

HDR

Regenerative Stormwater Conveyance Solution

Channel Stability and Nutrient Removal



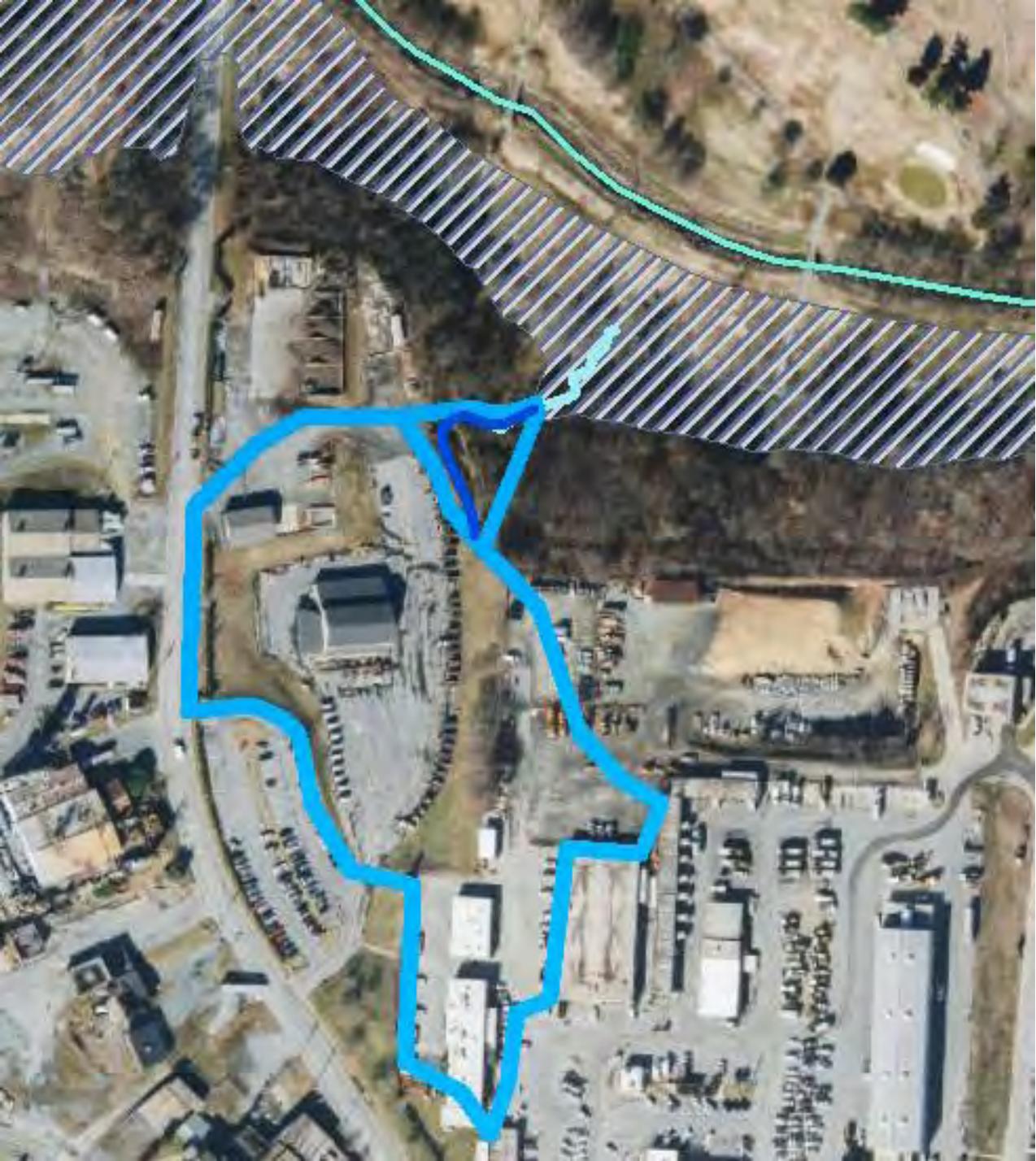
October 10, 2019

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Salt Barn RSC

Project Overview & Drivers



Watershed

- Industrial Drainage Area
- HSG C Soils
- Adjacent Salt Barn
 - Used for fueling
- Industrial and Roadway Pollutants

**Tributary to Mile Run
Creek – Flows to South
Buffalo Creek**



Issues

- Degrading channel
- Salt truck fuel spills
- Industrial and roadway pollutants
- Jordan Lake Nutrient Management Strategy
 - Promotes local government retrofits
 - Protects quality of water supply



