Bioengineering Solution for Infrastructure Protection and Stream Stability in Blackwater Creek

National Stream Restoration Conference 2022

Emily Burgess

Delivering a better world

aecom.com


AECOM
Why Bank Stabilization?
Delivering a better world
aecom.com

Reduce In-Stream Erosion

PG County, MD
Image Source: AECOM

Severn River discharging into Chesapeake Bay
Image Source: Severn River Keeper Program

Protect Existing Infrastructure

Common Constraints:

- Narrow floodplain width
- Site access is limited
- Funding is limited
- Time is limited

Stream erosion threatening property & infrastructure

Havre de Grace, MD
Image Source: AECOM

Sligo Creek, MD
Image Source: Dean Tousley
www.friendsofsligocreek.org


AECOM
Traditional Engineering Methods
Delivering a better world
aecom.com

Riprap and Gabion Baskets

Hilton Head, SC 2022

Devon, Great Britain 2015
Image Credit: Nigel Mykura

Concrete and Vertical Sheet Piles

Alexandria, VA 2021

Alexandria, VA 2021

Bank Stabilization Using Bioengineering

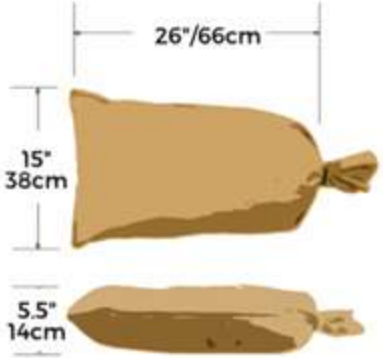
AECOM

Delivering a better world

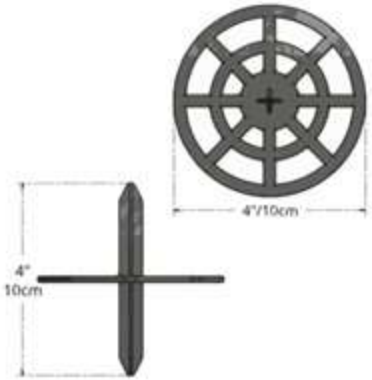
aecom.com

Vegetated Walls

1 Envirolok Bag



2 Connection Spikes



1 UV-Resistant Closure Tie

Benefits

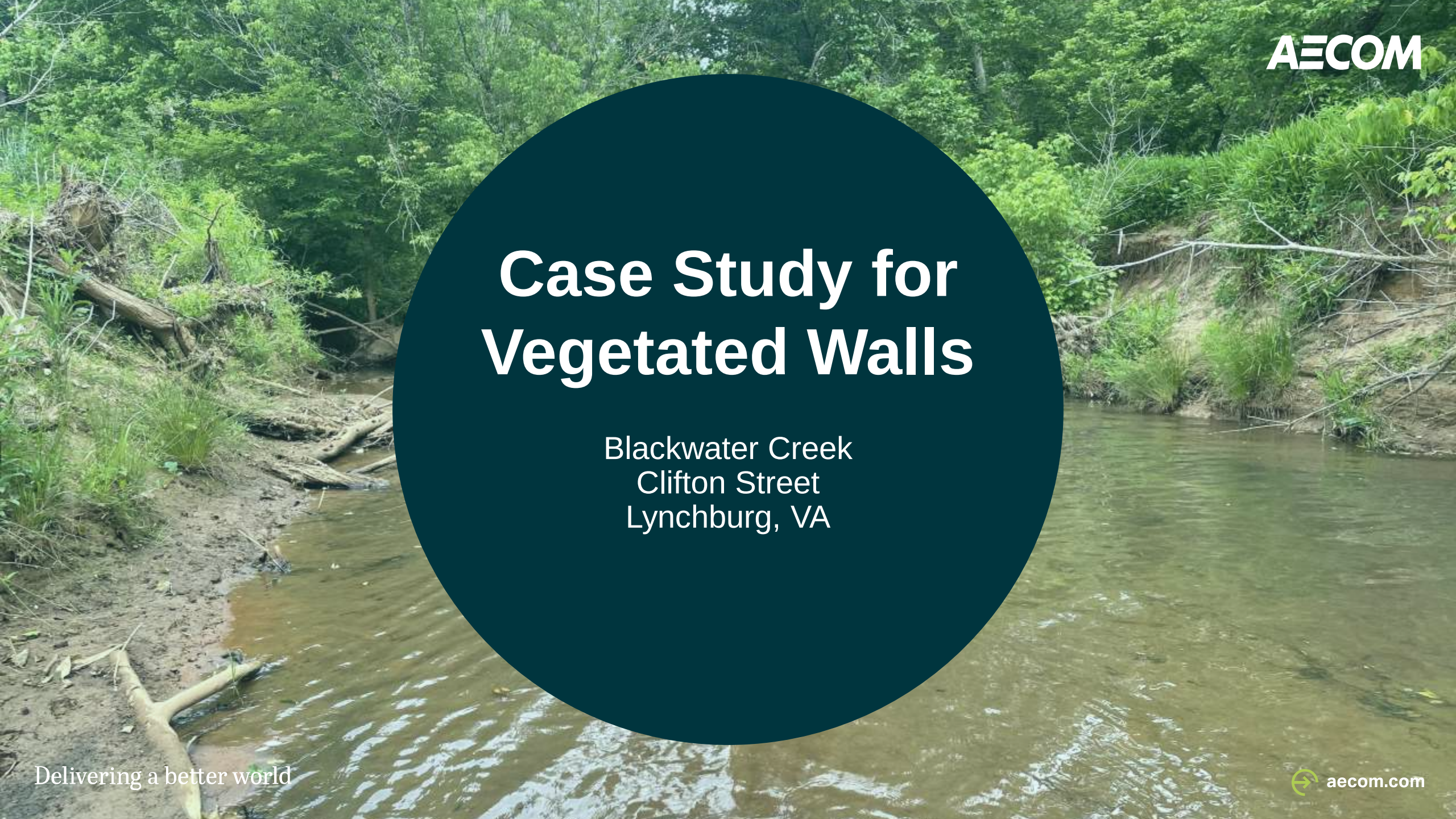
- Flexibility of design
  - Small bags conform to landscape
- Sustainable
  - No quarries or concrete
- Long-term Vegetative Stabilization
  - Plants grow through permeable bags

Sophia Creek – Barrie, ON
2015

French Broad River – Tennessee
2015

Benefits

- Multiple methods of reinforcement available
  - Geogrid vs Duckbill Anchors
- Permissible velocities
  - 16 – 20 ft/sec storms > 5 hr
  - 20 ft/sec storms < 5 hr



