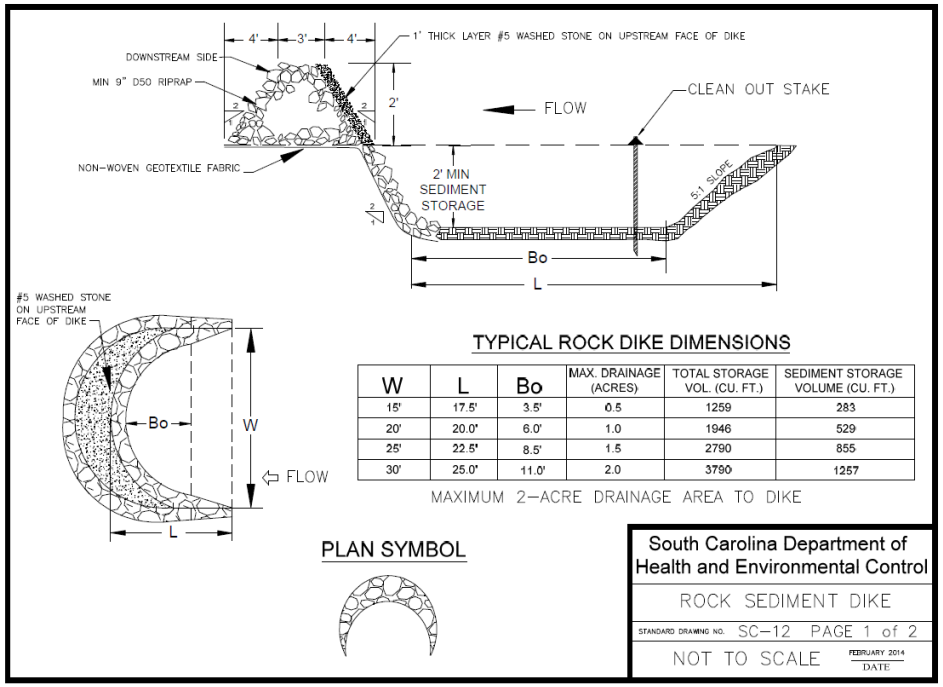
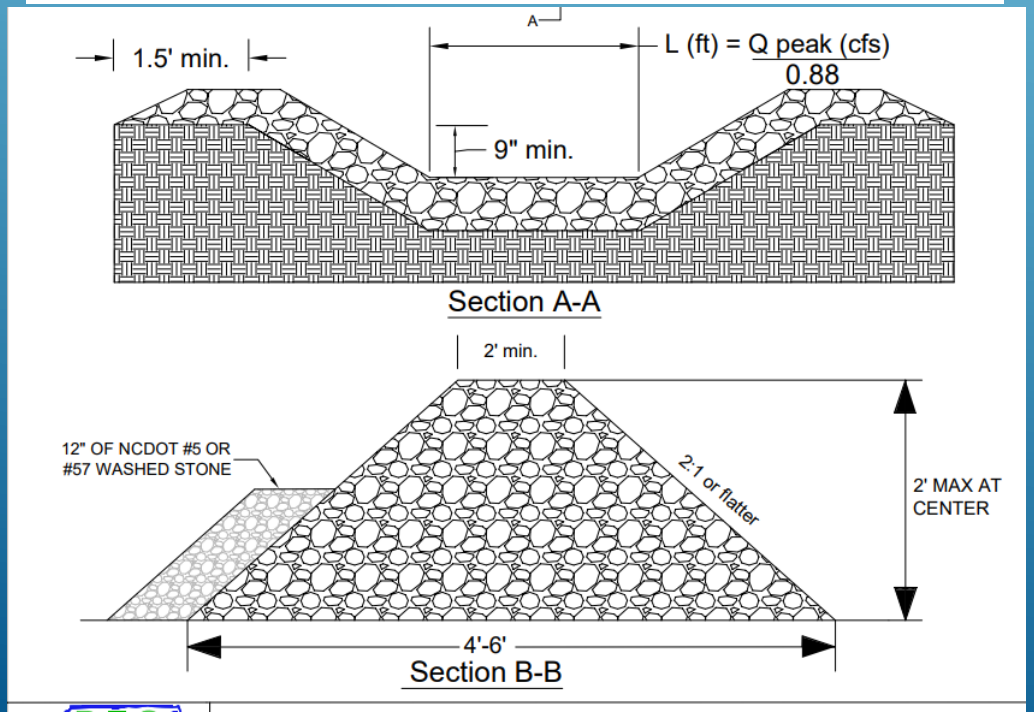
ROCK DIKE



W	L	Bo	MAX. DRAINAGE (ACRES)	TOTAL STORAGE VOL. (CU. FT.)	SEDIMENT STORAGE VOLUME (CU. FT.)
15'	17.5'	3.5'	0.5	1259	283
20'	20.0'	6.0'	1.0	1946	529
25'	22.5'	8.5'	1.5	2790	855
30'	25.0'	11.0'	2.0	3790	1257



6.87

CHECK DAM WITH A WEIR

Definition

A small stone dam structure with a weir outlet with a sediment storage area on the upper side.

