

# RUTGERS

New Jersey Agricultural  
Experiment Station

## Lockatong and Wickecheoke Creek Watersheds Roadside Drainage Retrofits

Franklin, Raritan, Delaware,  
and Kingwood Townships  
Hunterdon County, New Jersey



- Lockatong and Wickecheoke Creeks are impaired by sediment loads from surrounding land uses
- Streams have flashy hydrology which increase stream bank erosion and channel downcutting
- Majority of roads use drainage ditches as stormwater management and conveyance
- Roadside ditches move water and sediment quickly to streams contributing to the flashy hydrology
- Many ditches need improvements, through design and maintenance to reduce velocity and sediment transport
- ***Improvements must provide cost-effective solutions for municipalities***

- Develop cost-effective designs strategies to address the roadside drainage issues associated with these watersheds
- Develop cost-effective routine maintenance practices to reduce sediment loads
- Build capacity within the local municipalities to implement the design and maintenance strategies in a cost-effective manner

# Design Parameters

- Where possible, ditches and swales should be reconstructed to meet the design requirements set forth in the NJ Soil Erosion and Sediment Control Standards and guidance provide in the NJDEP Stormwater BMP Manual.
- In general ditches and swales should have wider bottom widths and maximum side slopes of 3:1. These dimensions can sustain a healthy grassy cover.
- In addition to stabilizing eroding soils and reconstructing the ditches, opportunities exist to retrofit many sites for water quality protection.
- The design of ditches and swales will depend on site-specific parameters, such as the right of way width, depth to groundwater, nearby vegetation, and topography. In general, water quality retrofits should promote infiltration by incorporating bioretention media, native plantings and vegetation, and periodic stone check dams to detain flows.