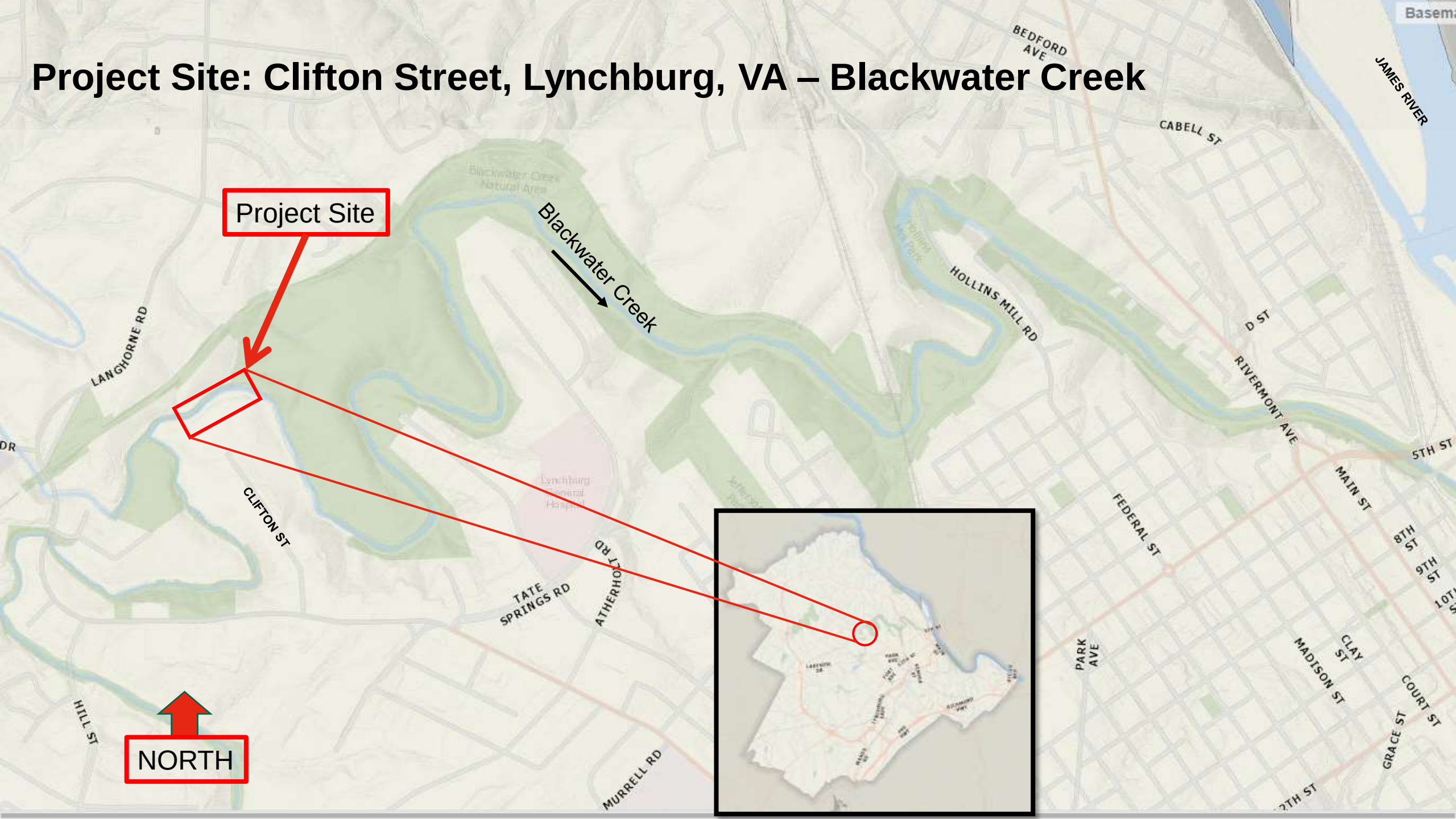
Case Study for Vegetated Walls

Blackwater Creek
Clifton Street
Lynchburg, VA

Delivering a better world

aecom.com

Project Site: Clifton Street, Lynchburg, VA – Blackwater Creek



Existing Conditions

- Provide support and cover for sewer pipe
- Minimize footprint for construction
- Remove accumulated debris