Purpose

To reduce erosion in a drainage channel by restricting the velocity of flow. This structure also has some ability to provide sediment control.

Conditions Where Practice Applies

This temporary practice may be used in the following locations:

- At outlets of temporary diversions, graded channels, and temporary slope drains;
- In small natural drainage turnouts; and
- In locations where the dams can be easily cleaned and maintained on a regular basis.

Do not use a check dam with a weir in intermittent or perennial streams.

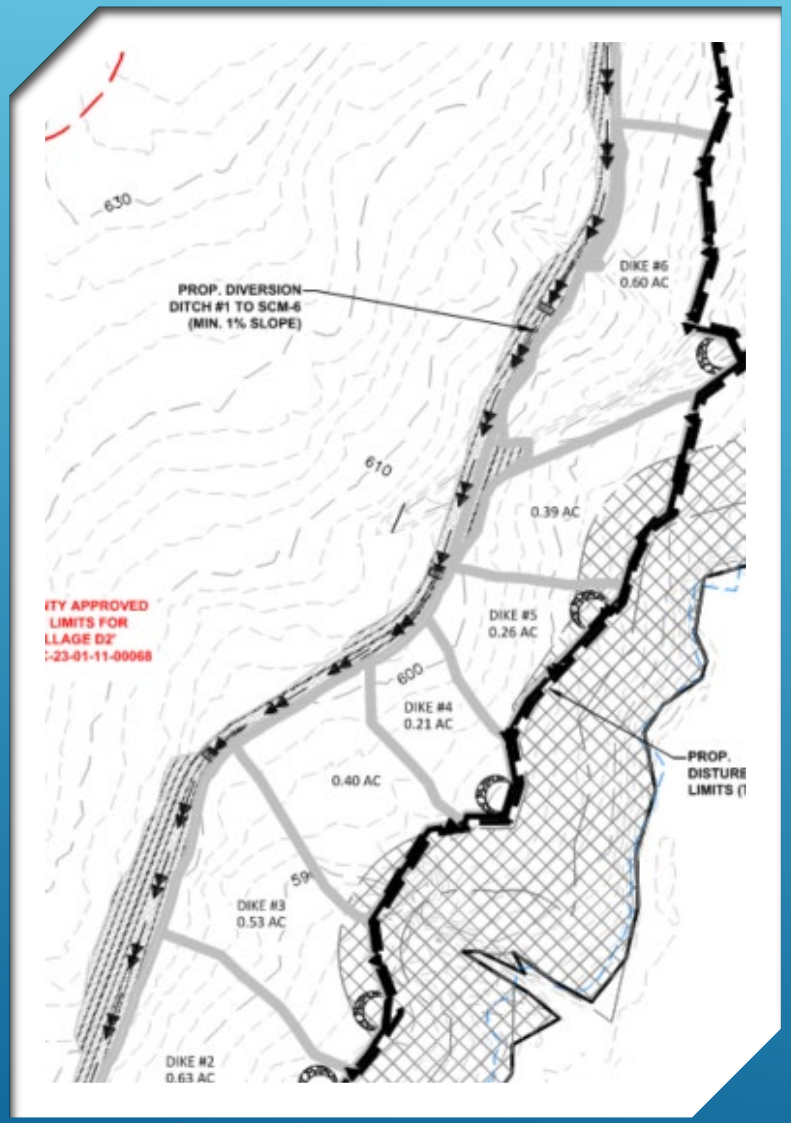
Planning Considerations

Check dams are an expedient way to reduce gullying in the bottom of channels that will be filled or stabilized at a later date. The dams should only be used while permanent stabilization measures are being put into place.

