

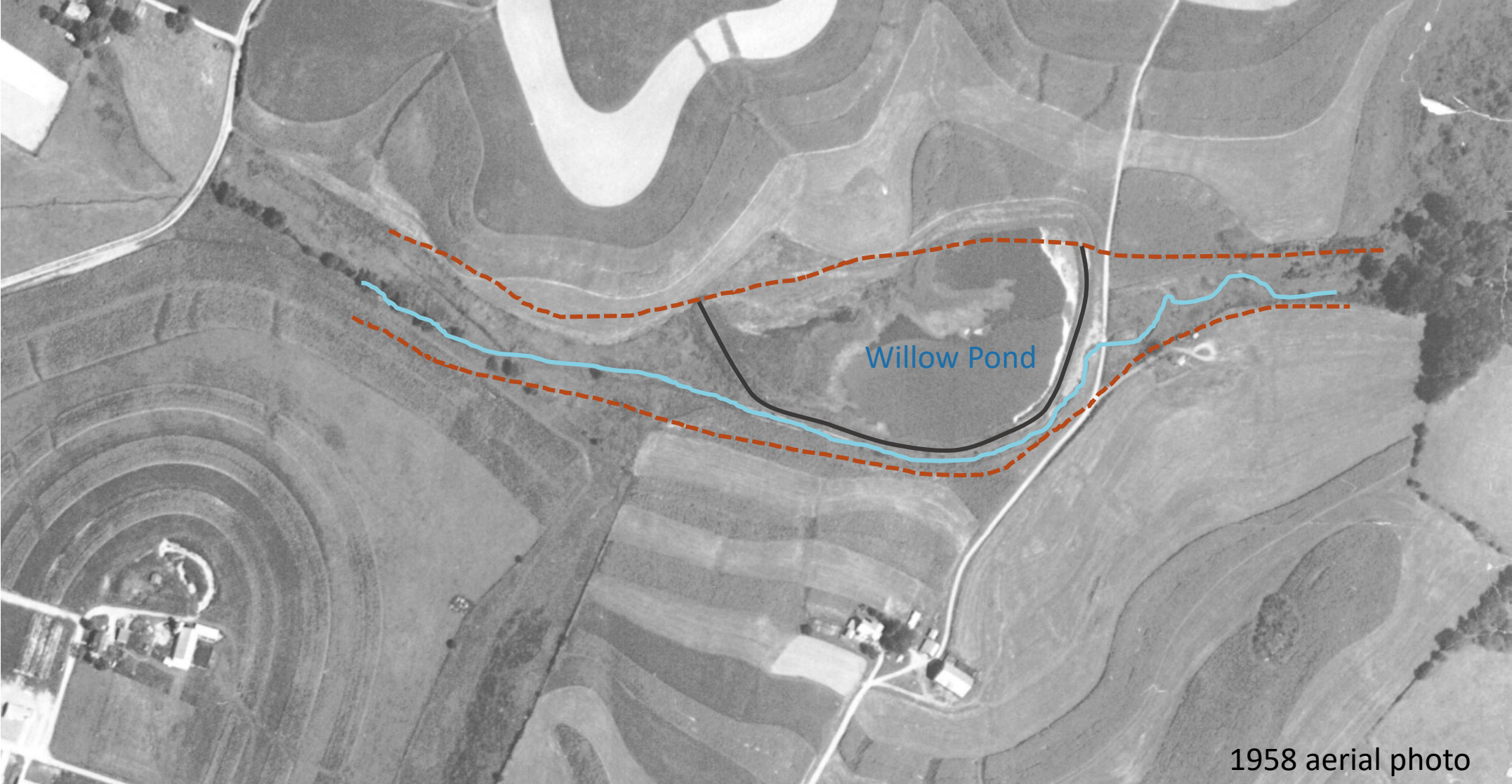


Willow Pond Retrofit and Stream Restoration

Westminster, Maryland

Carroll County Bureau of Resource
Management

Site History



1958 aerial photo

1991

- Eden Farms Subdivision constructed
- Minor modifications made for SWM quantity control (2- and 10-year)
- No water quality volume provided
- Retrofit included a CMP riser and outfall
- ~7 ac. surface area