Sediment basin



Degraded Channel



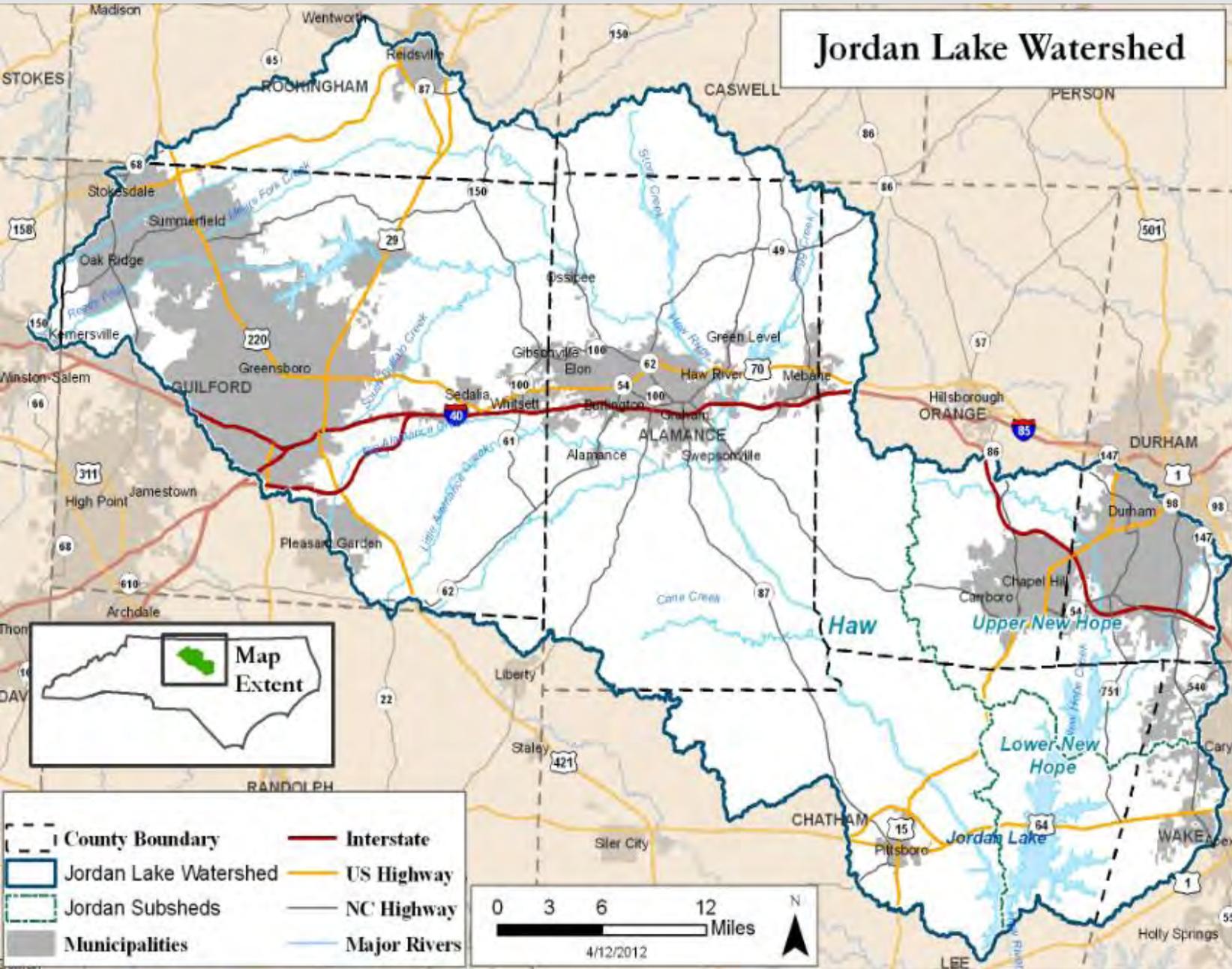
Water Quality Considerations

Water Quality Alternatives

Targeting Nitrogen and Phosphorous

- Wet Pond
- Wetland
- RSC Treatment





Jordan Lake NMS

- Local governments must develop a Stage One program including:
 - Public Education
 - Map MS4 System
 - Illicit Discharge Detection
 - Retrofit Opportunities
 - Maintenance of BMPs