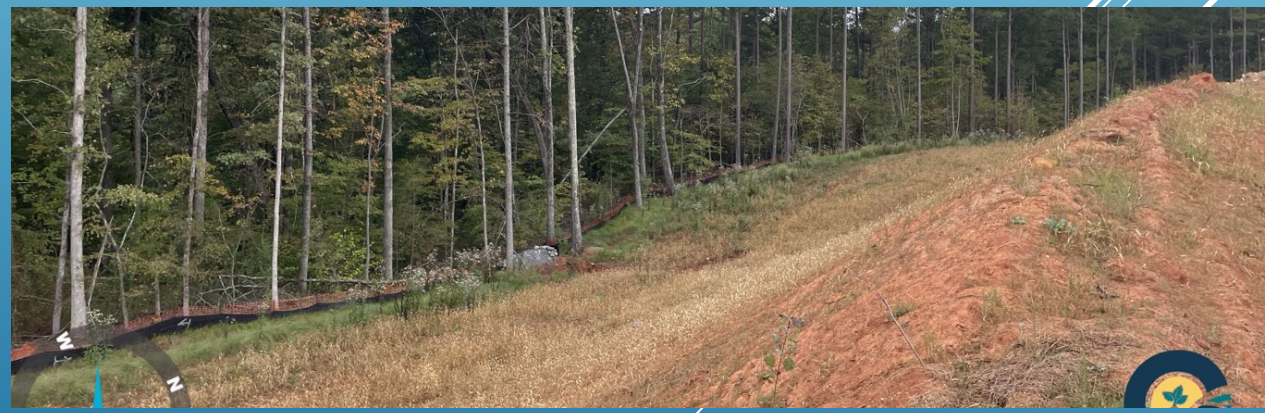
Check dams installed in grass-lined channels may kill the vegetative lining if submergence after it rains is too long and/or sedimentation is excessive. All stone and riprap must be removed if mowing is planned as part of vegetative maintenance.

Design Criteria

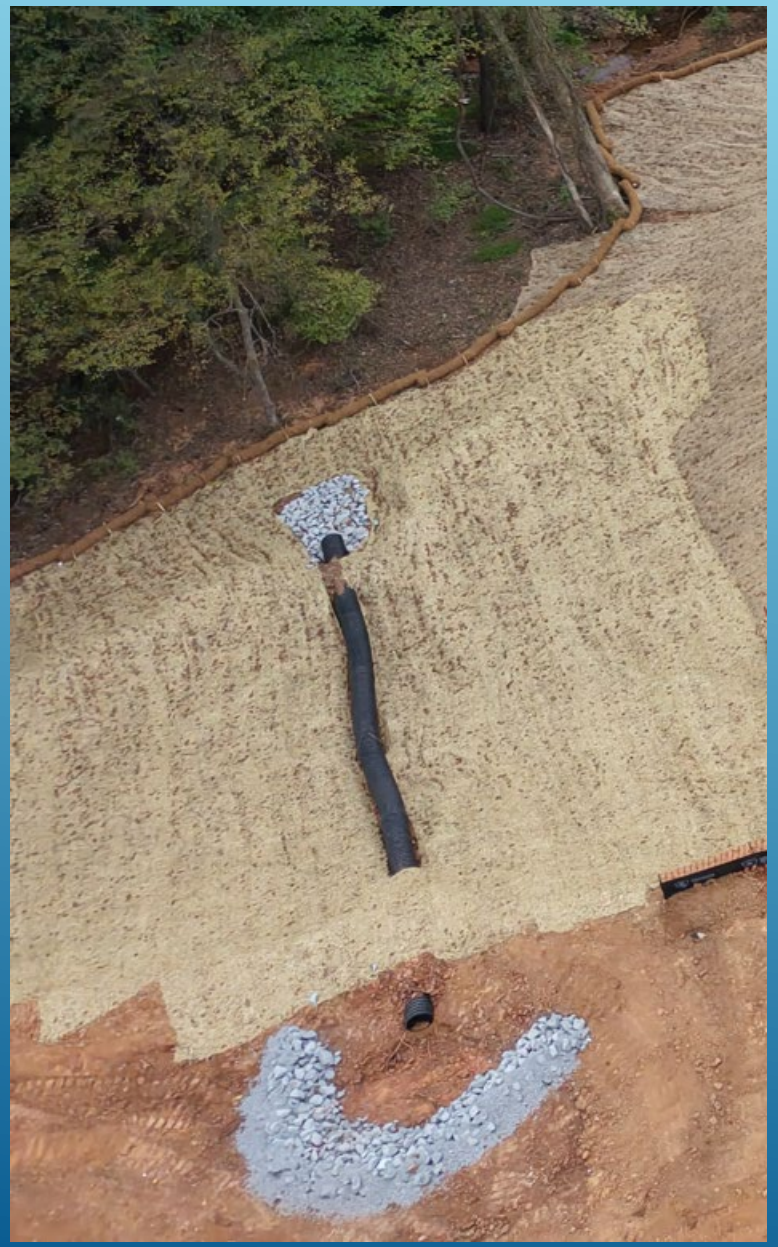
The following criteria should be used when designing a check dam with a