2019

- ~4.5 ac. surface area
- Failing CMP riser
- Average depth ~2 feet
- Embankment doesn't meet MD-378 standards
- Stream eroding embankment





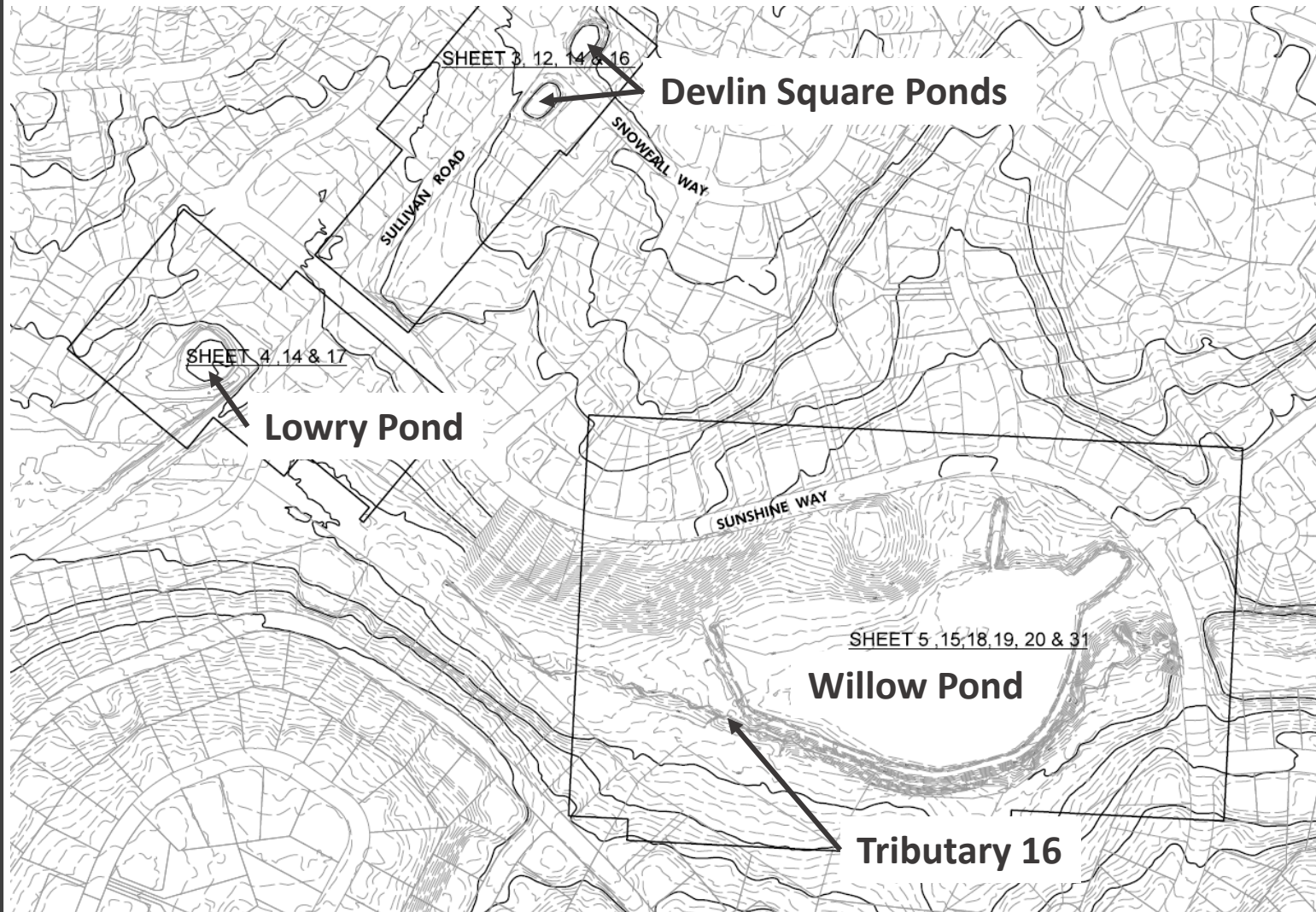
Pre-Project Conditions

Project Goals