Source – NC Department of Environmental Quality

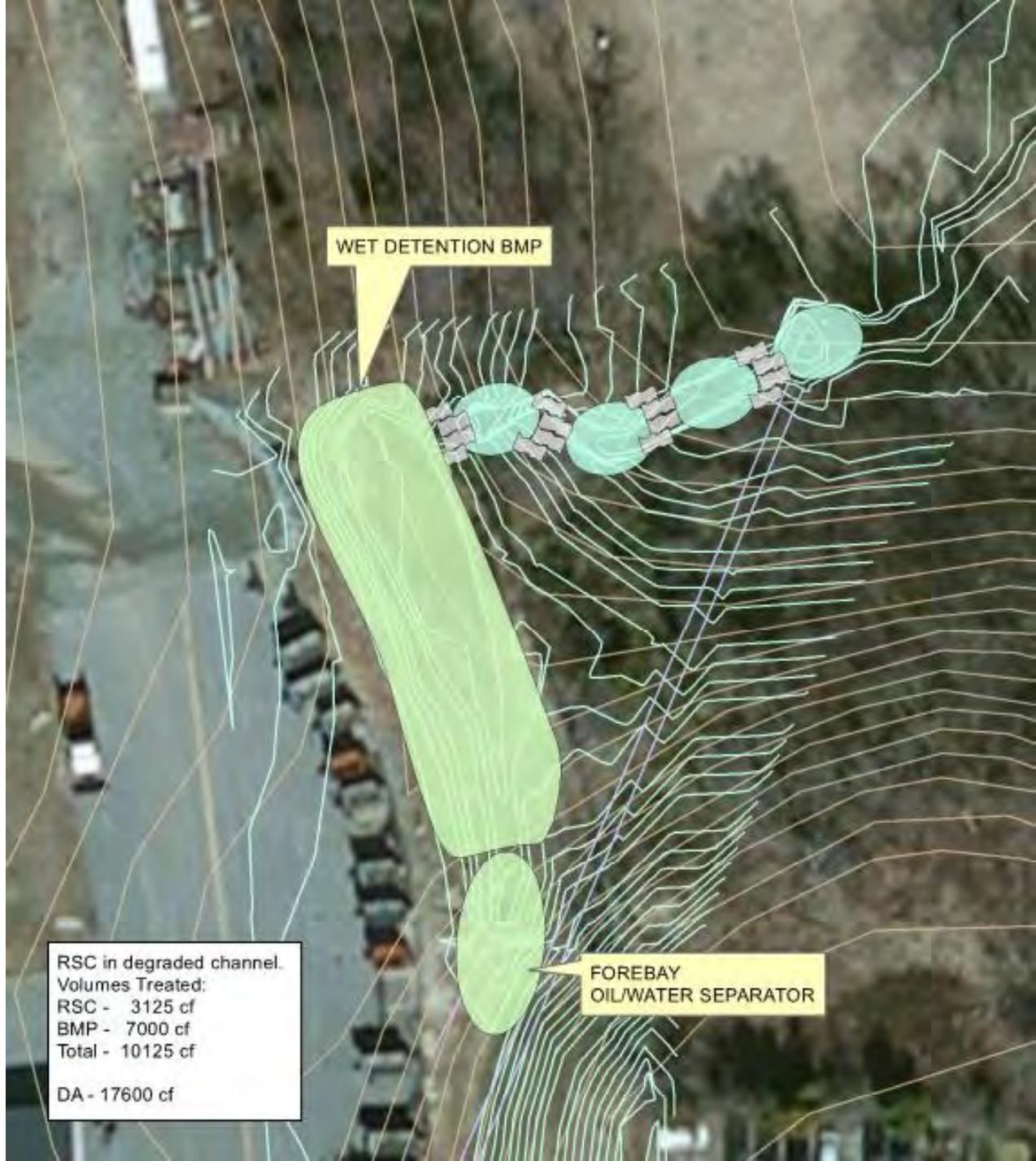
Feature

- BMP
- Oil Separator
- pool
- riffle

DATA SOURCE: (Source Name)

