

ACEC Erosion Control Design Training 2015



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Soil & Water Engineering Section Supervisor

New Consultant EC Title Sheet

- Consultant Title Sheet Projects
 - Design Build Projects
 - REU On-call Contract Projects
 - Division Design Raleigh Let (DDRL) Projects
- No DocuSign Requirement
- Soil & Water will not DocuSign

Revise this box to Reviewer Address as needed

<p><i>Prepared in the Office of:</i> XXXXX XXXXX XXXXX</p> <p>2012 STANDARD SPECIFICATIONS</p> <p><i>Designed by:</i></p> <p><u>XXXX XXXX</u> <u>XXXX</u></p> <p>NAME LEVEL III CERTIFICATION NO.</p>	<p><i>Reviewed In the Office of:</i> ROADSIDE ENVIRONMENTAL UNIT 1 South Wilmington St. Raleigh, NC 27611</p> <p>2012 STANDARD SPECIFICATIONS</p> <p><i>Reviewed by:</i></p> <p><u>XXXX XXXX</u></p>
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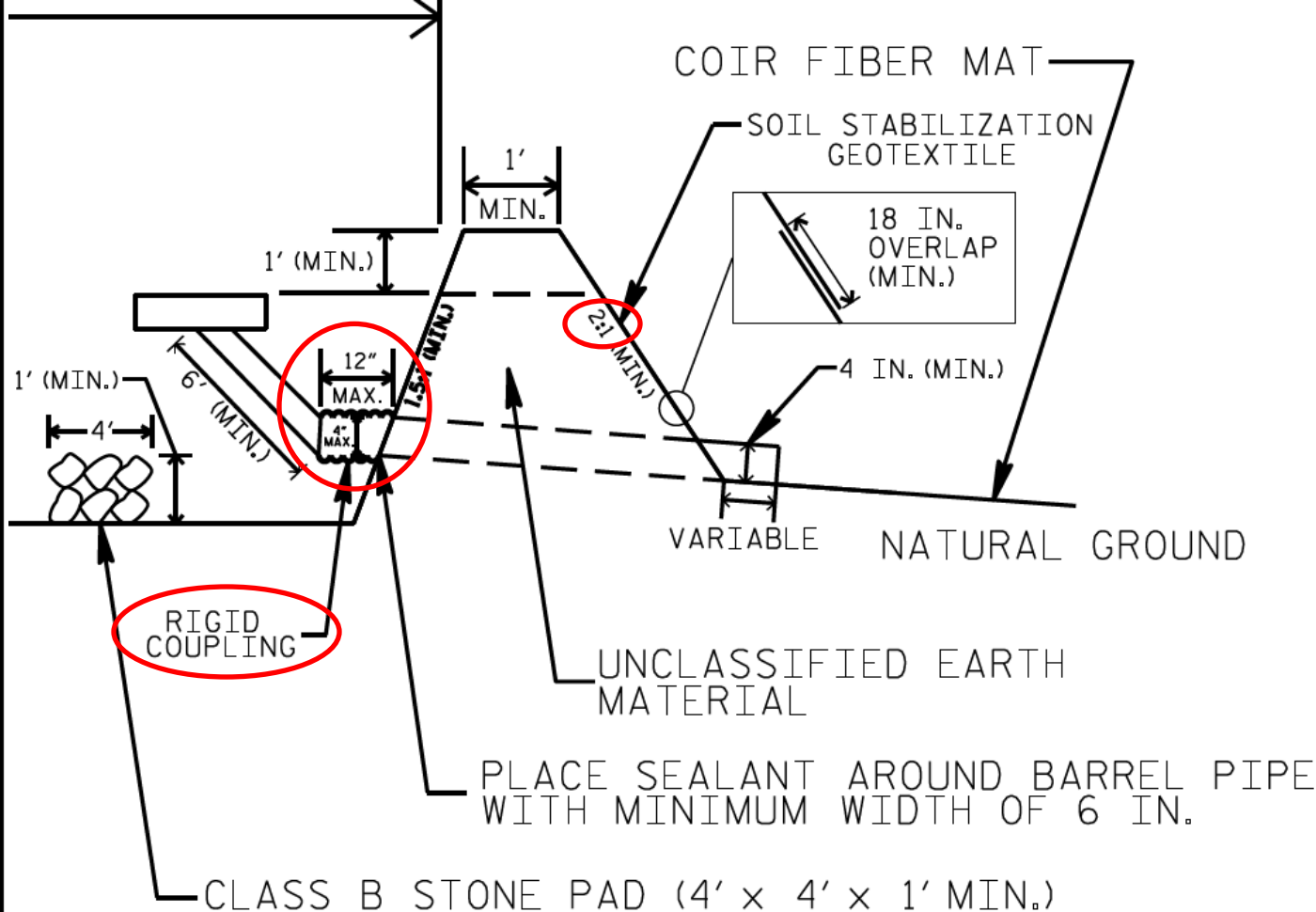
Primary NCDOT Erosion Control Reviewer's Name

