Clearing & Grubbing Erosion Control Design

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Surface Water Analysis

- Review project site for jurisdictional and environmentally sensitive area boundaries:

  - Streams
  - Wetlands
  - Riparian Buffer Zones

Permit Review

- Read through all permit conditions of:
  - 401 Water Quality Certification from DWQ
  - ACOE Section 404 Permit
  - Wildlife Resources Commission Conditions

DWQ 401 Condition

"e. If the project occurs in waters or watersheds classified as Primary Nursery Areas (PNAs), Trout (Tr), SA, WS-I, WS-II, High Quality Water (HQW), or Outstanding Resource (ORW) waters, then the sediment and erosion control requirements contained within *Design Standards in Sensitive Watersheds* (15A NCAC 04B.0124) supercede all other sediment and erosion control requirements."

Other Considerations

- Proximity of project to:
  - Schools
  - Businesses
  - Neighborhoods

- Historic Properties
- Archeological Sites

Contour Information

- Survey Files (i.e. *.tin file)
- LIDAR Contours
  - http://floodmaps.nc.gov/fmis/Download_LIDAR.aspx
- USGS Quad Maps
  - http://www.ncdot.org/it/gis/DataDistribution/USGSTopographicMaps/default.html

Pre-Design Strategy

- Sit back, relax and take a deep breath…
- Look at the entire project as a whole…
- Develop a game plan!

Sediment Basin Analysis

- Determine locations of sediment basins
- If possible, place sediment basins to perimeter of construction limits so that basins can be utilized for life of project
- Look to incorporate Clearing & Grubbing **and** Final Grade sediment basins within permanent stormwater basin

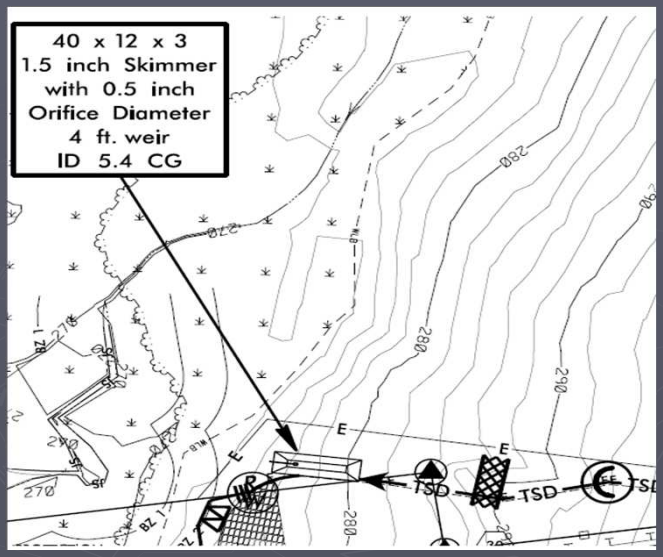
NCDOT Sediment Basins

- Silt Basin Type B 
- Temporary Rock Sediment Dam Type B
- Skimmer Basin  
- Tiered Skimmer Basin 

Sediment Basin Tips

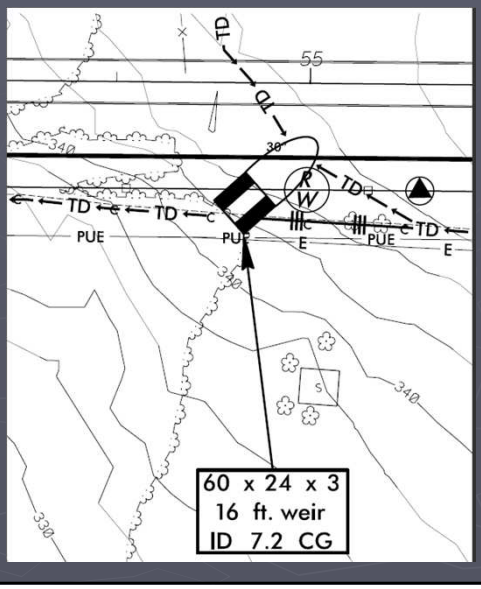
- Place Basins with Skimmer at drainage outlets that drain directly to:
  - Jurisdictional Water Bodies
  - Riparian Buffer Zones
- Place Basins with Stone Outlet at drainage outlets:
  - That **DO NOT** drain directly to Jurisdictional Areas
  - Inside project footprint where basin will have short life
- Dimension Clearing & Grubbing basins to the largest criteria based on Clearing & Grubbing **AND** Final Grade conditions