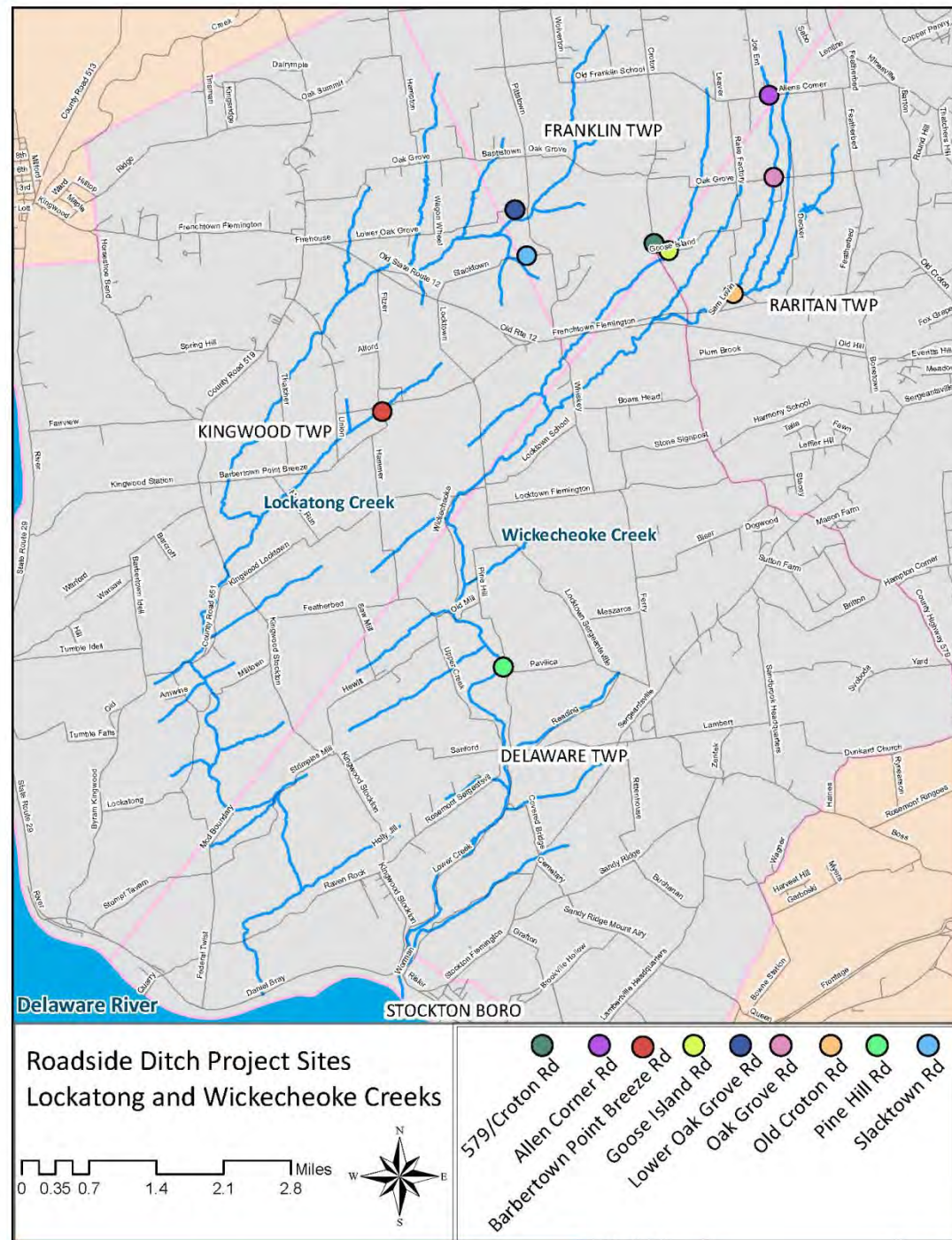
# Roadside Projects Location Map

**Kingwood Twp:**  
Barbertown-Point Breeze Road

**Raritan Twp:** Goose Island  
Road, Oak Grove Road,

**Delaware Twp:** Pine Hill Road

**Franklin Twp:** County Route  
579, Slacktown Road, Lower  
Oak Grove Road. Allen Corner  
Road





## Barbertown-Point Breeze Road @ Fitzer Road

- Drainage area ~ 80 acres (row crops and woodland)
  - Right of Way = 12-16 Ft. (available for swale design)
  - Soils: C/D Hydrologic Soil Group
  - Slope: 1 – 1.5%
- 
- Proposing 300 linear foot ditch improvements along both Fitzer Road and Barbertown-Point Breeze Road with 8 – 10 ft. bottom width and 2 – 3 ft. depth.
  - Integrating sand/infiltration media and stone check dams to capture/remove sediment and increasing swale slope to 2% minimum.



Fitzer Road



Barber Town-Point Breeze Road



### Proposed Drainage Swale Characteristics:

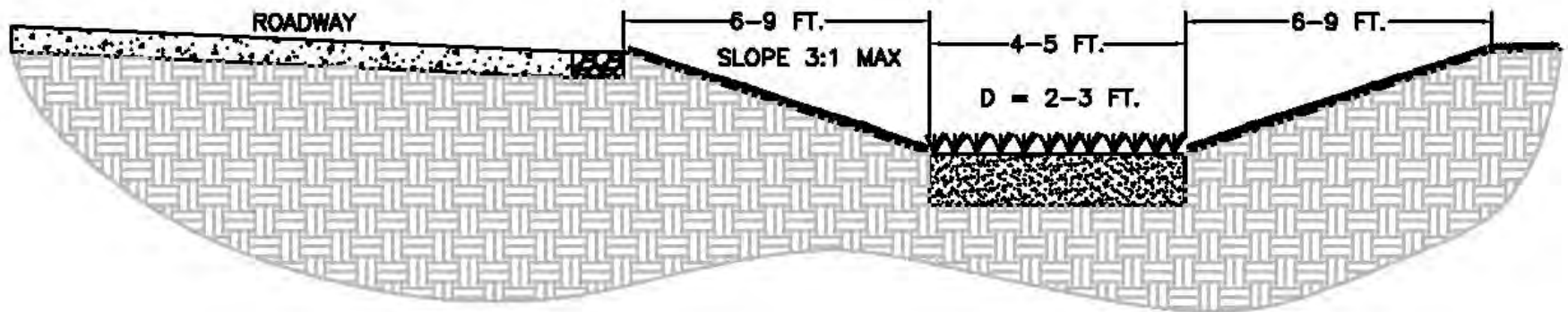
~40 acres draining to each swale

WQ Storm Peak ~ 5.6 cfs  
Max. Depth in Swale ~ 0.84 ft.  
Max. Velocity ~ 0.52 fps