Revisions to Basin Details

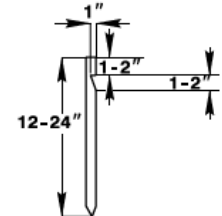
- Revised Exterior Basin Slopes from 3:1 to 2:1
- Added Rigid Coupling Requirement
- Decreasing Weir Length to $Q/0.8$ (from $Q/0.4$)
- Tiered Skimmer Basin
 - Deleted Slope Drain Pipes between Basins
 - Revised Upper Basin Depth(s) from 3 ft. to 2 ft.

PROJECT REFERENCE NO. X-XXXX	SHEET NO. EC-2B
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

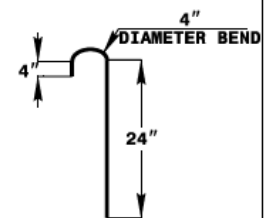
SKIMMER BASIN WITH BAFFLES DETAIL



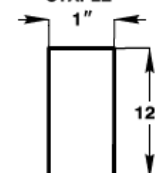
2" x 2" (nominal)
WOODEN STAKE



#10 STEEL
REINFORCEMENT BAR



1" (nominal)
STAPLE



**COIR FIBER MAT
ANCHOR OPTIONS**

1. SEED AND PLACE MATTING FOR EROSION CONTROL ON INTERIOR AND EXTERIOR SIDESLOPES.

DETERMINE PRIMARY SPILLWAY WEIR LENGTH (FT.) USING $Q/0.8$ WHERE Q IS FLOW RATE (CFS) INTO BASIN.

6. SOIL STABILIZATION GEOTEXTILE FOR PRIMARY SPILLWAY SHALL BE ONE CONTINUOUS PIECE OF MATERIAL OR OVERLAPPED 18 IN. (MIN.).

NOT TO SCALE

PROJECT REFERENCE NO.		SHEET NO.	
X-XXXX		EC-2C	
RW SHEET NO.			
ROADWAY DESIGN ENGINEER		HYDRAULICS ENGINEER	



1. SEED AND PLACE MATTING FOR EROSION CONTROL ON INTERIOR AND EXTERIOR SIDESLOPES OF BASINS.
2. LIMIT HEIGHT OF EARTH DIKES TO 5 FT.
3. ADDITIONAL MODIFIED SILT BASINS TYPE 'B' MAY BE NEEDED DEPENDING ON SLOPE.
4. FOR BASIN DEPTHS OF 3FT., THE MINIMUM BASIN WIDTHS SHALL BE 9 FT.
5. DETERMINE PRIMARY SPILLWAY WEIR LENGTHS (FT.) USING $Q/O.8$, WHERE Q IS FLOW RATE (CFS) INTO UPPER BASIN.
6. SOIL STABILIZATION GEOTEXTILE FOR PRIMARY SPILLWAYS SHALL BE ONE CONTINUOUS PIECE OF MATERIAL OR OVERLAPPED 18 IN. (MIN.).