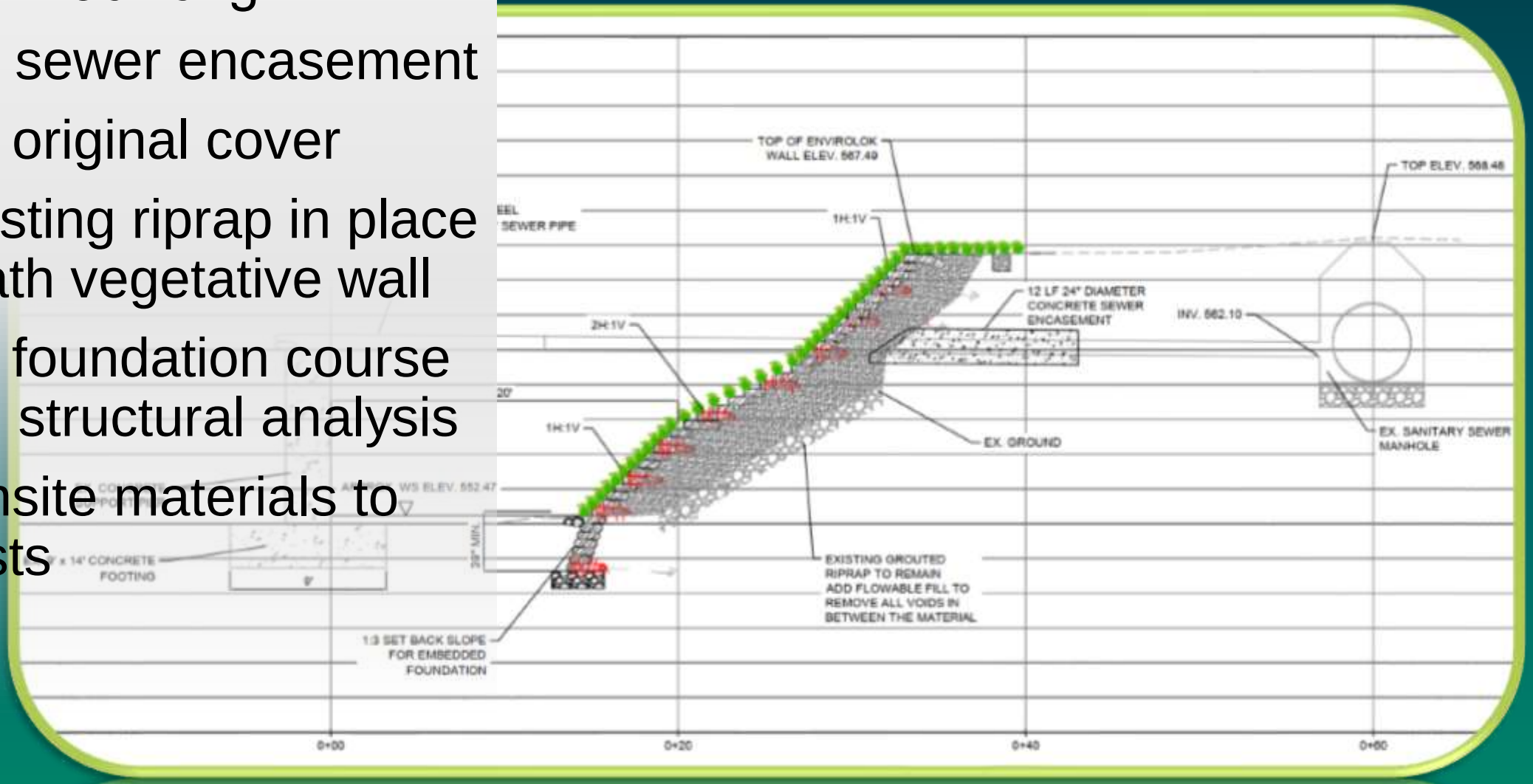
Design Challenges

- Urban stream
- Flashy flows
- Residential property
- Impaired upstream and downstream
- Regular influx of woody debris