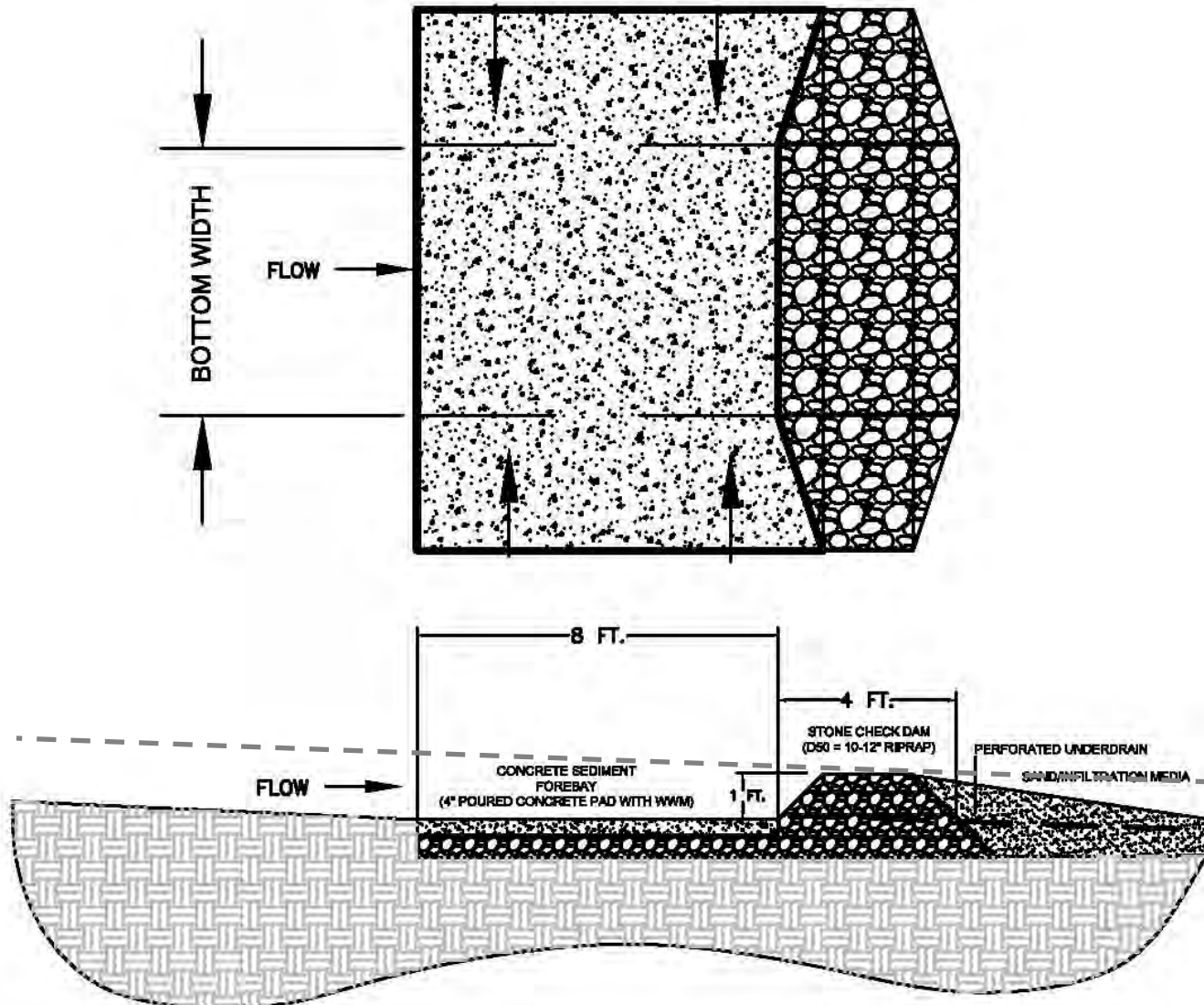
25-Yr Storm Peak ~ 91 cfs  
Max. Depth in Swale ~ 1.35 ft.  
Max. Velocity ~ 4.8 fps







**PROPOSED SWALE CROSS-SECTION**



**TYPICAL CONCRETE SEDIMENT FOREBAY DETAIL**

## Oak Grove Road

- Drainage area ~ 1.1 acres (grass/woodland)
- Right of Way = 16 Ft. (available for swale design)
- Soils: C Hydrologic Soil Group
- Slope: 1%
- Proposing 200 linear foot water quality swale with 3 ft. bottom width and 1.5 ft. depth.
- Integrating infiltration media and stone check dam with treatment cell to remove sediment.