NOT TO SCALE

Sediment Basin Guidance

- Place Sediment Basin at all Feasible Drainage Outlets!
- Design Surface Dewatering Basin @ Jurisdictional Outlets
 - Device with Skimmer
 - Basin with Skimmer plus Riser
 - Infiltration
- If Sediment Basin not Feasible:
 - Place Stone Device at Outlet utilizing Sediment Control Stone
 - Use Flocculant Measures Up Gradient

Flocculant Device Guidance

- Place Flocculant Device at Sediment Basin Inlet
- Place Flocculant Devices in Ditches that:
 - Flow to Jurisdictional Resources
 - Flow to Areas where Surface Area and/or Sediment Storage not achieved
- Design Flocculant Measures with Appropriate Spacing in:
 - Temporary Ditches Carrying Disturbed Area Runoff
 - Proposed Ditches Carrying Disturbed Area Runoff

Don't Place Flocculant Devices at:

- Drainage Outlets
- Clean Water Diversions
- Live Streams
- Wetlands

Water Quality Evaluation

- Division of Water Resources Surface Water Classifications
<http://portal.ncdenr.org/web/wq/ps/csu/classifications>
- Check for Critical Area (CA) Waters
- Use the Final **2014** 303(d) list for Turbidity Impairment
<http://portal.ncdenr.org/web/wq/ps/csu/swstandards/303d>

ROADSIDE ENVIRONMENTAL UNIT
SURFACE WATERS PRESENT WORKSHEET

Buncombe County	13 Div.	42324.1.1 WBS #	B-5167 TIP
Broad _____		River Basin(s) _____	
Flat Creek			
9-12			
C; Tr			

Name(s) of stream(s) or lake(s) with DWQ index number and classification

- ☐ No High Quality Water (HQW) and /or Trout Water
☐ 303(d) Stream listed for Construction Related Impacts (Sediment and/or Turbidity)
☒ Trout Water and/or ☐ Inland County HQW and/or ☐ CA water(s) Exist
☐ Falls Lake Watershed

Location of zone within 1

mile and draining to TrW: From Sta. Begin to Sta. End
 to HQW/CA water: From Sta. _____ to Sta. _____
 to 303(d): From Sta. _____ to Sta. _____

- ☐ Coastal County High Quality Water Exists

Location of zone within

600' to HQW: From Sta. _____ to Sta. _____

* Coastal Counties: Beaufort, Bertie, Brunswick, Camden, Carteret, Chowan, Craven, Currituck, Dare, Gates, Hertford, Hyde, New Hanover, Onslow, Pamlico, Pasquotank, Pender, Perquimans, Tyrrell, and Washington

For projects in the following river basins, Riparian Buffer Zones need to be identified:

- ☐ Neuse River Basin ☐ Tar-Pamlico River Basin ☐ Jordan Lake Watershed
☐ Catawba River (Main Stem) ☐ Randleman Lake Watershed

Mark project limits on USGS topographic map(s).

Topo map name(s) Black Mountain

Mark project limits on USDA County Soil Survey map(s), if available.

Soil map sheet number(s) N/A

Filed by: MEH Date: 5-22-12

EC Plan Submittal Items

- Water Quality Sheet
- Checklist
- Matting Spreadsheet
- Basin Design Spreadsheet(s)
- Quantity Spreadsheet (Complete **all** Tabs!)
- Plans (Hard Copies & PDF)
- Microstation Files
- Special Provisions (If Design Build)

EC Design Procedure

1. Determine Stream Classifications for Water Quality
2. Place Environmentally Sensitive Area (If applicable)
3. Choose Design Storm for Basins (10-yr or 25-yr)
4. Preliminary Sediment Basin Design
5. Culvert Phasing Design (If applicable)
6. Coordinate Stilling Basins with Sediment Basins
7. Design Runoff Conveyances to Sediment Basins
8. Place Perimeter Sediment Control Measures
9. Design Upland Erosion Control
10. Place Plan Sheet Notes

Culvert Phasing Tips

- Avoid Pumping Effluent across Temporary Channels
- Arrange Pipes and Channels for Complete Construction
 - Wing Walls
 - Channel Improvements
- Don't Show Erosion Control Measures in Phasing
- Coordinate with Traffic Control Plans (Temp. Shoring)
- Culvert Phasing Presentation

http://www.ncdot.gov/doh/operations/dp_chief_eng/roadside/soil_water/erosion_control/downloads.html