Skimmer Basin on EC Plans



Skimmer Basin with Baffles

Basin with Stone Outlet



Stone Outlet Basin with Baffles

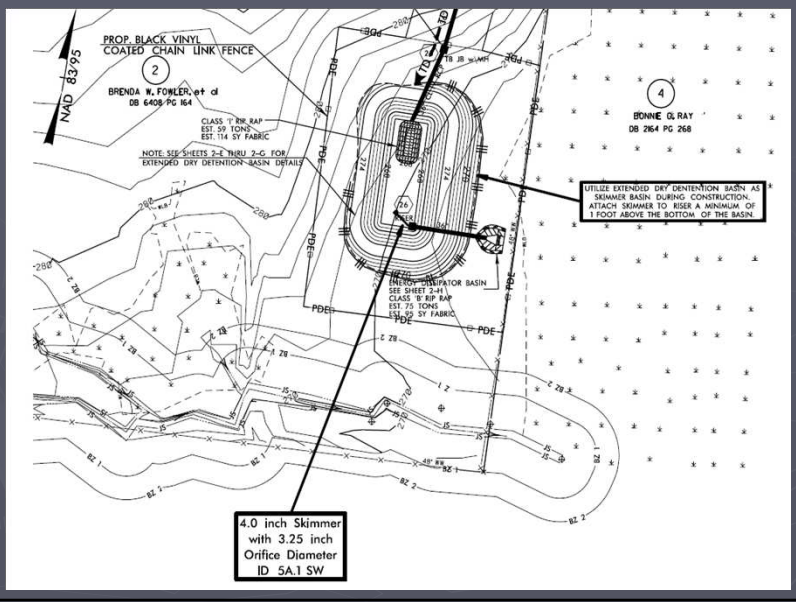
Don't place sediment basins in following locations:

- Riparian Buffer Zones (unless permitted)
- Wetlands (unless permitted)
- Close to Homes or Businesses
- In live streams

Stormwater Basin and EC Design

1. Design Stormwater Basin for NPDES guidelines
2. Determine surface area and sediment storage criteria for Clearing & Grubbing **and** Final Grade EC phases
3. Compare surface area and storage volume provided by Stormwater Basin to erosion control basin requirements
4. Size Skimmer for Stormwater Basin volume, not the required sediment storage volume
   - Skimmer attached to riser of Stormwater Basin 1 ft. from bottom

Stormwater Basin & EC Plans



Hazardous Spill Basin with Skimmer

Perimeter EC Measures

- Sediment Trapping Devices:
  - Silt Fence 
  - Special Sediment Control Fence (SSCF) 
  - Temporary Silt Ditch 