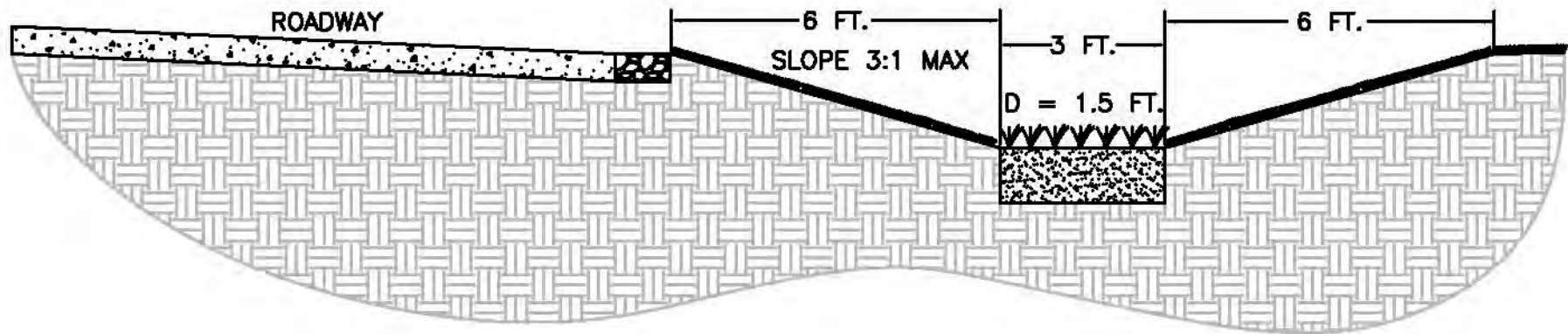






# Oak Grove Road

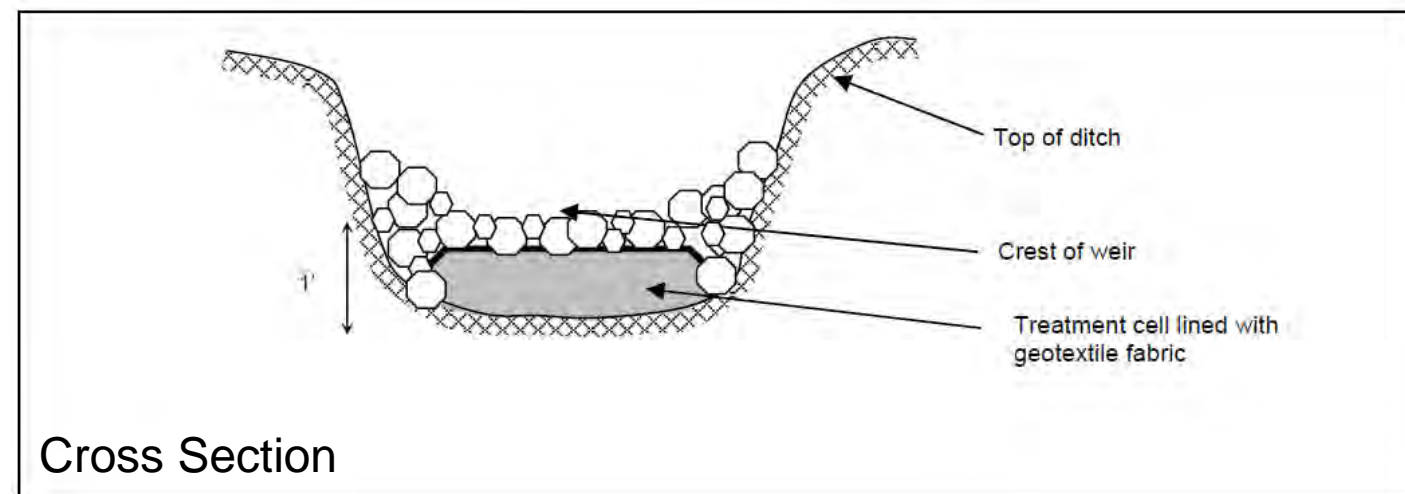
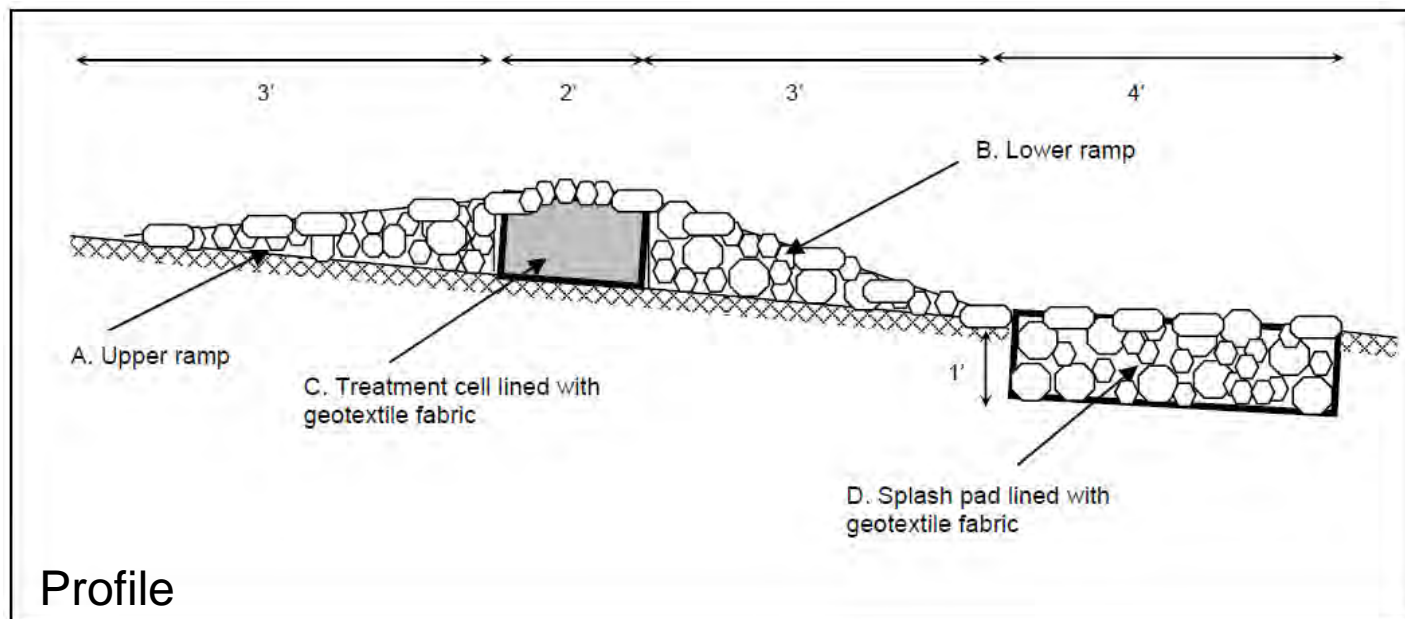
Rebuild existing swale to meet NJ Standards for Soil Erosion and Sediment Control and guidance from NJDEP BMP Manual – “Grass Swales.” Vegetate with native grasses and plants.



**PROPOSED SWALE CROSS-SECTION**  
(Minimum 2% slope)

## Modified Check Dam Designs

NOTE: Treatment  
cell can be filled  
with material to  
remove nutrients





## Pine Hill Road

- Existing Dirt road
- ~ 2 ft.-wide ditch drains to culvert underneath road and discharging 5-8 feet to 40%-50% slope
- Gully/Ditches from upland areas experiencing extreme erosion
- No headwall or protection where runoff discharges from outlet

## Proposed Drainage Swale Characteristics:

~100 acres draining to outlet

WQ Storm Peak ~ 5.6 cfs

Max. Depth in Swale ~ 0.84 ft.