Pump and Dike

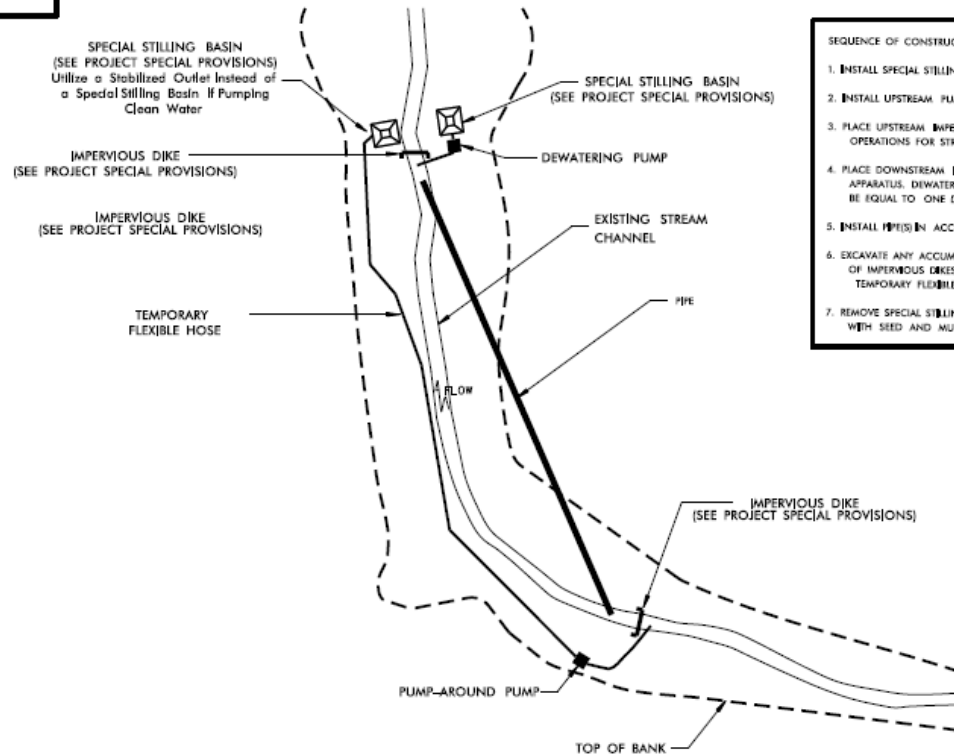
- Short Duration Process (Max. 5 days!)
- Use for Pipe Installation
- Include Pump-Around Detail in the Plans
- Reference BMP Manual with Note

EXAMPLE OF PUMP-AROUND OPERATION

PROJECT REFERENCE NO. X-1111	SHEET NO. EC-28
RDWY DESIGN ENGINEER	HYDRAULICS ENGINEER

NOTES:

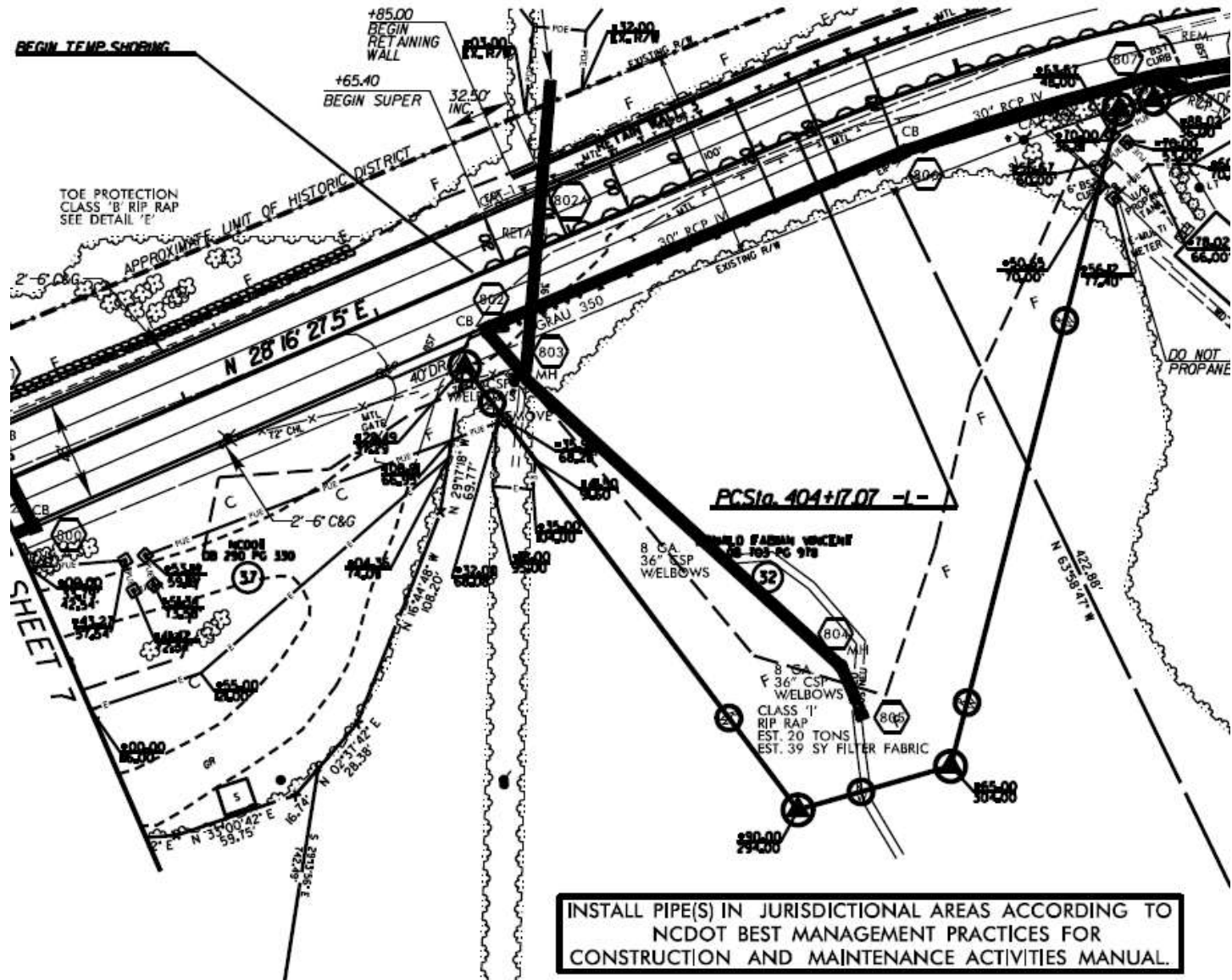
- 1) All excavation shall be performed in only dry or isolated areas of the work zone.
- 2) Impervious dikes are to be used to isolate work from stream flow when necessary.
- 3) Maintenance of stream flow operations shall be incidental to the work. This includes polyethylene sheeting, diversion pipes, pumps and hoses.
- 4) Pumps and hoses shall be of sufficient size to dewater the work area.



SEQUENCE OF CONSTRUCTION FOR TYPICAL WORK AREA

1. INSTALL SPECIAL STILLING BASIN(S).
2. INSTALL UPSTREAM PUMP AND TEMPORARY FLEXIBLE HOSE.
3. PLACE UPSTREAM IMPERVIOUS DIKE AND BEGIN PUMPING OPERATIONS FOR STREAM DIVERSION.
4. PLACE DOWNSTREAM IMPERVIOUS DIKE AND PUMPING APPARATUS. DEWATER ENTRAPPED AREA. AREA TO BE DEWATERED SHALL BE EQUAL TO ONE DAY'S WORK.
5. INSTALL PIPES IN ACCORDANCE WITH THE PLANS.
6. EXCAVATE ANY ACCUMULATED SILT AND DEWATER BEFORE REMOVAL OF IMPERVIOUS DIKES. REMOVE IMPERVIOUS DIKES, PUMPS, AND TEMPORARY FLEXIBLE HOSE (DOWNSTREAM IMPERVIOUS DIKES FIRST).
7. REMOVE SPECIAL STILLING BASIN(S) AND BACKFILL. STABILIZE DISTURBED AREA WITH SEED AND MULCH.