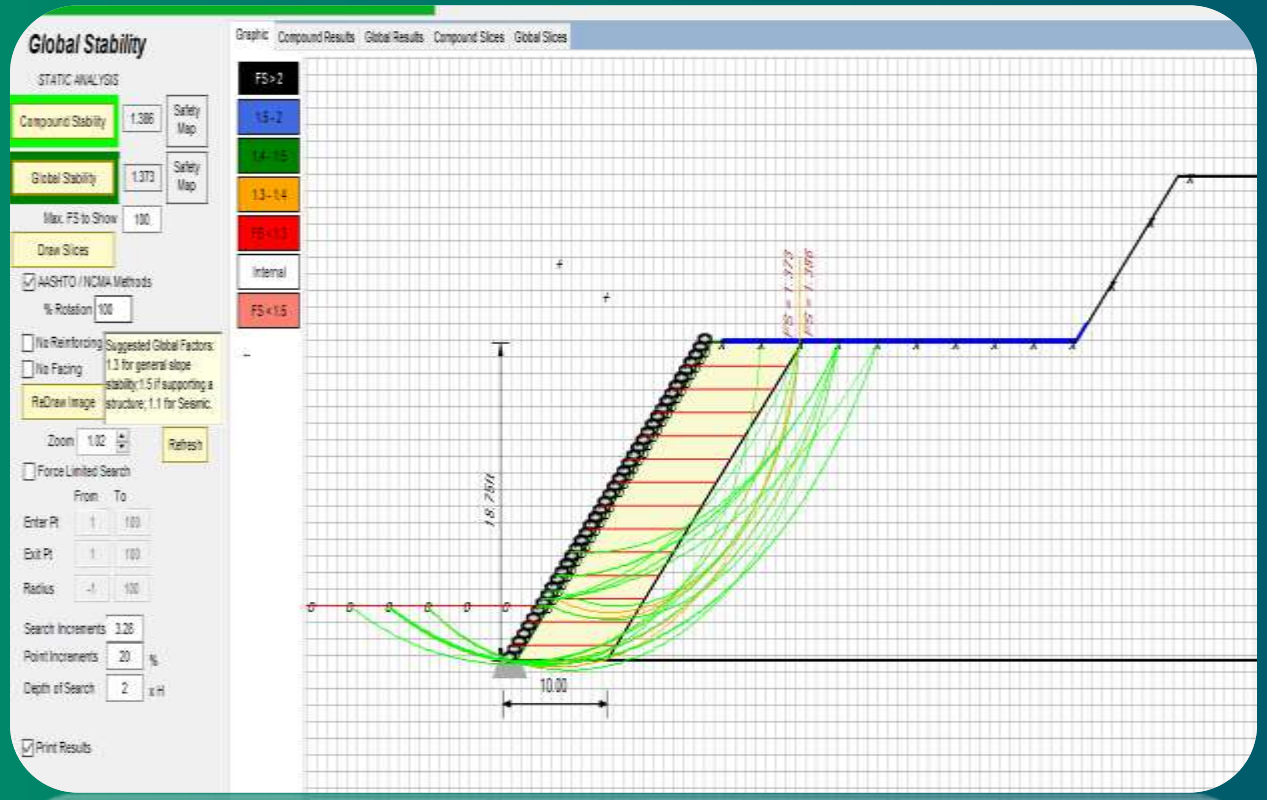
Vegetated Wall Cross Section

Design Features

- 15.5’ tall x 136’ long
- Concrete sewer encasement
- Restores original cover
- Grout existing riprap in place underneath vegetative wall
- Embed a foundation course based on structural analysis
- Reuse onsite materials to lower costs



Structural Analysis



Envirolok Analysis Software

- Comes installed with block and reinforcement data for quick structural analysis
- Can customize soil data, water levels, seismic factors, loading, and wall geometry
- If reinforcement is used, length can be adjusted at each layer to minimize construction cost

Cost Analysis – materials and vegetation

	Cost / SF (vertical face)
Small Stream (Timber Branch – highly urban setting)	$35
Medium Stream (Blackwater Creek – residential setting)	$37
Large Stream (James River – industrial setting)	$48

Planting Plan

- Southern Virginia Piedmont
- Riparian and Wet Conditions
  - Goldenrod
  - Milkweed
  - Switchgrass
  - Wildrye
- Food and habitat for wildlife as well as slope stabilization

Early-Construction (February 2022)

Construction Challenges

- Site Access
- Hit Bedrock 2-3’ below ground surface
- Groundwater Seepage

Early-Construction (February 2022)

Mid-Construction (May 2022)

Mid-Construction (May 2022)

Mid-Construction (June 2022)

Post-Construction (June 2022)

Post-Construction (July 2022)


Thank you.
Delivering a better world
aecom.com