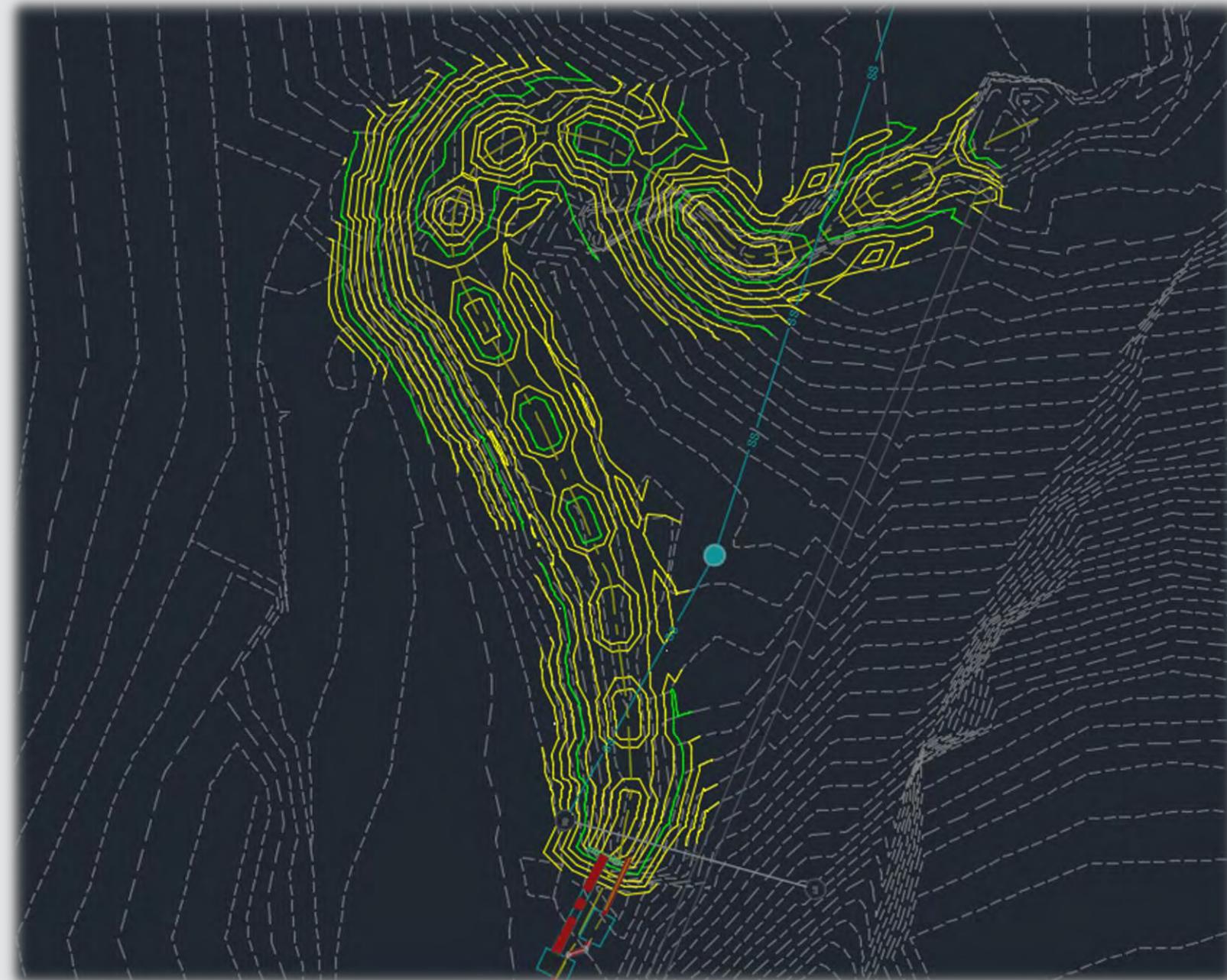
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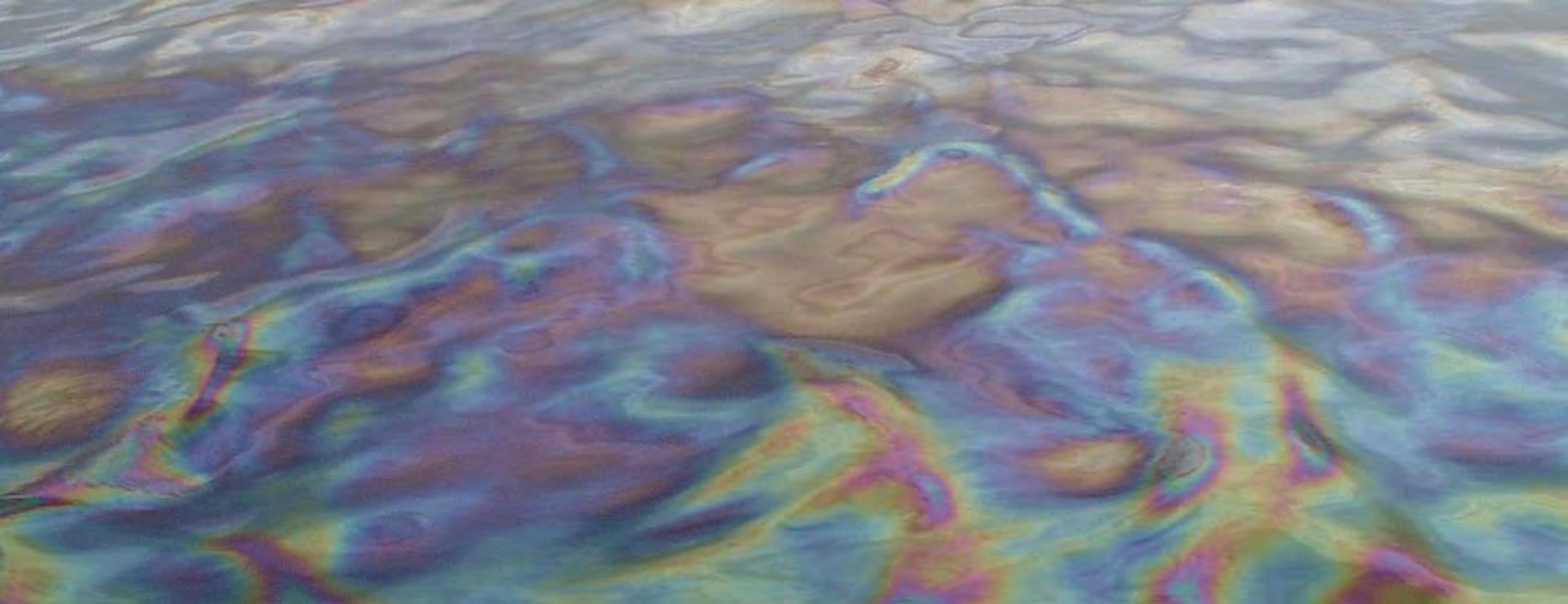
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Determining Factors

- Maintenance
- Long-term Cost
- Grade Control
- Stabilize Length of Treatment
- Sanitary Conflict