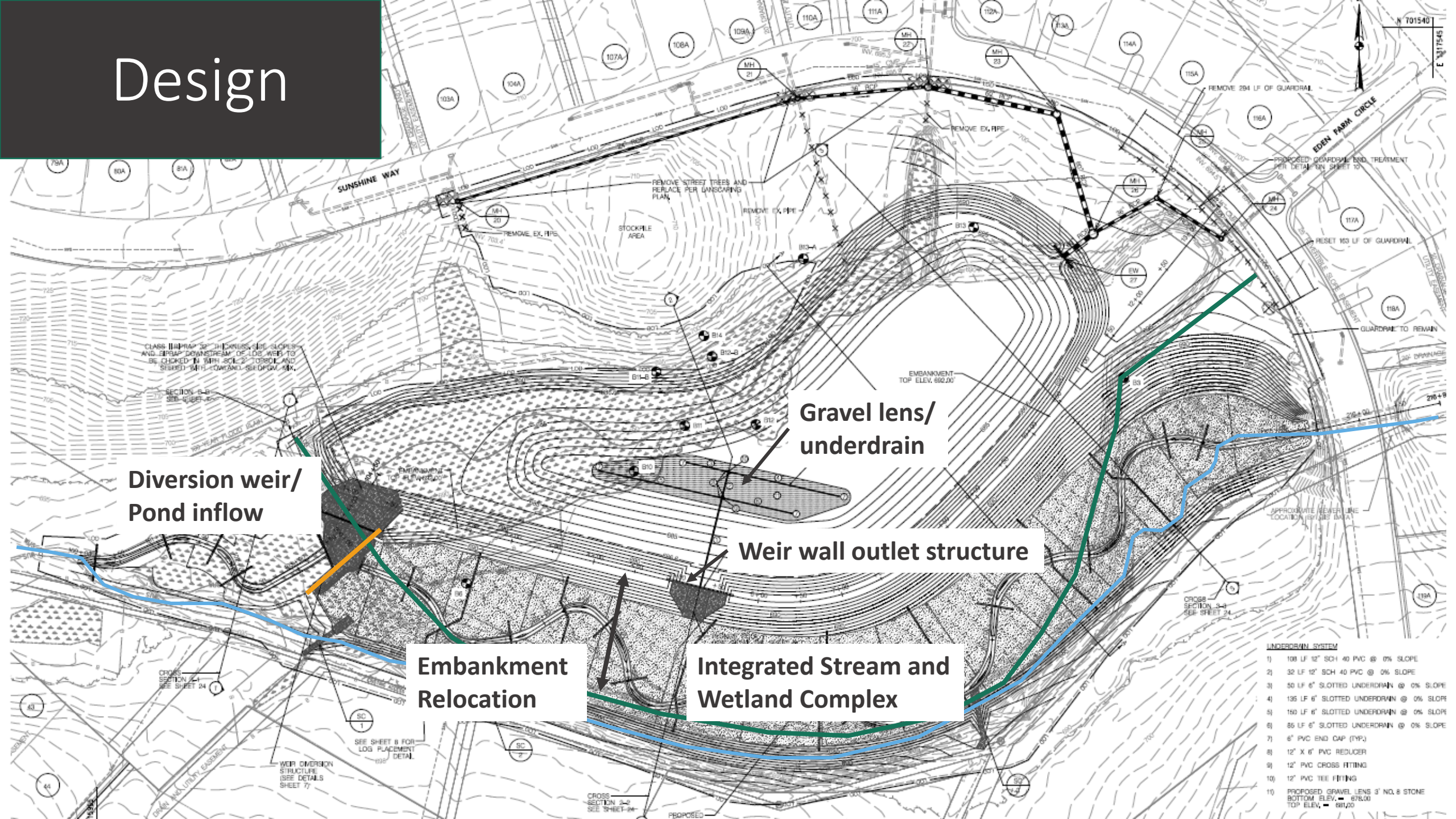
- **Maximize NPDES/MS4 Credits**
- Provide water quality for min. 1" rainfall
- Manage flood flows to pre-development conditions
- Meet dam safety requirements
- Reduce erosion