Max. Velocity ~ 0.52 fps

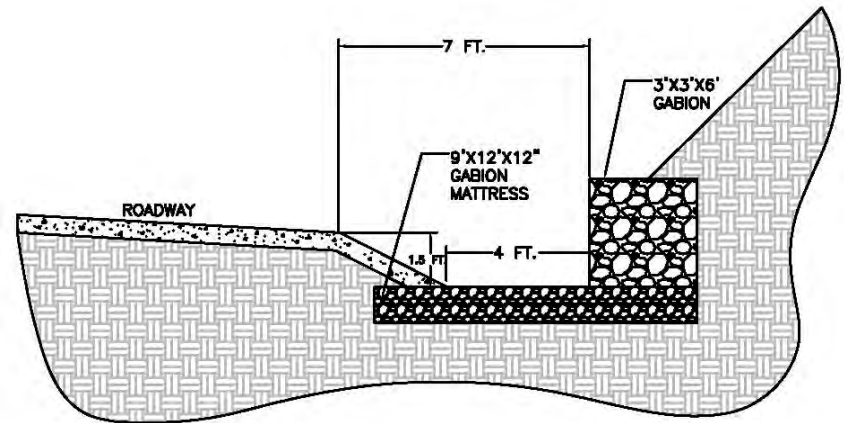
25-Yr Storm Peak ~ 91 cfs

Max. Depth in Swale ~ 1.35 ft.

Max. Velocity ~ 4.8 fps

## Pine Hill Road

- Drainage area ~ 100 acres (grass/woodland, farmsteads, row crops)
- Right of Way = 4-10 Ft. (available for swale design)
- Soils: B Hydrologic Soil Group
- Slope: 2%
- Proposing 500-700 linear foot swale with 4 ft. bottom width and 1.5 ft. depth.
- Precast drop structure and outlet protection.



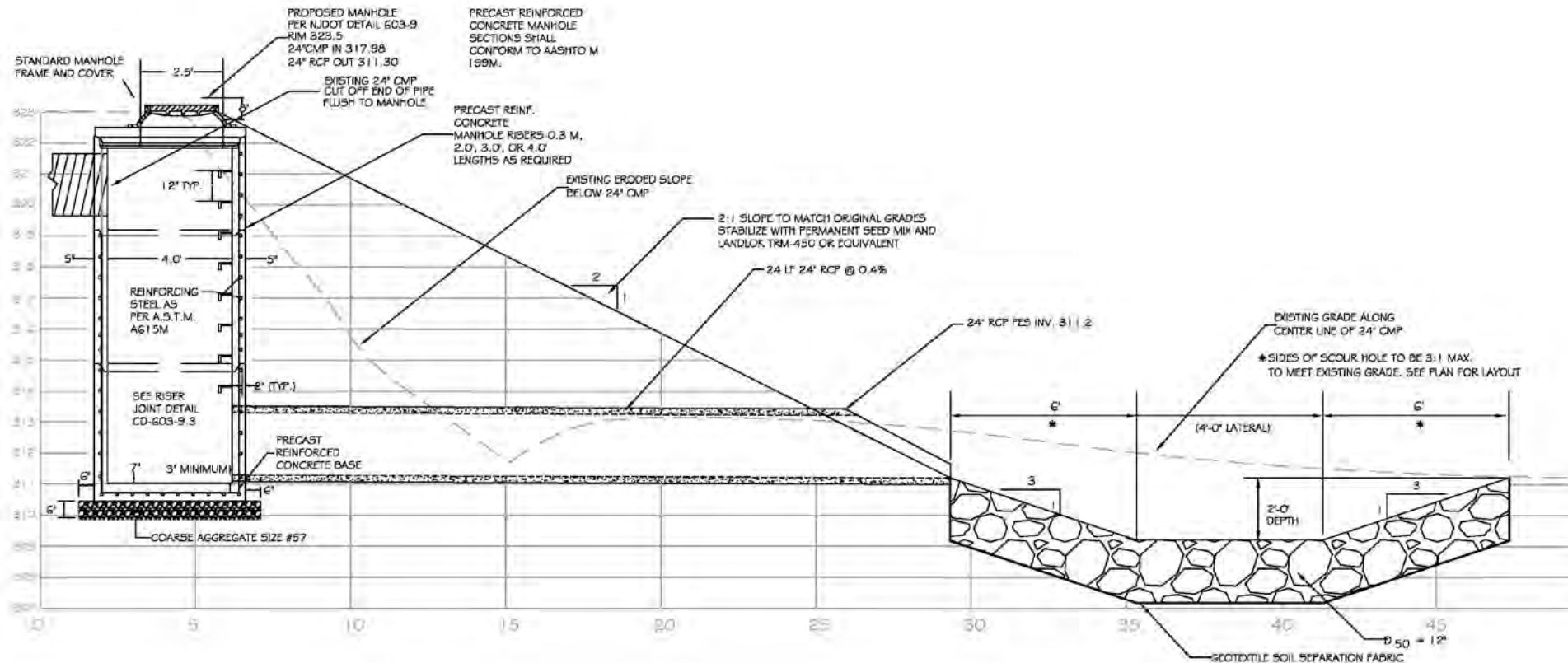
**PROPOSED SWALE CROSS-SECTION**

## Solution:

Install a pre-cast drop structure with concrete, rip rap, or gabion outlet protection to reduce velocity of runoff and capture sediment from road runoff.