Phasing Per BMP Manual Note



Stilling Basin Design

- Volume (ft³) = Width of Stream Channel (ft.) x (Length of Culvert (ft.) + 20 ft. (10 ft. on Each Side)) x (Depth of Water in Stream (ft.) + Undercut for Bottom of Culvert (ft.))
- Typically used for Volumes > 100 CY (2700 ft³)
- Freeboard = 6 inches (Minimum)
- Design Permeable Stone Drain to Dewater at a Slow Rate
- Add Volume to Required Volume of Sediment Basins

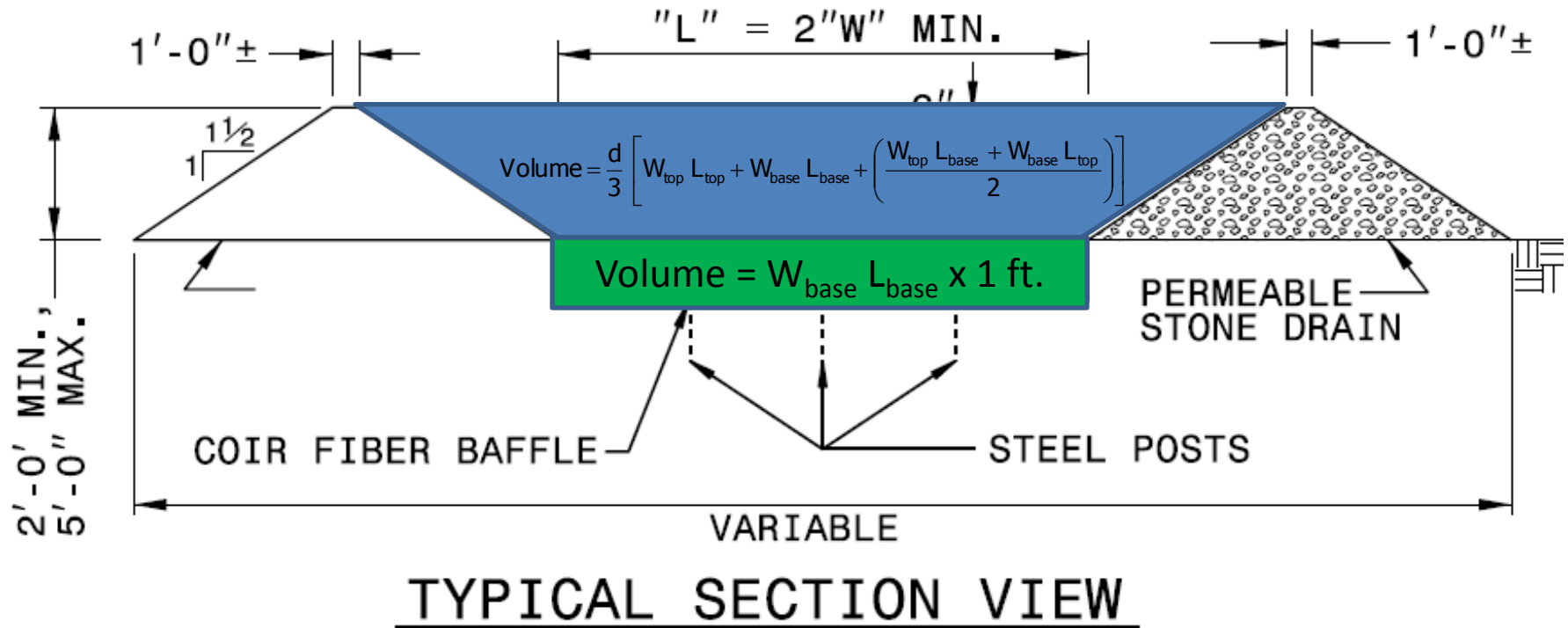
Stilling Basin Volume Design

- Formula for Stilling Basin Volume:

$$\text{Volume} = \frac{d}{3} \left[W_{\text{top}} L_{\text{top}} + W_{\text{base}} L_{\text{base}} + \left(\frac{W_{\text{top}} L_{\text{base}} + W_{\text{base}} L_{\text{top}}}{2} \right) \right] + W_{\text{base}} L_{\text{base}} \times 1 \text{ ft.}$$