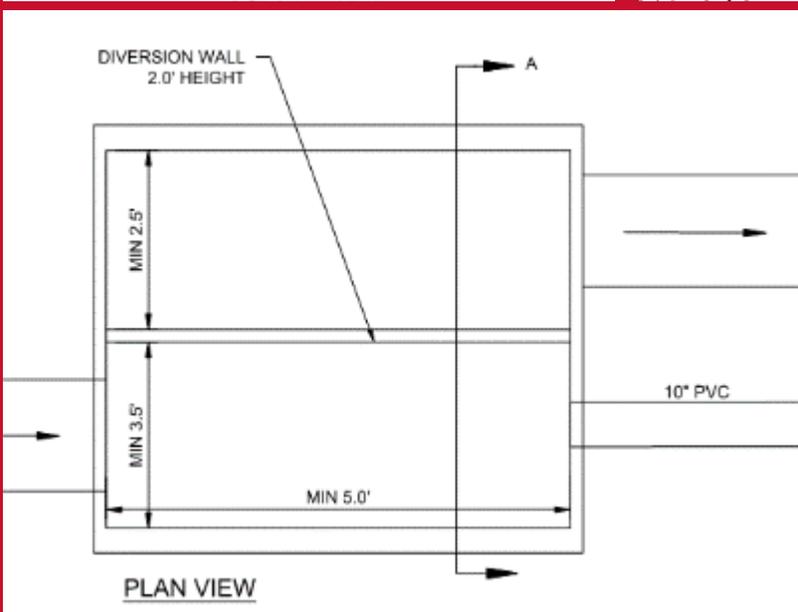
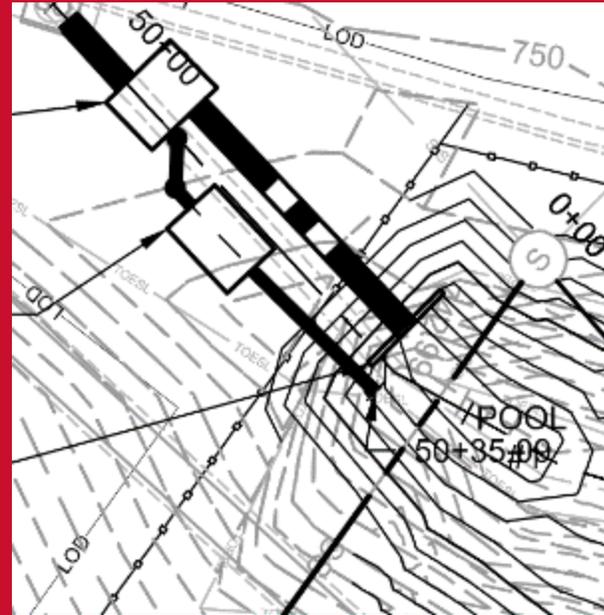
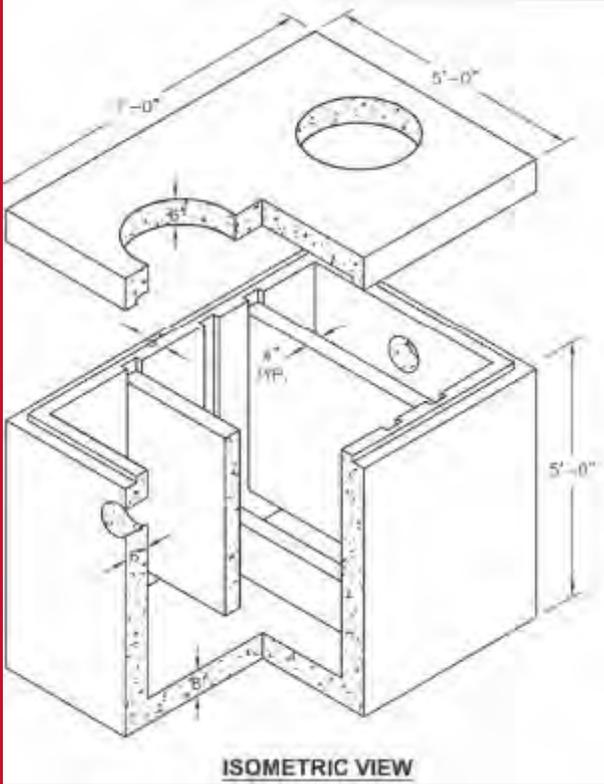


Other Considerations

Maximizing Project Impact

Oil/Water Separator

- Capture salt truck spills/leaks
- Size a limiting factor for stormwater flows
- Flow-Splitter
 - Dry weather capture
 - 500 gallon capture, stored in flow splitter
 - Storm flows bypass OWS, minimizes risk of oil escape
 - Minimize tailwater impact on drainage



Jurisdictional Waters

- 80 linear feet
- Groundwater observed in eroded part of channel
- Floodplain present
 - Net reduction in volume



Regenerative Stormwater Conveyance



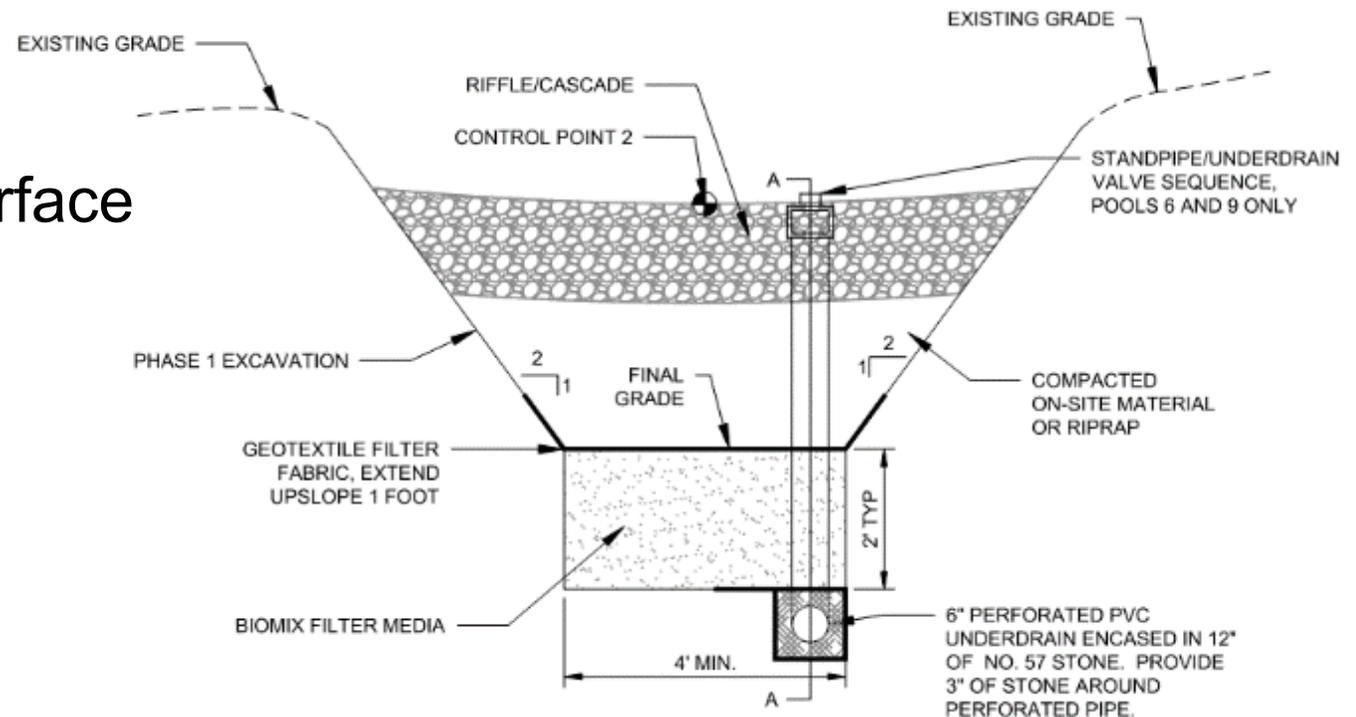
What is it?