**TYPICAL DROP STRUCTURE DETAIL**

## Croton Road/County Route 579

- Drainage area ~ 32 acres  
(agricultural/meadow/grass/ungrazed)
- Right of Way = 14-18 Ft. (available  
for swale design)
- Soils: C/D Hydrologic Soil Group
- Slope: 1.5 - 2%
- Proposing 300 linear foot water  
quality swale with 8-10 ft. bottom  
width and 2-3 ft. depth.
- Integrating concrete forebay/stone  
check dams and sand/infiltration  
media for sediment removal.

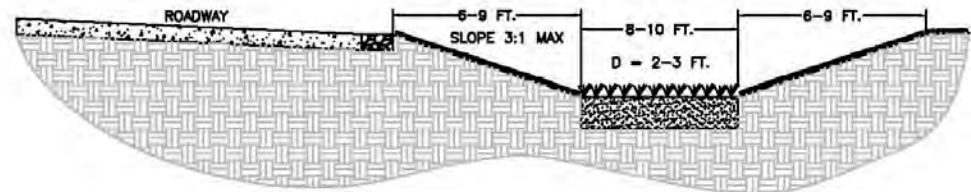




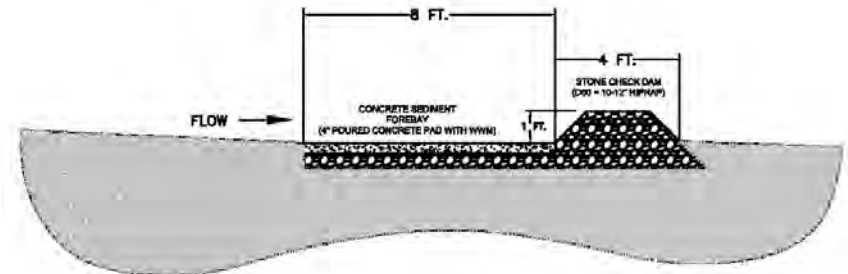
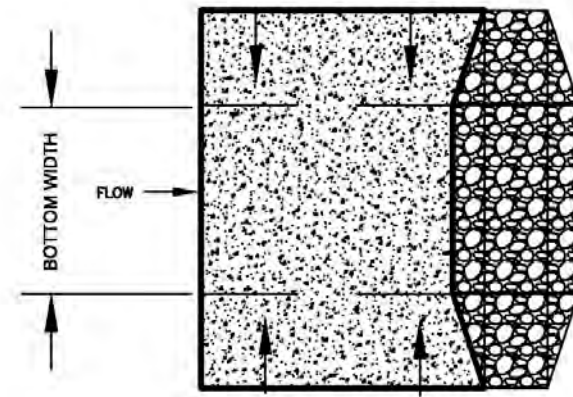


## Proposed Drainage Swale Characteristics:

- ~32 acres draining to outlet
- WQ Storm Peak ~ 1.1 cfs
- Max. Depth in Swale ~ 0.29 ft.
- Max. Velocity ~ 0.35 fps
- 25-Yr Storm Peak ~ 43 cfs
- Max. Depth in Swale ~ 2.25 ft.
- Max. Velocity ~ 1.1 fps



**PROPOSED SWALE CROSS-SECTION**



**TYPICAL CONCRETE SEDIMENT FOREBAY DETAIL**

- Mowing – vegetation within swales should be kept between 4” to 6”. For grass swales, the higher the grass, the lower the velocity
- Cleaning – swales with check dams will have to be cleaned of sediment from the concrete sedimentation basin using a backhoe.

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- Yu, S.L, R.J. Kaighn, Jr., and S.L.Liao. 1994. Test of best management practices for controlling highway runoff: phase II. Virginia Transportation Research Council Report 94-R21. Virginia Transportation Research Council. FHWA/VA-94-R21