- $d = 2 - 5 \text{ ft.}$
- Side Slope = 1.5:1

Stilling Basin Storage



Silt Bag Design & Placement

- Maximum Pumping Rate of 80 gal/min/sf
- Typically, Volumes less than 100 CY (2700 ft³)
- Place Inside Perimeter EC Devices
- Place on Level Ground
- Locate to Avoid Pumping Across Stream

Stilling & Sediment Basin Design

- Example of Stilling Basin as Sediment Basin:
 - Required Volume for Sediment Basin = 1800 ft^3
 - Required Volume for Stilling Basin = 1500 ft^3
 - Provided Volume of Sediment Basin = 2820 ft^3
- Additional Volume Needed for Sediment Basin =

$$1800 + 1500 - 2820 = \underline{480 \text{ ft}^3}$$

Temporary Pipe Design & Construction

- Design to 5 times Average Daily Flow (ADF)
- Common Sizes: 15", 18" and 24"
- Anchor Ends with Impervious Dikes
- Used Primarily for Culvert Extensions

Temporary Channel Design

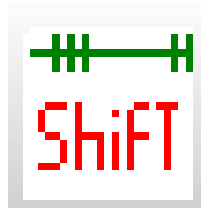
- Design to 5 times Average Daily Flow (ADF)
- Use Maximum of 2:1 Side Slopes
- Design as Base Ditch
- Don't Design in Areas of Existing Fill Slopes!

Common CADD Issues

- Devices not Rotated Properly
- Gaps between Perimeter Measures
- Environmentally Sensitive Area (ESA) Hatching
- Placement and Clipping of Notes

Erosion Control Tool Box

- Line Style Shift



- Auto Text Inlet Protection Labeler

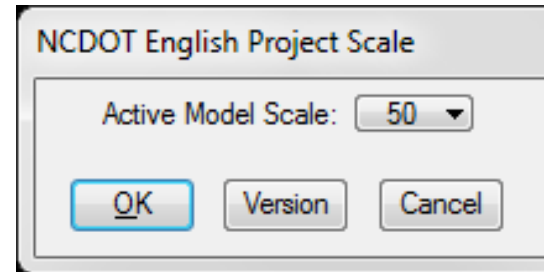


- Design & Computation Manager

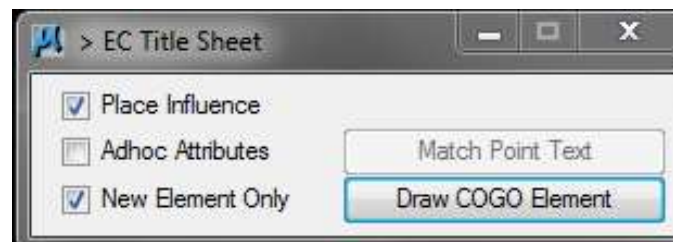


Keys to D&C Manager

- Set Project Scale



- Place ☒ in Box beside “Place Influence”
- Place ☒ in Box beside “New Element Only”



EC Quantity Procedure

1. Compute Quantities in D&C Manager
2. Export Quantities to CSV File
3. Copy/Paste Quantities from CSV file to EC Mapper
4. Copy/Paste* from Mapper to Quantities Spreadsheet

* - Highlight Matching Cell Areas with Dashed Borders

Design Build Projects

- Erosion Control in Color
- *Provide Responses to REU Comments*
- Incorporate Previous Comments to Future Submittals
- Stagger New Submittals (At least after 2nd REU Review)
- Clip or Move Notes & Labels for Clear Background

EC Design & Construction Manual

- January 2015 Release Date
- “Flocculant” Replaces “PAM”
- Available Electronically (PDF) at:
http://www.ncdot.gov/doh/operations/dp_chief_eng/roadside/soil_water/design_construction_manual/

Questions?