- Silt fence (conditional rezoning) but rendered useless
- Perimeter swale
- Rock sediment dike
- Less than one acre, preferably closer to 0.5 acre each



SLOPE DRAINS



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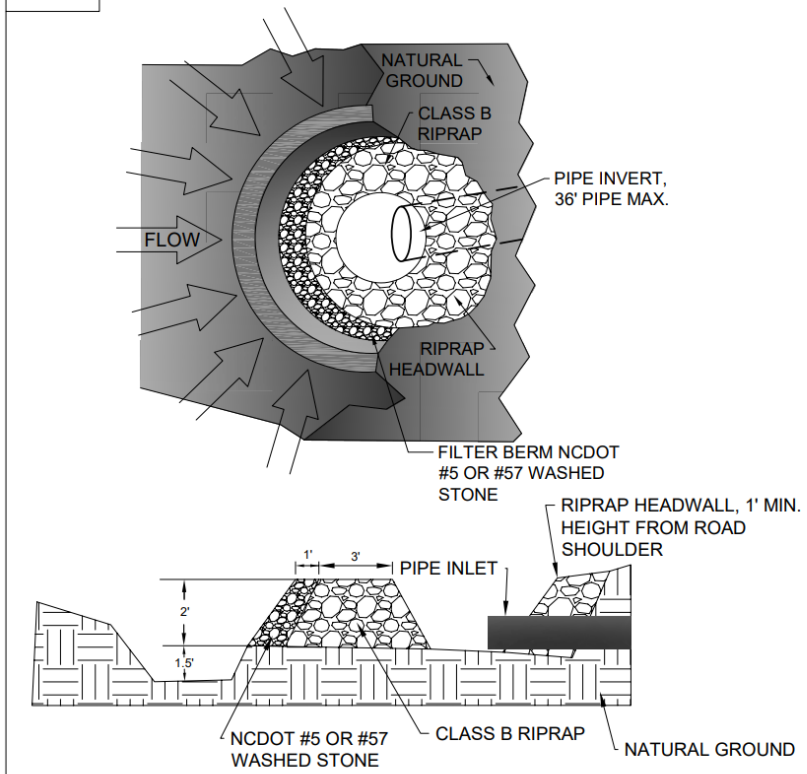

NOTES:

1. Clear the area of all debris that might hinder excavation and disposal of spoil.
2. Install the Class B or Class 1 riprap in a semi-circle around the pipe inlet. The stone should be built up higher on each end where it ties into the embankment. The minimum crest width of the riprap should be 3 feet, with a minimum bottom width of 11 feet. The minimum height should be 2 feet, but also 1 foot lower than the embankment of diversions.
3. A 1 foot thick layer of NC DOT #5 or #57 stone should be placed on the outside slope of the riprap.
4. The sediment storage area should be excavated around the outside of the stone horseshoe 18 inches below natural grade.
5. When contributing drainage area has been stabilized, remove the pipe and rock, fill depression, establish final grading elevations, compact the area properly, and stabilize with ground cover.

MAINTENANCE:

1. Inspect all measures at least weekly and after each rainfall of 1.0 inch or greater and repair immediately.
2. Remove sediment and restore the sediment storage area to its original dimensions when the sediment has accumulated to one-half the design depth of the trap.
3. Place the sediment that is removed in the designated disposal area and replace the contaminated part of the gravel facing.
4. Check the structure for damage. Any riprap displaced from the stone horseshoe must be replaced immediately.
5. After all the sediment-producing areas have been permanently stabilized, remove the structure and all the unstable sediment. Smooth the area to blend with the adjoining areas and provide permanent ground cover.

MAKE A TEMPORARY SD INLET

OTHER BIG PICTURE PLAN REVIEW THOUGHTS?

MASS GRADING PLAN PHASE

- Two phases required at minimum
- Three phases requires a deep understanding of means & methods and provides clarity in the field
- More efficient plan review process

• VEGETATED PERIMETER DIVERSION DITCHES THAT REMAIN THROUGHOUT CONSTRUCTION

- Easier implementation, maintenance, and more successful control of erosion & sedimentation.

- Temporary (unstable) diversion ditches increase risk
  - A significant amount of sediment captured in sediment basins comes from eroded diversion ditches

ENHANCED FIRST INLET ZONE OF SEDIMENT BASIN


Maps
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FINAL THOUGHTS

https://bit.ly/2025EscEval

Regulators:

Remember, there is intentional flexibility in the requirements

Designers:

Must understand means & methods of erosion & sediment control

Developers:

What level of risk are you willing to take?