Watershed Improvements

- Fill 2 Devlin Square dry ponds
- Improve storm drain conveyance along Sullivan Road
- Fill Lowry Pond (wet pond)
- Combine storm drain outfalls entering Willow Pond and improve storm drain along Sunshine Way
- Retrofit Willow Pond
- Restore stream and floodplain of Tributary 16



Design



**Diversion weir/
Pond inflow**

**Gravel lens/
underdrain**

Weir wall outlet structure

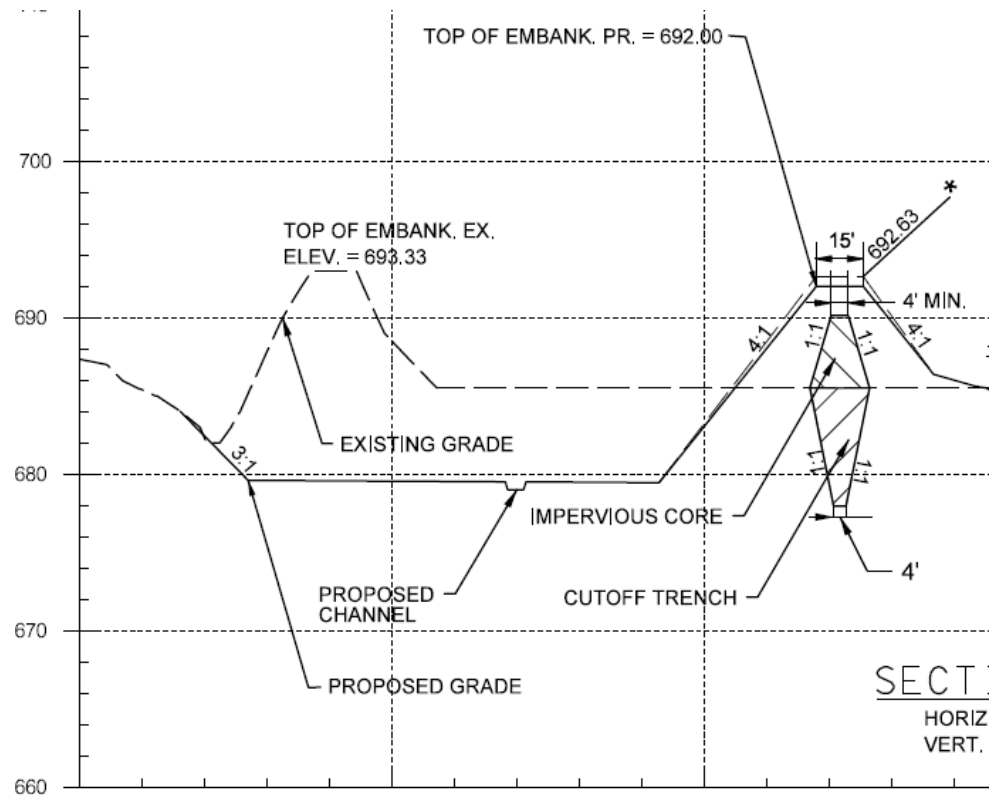
**Embankment
Relocation**

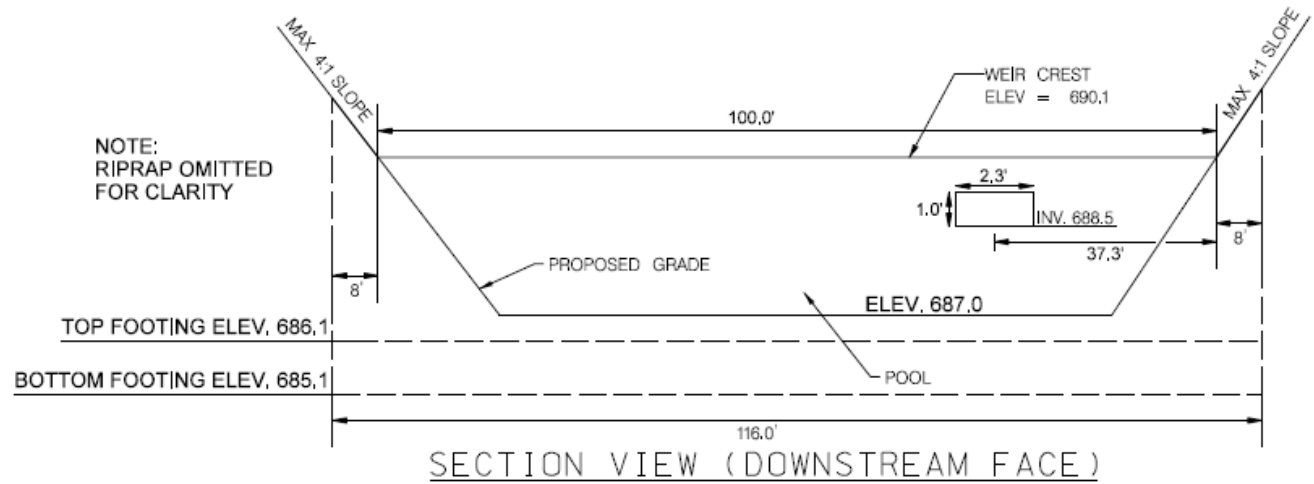
**Integrated Stream and
Wetland Complex**