- Runoff Diversion Devices:
  - Temporary Diversion 

  - Temporary Earth Berm 

Silt Fence and SSCF

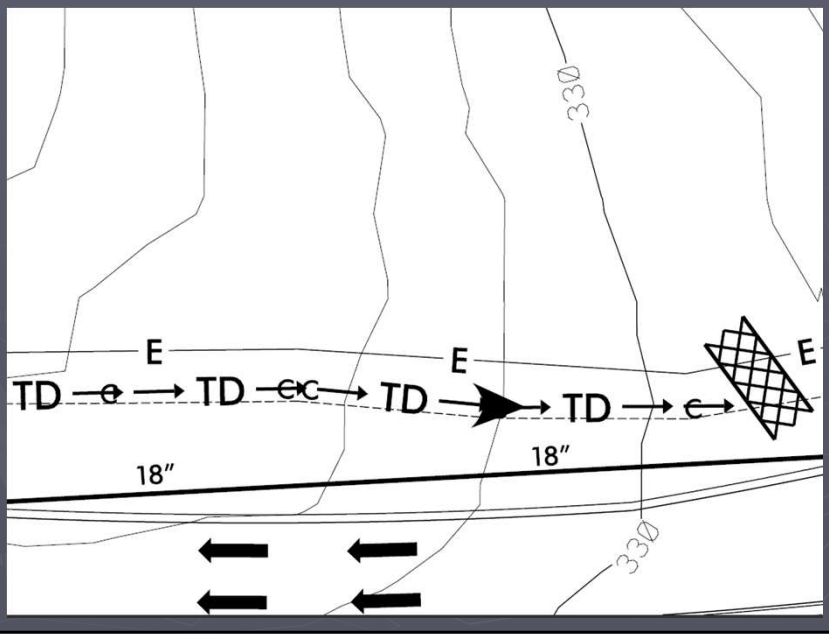
- Placement Locations on EC Plans:
  - Toe of Bridge Approach Fill Slopes
  - Toe of Fill Slopes in Wetlands
  - Toe of Fill Slopes in Urban Areas
  - Above Culvert Inlets and Outlets, esp. on Final Grade Phase
  - Perimeter of Streams and Fill Slopes inside Riparian Buffers
- For long runs of Silt Fence, place drainage breaks (SSCF, Checkdam, Wattle)

Silt Fence with SSCF Section

Temporary Ditches & Berms

- Place Temporary Diversions (TD) in proposed ditches
- Utilize TDs and Berms to direct runoff into side of sediment basins opposite of the primary spillway
- Utilize Velocity Checks with all temporary **and** permanent ditches
- If possible, direct offsite runoff around construction area with ditches and berms
  - Analyze for Velocity Checks and Channel Lining needs!

Offsite Runoff Diversion



Environmentally Sensitive Areas (ESA)

- ESA Hatching on Erosion Control Plans
  - 50 ft. from top of streambank
  - Sediment Basins not allowed in ESA for Riparian Buffer Areas (unless permitted)
  - Stringent groundcover requirements for ESA
- 25-yr Storm data instead of 10-yr data for sediment basin design

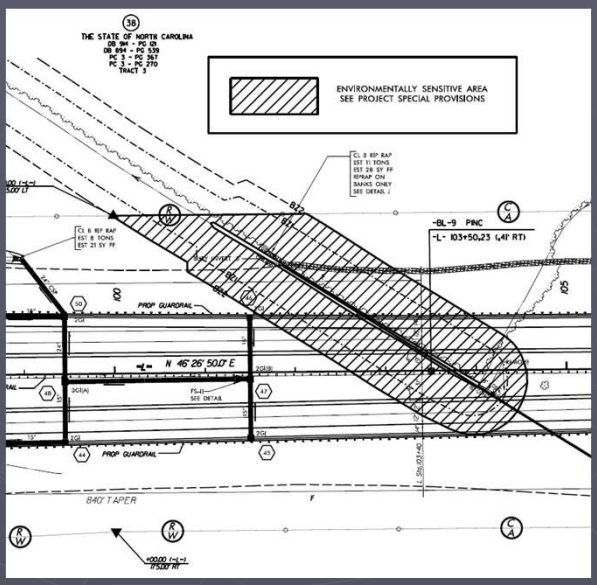
ESA Locations

- DWQ High Quality Waters
  - WS-I, WS-II, HQW, ORW, SA
- DWQ and WRC Trout Streams
- Streams with Riparian Buffers
- Relocated Streams (Existing Channel)
- 303(d) Streams for Sediment or Turbidity Impairment
- Design Standards in Sensitive Watersheds Permit Condition

ESA Field Provisions

- Boundary of ESA delineated with Tree Protection Fence
- ESA areas can be cleared but not grubbed until immediately prior to grading operations
- Once grading operations begin, work must progress in a continuous manner
- Permanent Seeding & Mulching in ESA after final grade establishment
- Stage Seeding for slopes greater than 20 ft. or 2 acres