- Open-channel conveyance structures that convert surface storm flow to shallow groundwater flow
- Designed to safely convey and treat the water quality of storm flow
- Pool – Riffle – Cascade structures
- Store sediment in pools through settlement
- Filter sediment through subsurface media
- Ditches, outfalls, and ephemeral channels

~ Anne Arundel County
Regenerative Step Pool Storm
Conveyance Design Guidance

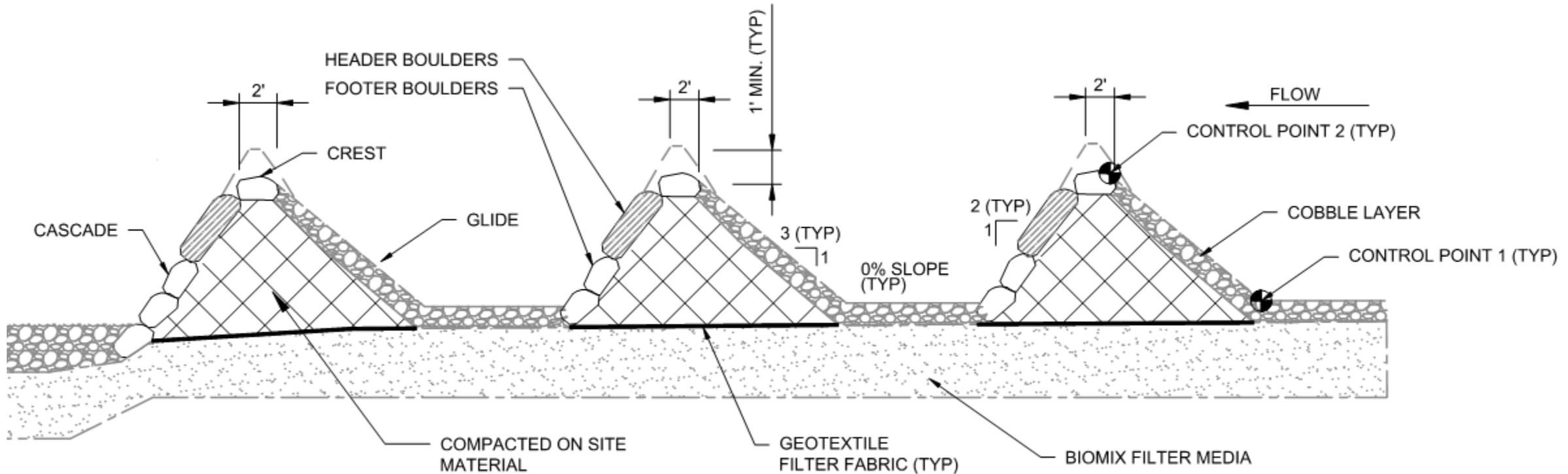
Project Specific Design

- Outfall, channel stabilization
- Water quality treatment
 - Bioretention media with underdrain
- Stable surface conveyance, subsurface nutrient filtration
- 100-Year design flows
- Minimize maintenance
- Pollutant monitoring
- Groundwater interface