Embankment Relocation

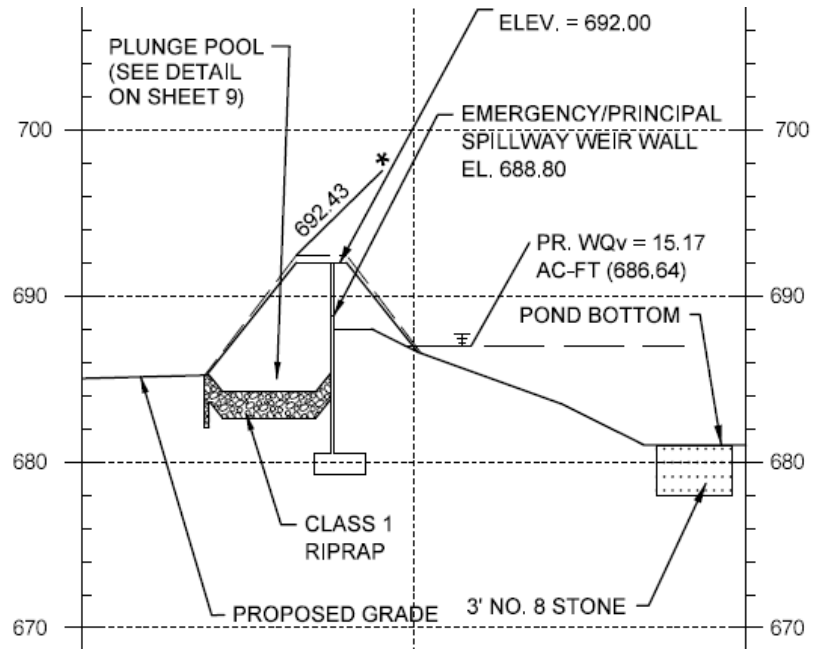


Integrated Stream and Wetland Complex