ESA on Erosion Control Plans

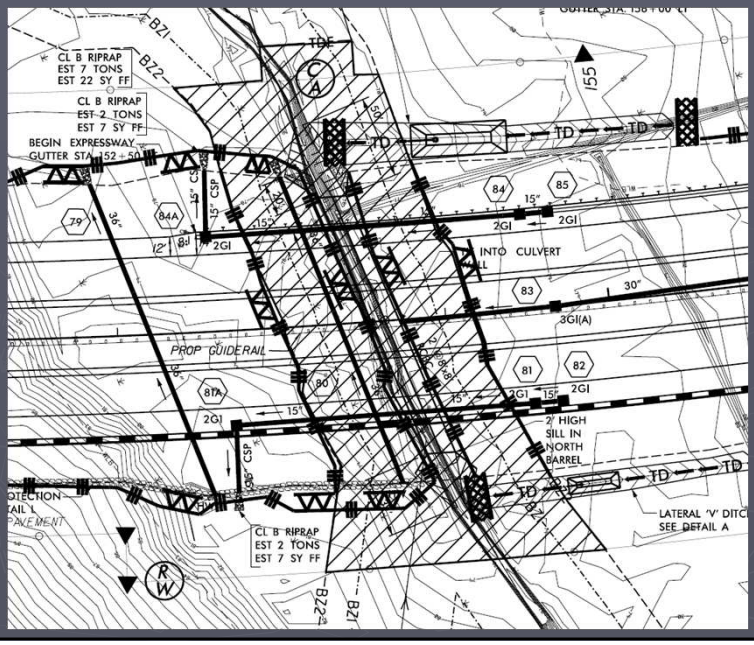


ESA Erosion Control

EC in Riparian Buffers

- No excavated erosion control devices inside Riparian Buffer, unless permitted by DWQ!
- Runoff treated separately inside and outside Buffer
- Protect Buffer and Stream with Perimeter EC Devices

Riparian Buffer EC Design



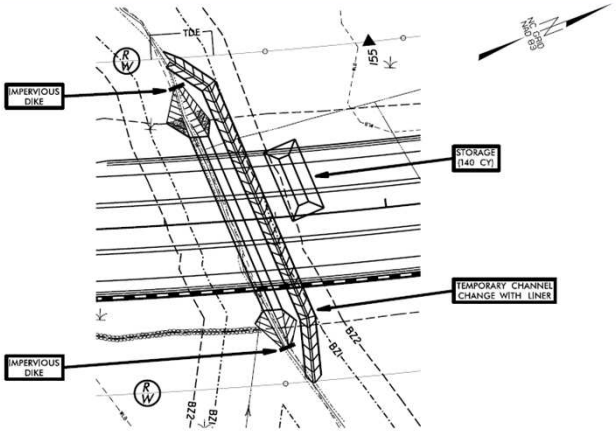
Items to Show on C&G Erosion Control Plans

- Contours
- ESA
- Tree Protection Fence for ESA and Permitted Areas
- Culvert/Pipe Phasing
- Proposed Drainage Structures

Culvert & Pipe Phasing

- Show construction sequence for culverts and pipes that convey jurisdictional water
- Include the culvert/pipe phasing on C&G erosion control plans
- Do not show EC devices unless they are part of phasing!

Culvert Phasing



1. CONSTRUCT STILLING BASIN (140 CY).
2. CONSTRUCT TEMPORARY CHANNEL CHANGE WITH LINER (2 FT. BASE, 3 FT. DEEP, 2:1 SIDE SLOPES).
3. CONSTRUCT IMPERVIOUS DIKES, DIVERTING FLOW THROUGH TEMPORARY CHANNEL CHANGE.
4. CONSTRUCT PROPOSED CULVERT AND INLET/OUTLET CHANNEL IMPROVEMENTS.
5. REMOVE IMPERVIOUS DIKES AND TEMPORARY CHANNEL CHANGE, DIVERTING FLOW THROUGH PROPOSED CULVERT.
6. REMOVE STILLING BASIN, AND COMPLETE ROADWAY.

Final EC Thoughts

- Consider Final Grade erosion control while designing Clearing & Grubbing phase
- Be creative and don't just use "standard design"
- Submit your best EC design initially; Don't rely on DOT/LQ reviews for QA/QC!

Web Site

- http://www.ncdot.org/doh/operations/dp_chief_eng/roadside/soil_water/

  -Special Provisions

  -Details

  -Spreadsheets

  -Sample EC Plans

Questions?