Vertical Profile - Cascades

- $V_{max} = 11 \text{ ft/s}$

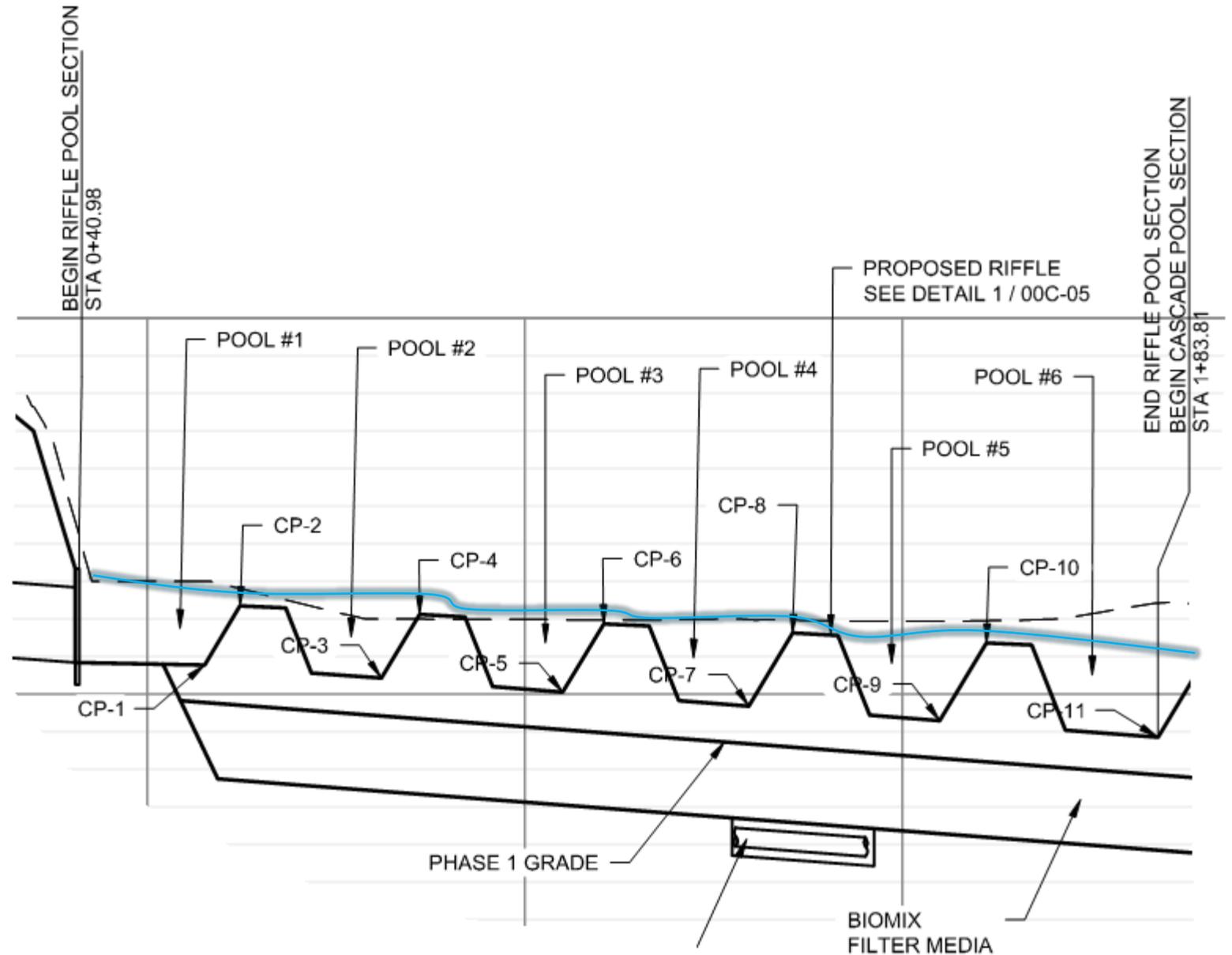


REGENERATIVE STORMWATER CONVEYANCE - CASCADE PROFILE

NOT TO SCALE

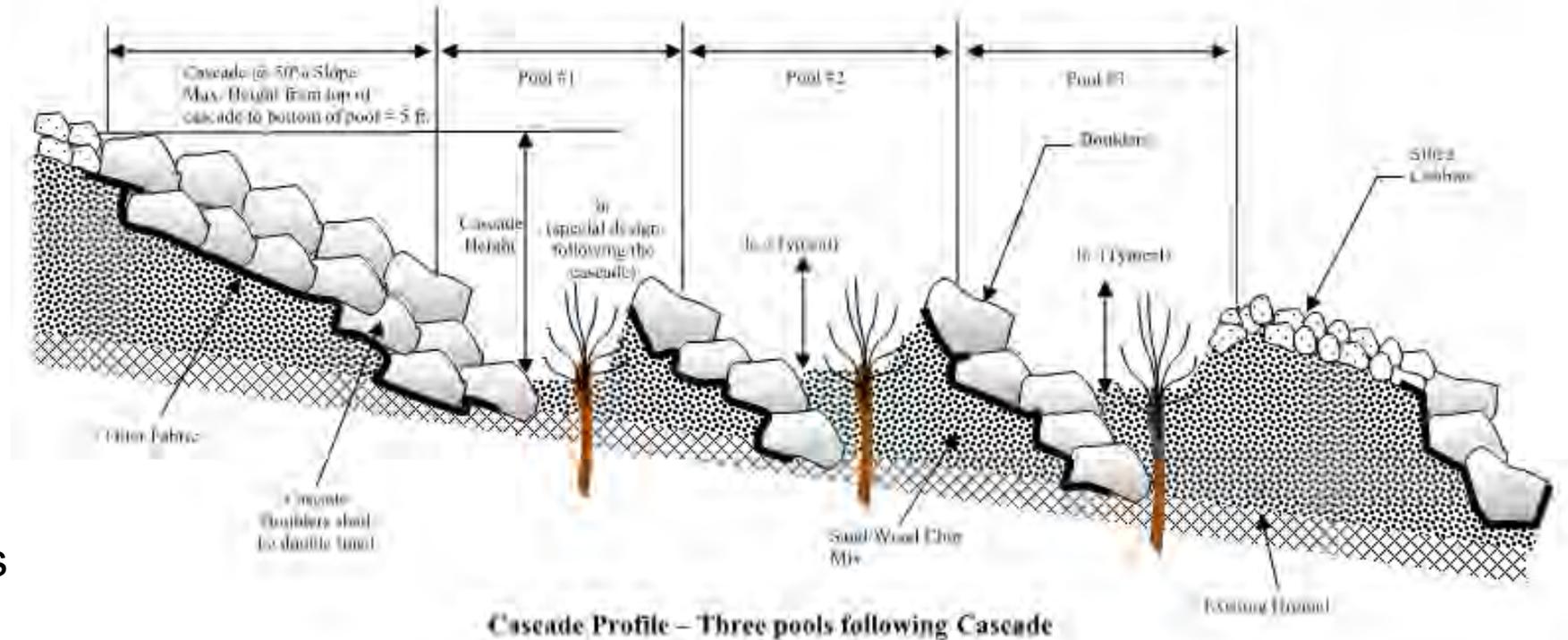
Vertical Profile Riffles

- Pool depth to provide Water Quality storage
- < 2% slope
- Riprap D50 = 14 inches
- Velocity = 3.3 ft/s
- Flow = 67 cfs



Stability

- Cascade
 - Boulder Sizing
 - 4'x2'x1.5'
- Riffle
 - Riprap Sizing
 - D50=14"
- Pools
 - After Cascade
 - 12" cobble thickness

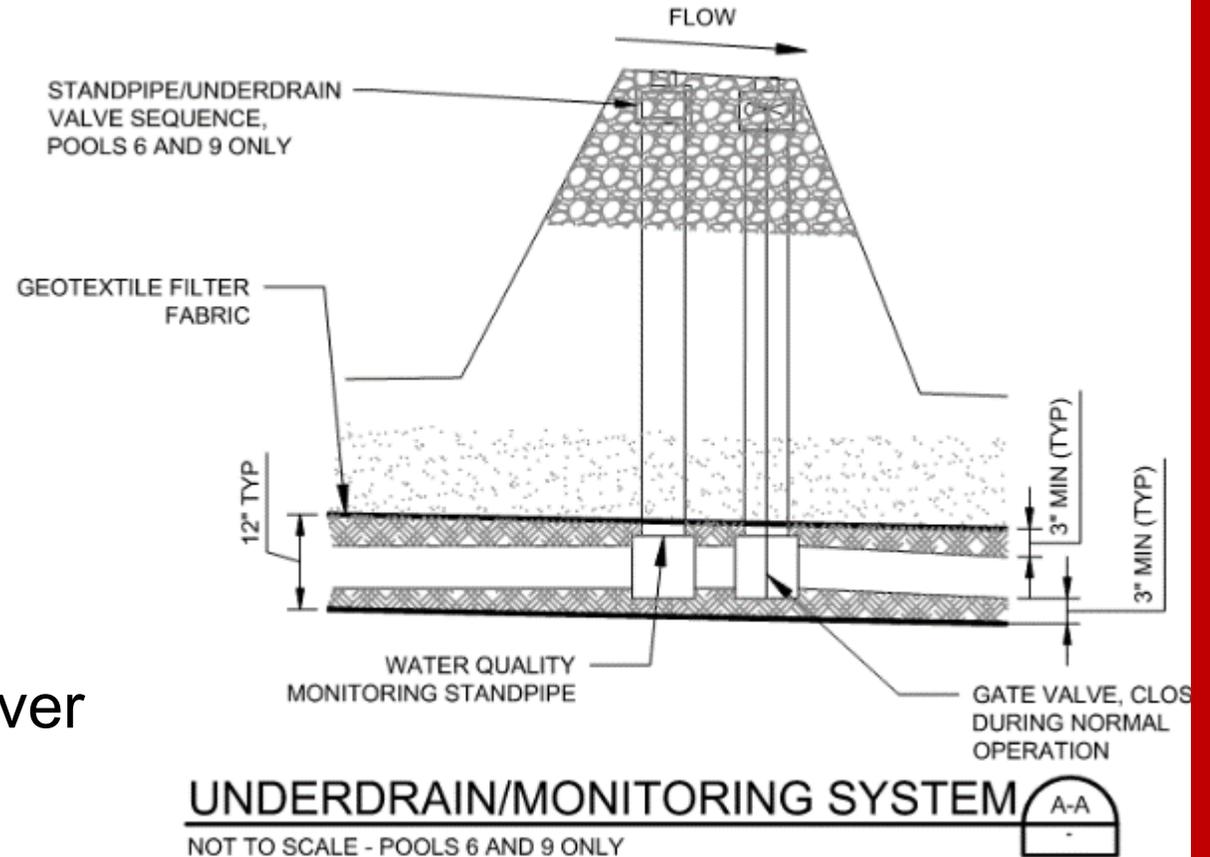


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Nutrient Removal

Nitrogen and Phosphorous

- Bioretention media recommended by NC State
- Clogging concern
 - Underdrain with valve
 - Sampling tubes
- NC State Stormwater Engineering Group
 - Group is monitoring RSCs to develop scientific support
- Treats 16,000 cubic feet of runoff over 300 linear feet



Visualization







Rendering



Reality





Closing Remarks – RSCs

- Innovative and customizable
- Good for gently to moderately sloping channels
- Steep slopes = Pricey
- Low-maintenance, depending on planting plan
- Aesthetic-friendly
- Water quality benefits TBD...

Thank you!

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