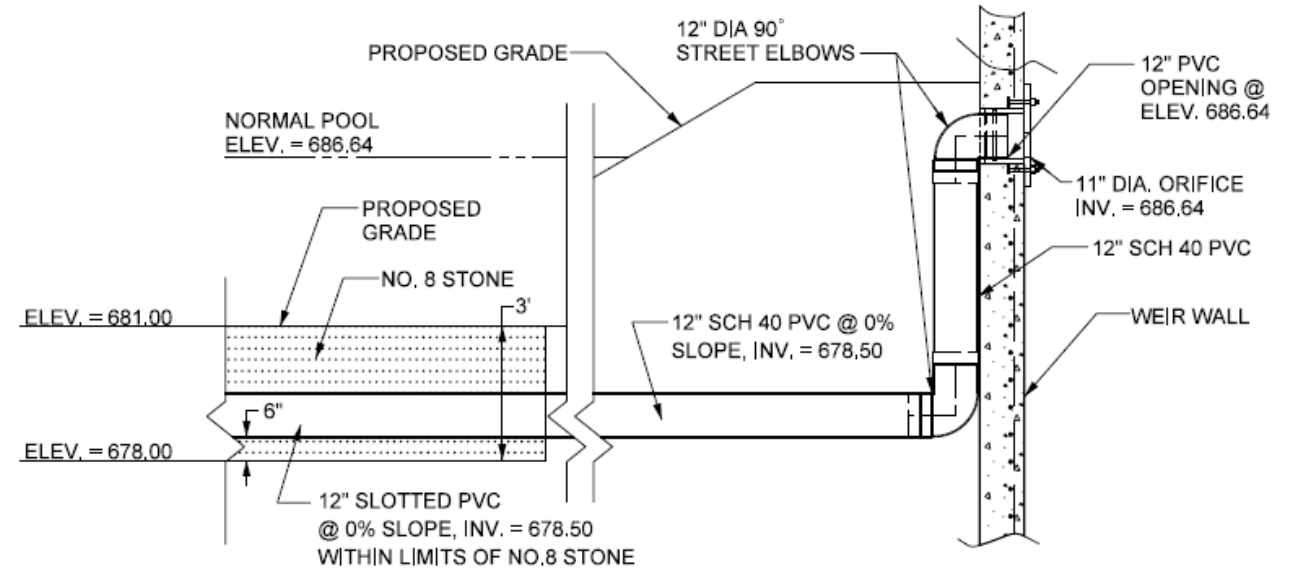
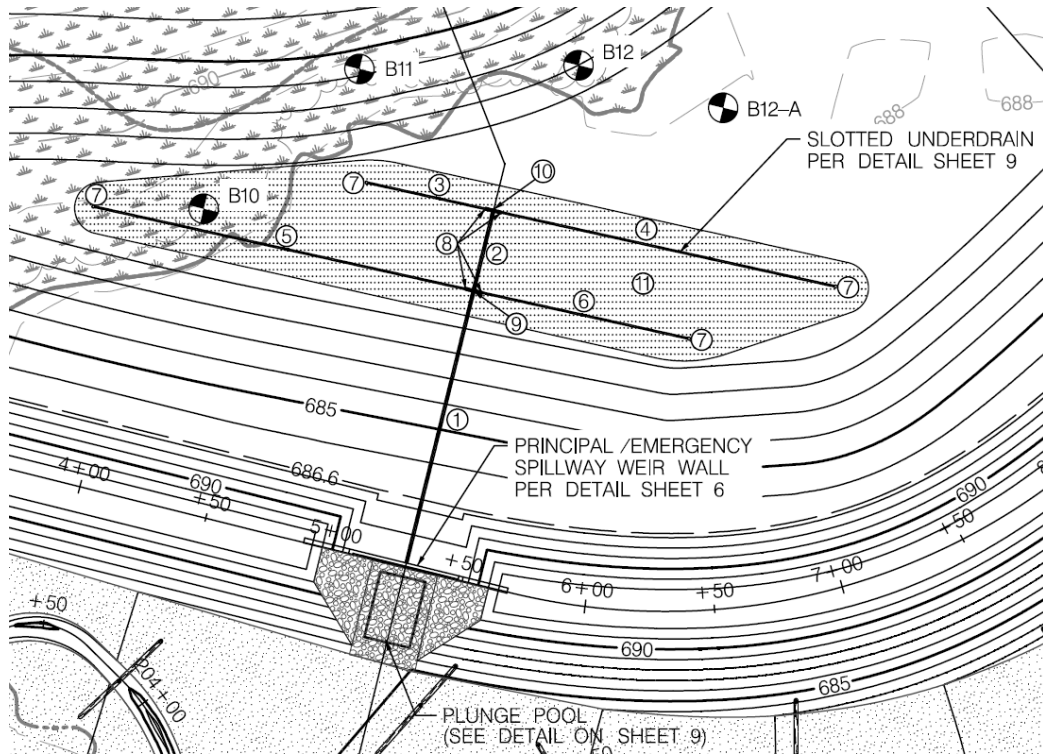




Diversion Weir



Weir Wall Outlet Structure



DETAIL - HORIZONTAL EXTENDED DETENTION DEWATERING DEVICE
NOT TO SCALE

Gravel Lens/ Underdrain



June 10, 2021 Storm

- Left: Diversion Weir to Willow Pond
- Right: Inflow to Willow Pond



June 10, 2021 Storm

- Left: Pond Outlet Weir
- Right: Downstream project limit



Post-storm Photos
June 12, 2021

Stormwater Management Project Benefits

Treatment of 2.5” of rainfall for 73 acres of impervious surface

15.2 acre-feet water quality volume

Anticipated reduction in stream temperature (surface area reduction, increased pond depth, and discharge from pond bottom)

Reduction of peak discharge at downstream culvert by 48% (10-year) and 16% (100-year)

Floodplain Restoration Project Benefits

Restoration of 3.7 acres of wetland floodplain connected to historic groundwater aquifer

Significant reduction of channel velocity and shear stress

Reduction of 100-year water surface elevations of up to 8 feet

Enhanced flood attenuation, nutrient filtration, hyporheic flow exchange, carbon sequestration, and wildlife habitat

NPDES/MS4 Stormwater Credits

Credit Source	Impervious Acre Credit
Impervious Surface Treatment at Willow Pond (1" Rainfall)	72.8 acres
Incentive for Extra Credit (2.5" Rainfall)	27.3 acres
Stream Restoration Credit	28.2 acres
Total	128.3 acres

Project Stats

- ~93,000 CY Excavation
- ~10,000 CY Clay Core Trench
- 2,268 LF Storm Drain Improvements
- 4,648 Trees Planted
- \$3.4M Project Cost (Design and Construction)
- \$26,500/ Impervious Acre Credit

Grant Funding



Carroll County received \$1.9M from the Maryland Department of Natural Resources, Chesapeake & Atlantic Coastal Bays Trust Fund.



The Trust Fund was established to provide financial assistance advance Maryland's progress in meeting the restoration goals of the Chesapeake Bay and the Atlantic Coastal Bays by focusing on nonpoint source pollution control projects.

Permit Conditions (USACE 3-year Monitoring)

Photo documentation

- Stability of bed controls
- Bank vegetation
- Channel and floodplain flow exchange

Vegetation assessment

- Woody planting survivorship
- Herbaceous percent ground cover

Rapid bio-assessments for ecological or beneficial lift

- Invasive plant reduction
- Macroinvertebrate communities greater than or equal to baseline conditions

Additional County Monitoring



Bacteria TMDL Monitoring (e-coli sampling)

1 of 5 bacteria trend monitoring locations in Liberty watershed



Urban Trend Monitoring

Carroll County has one long term trend monitoring location in each Chesapeake Bay TMDL River segment - Willow Pond is the location for the Patapsco Bay River Segment

- Chemical grab samples
- Stream stage height and flashiness measurements
- Road salt runoff measurements



Gravel Lens Temperature Monitoring

Temperature monitoring of release from gravel lens to see if temperature reduction occurs

Monitoring has been in place since 2018 with pre-construction data

Sensors in the outfall of the facility, upstream, downstream and in the facility

Control site at another wet pond in watershed with same measurements



Questions?

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