



BROAD CREEK PARK

Valley Wide Floodplain Reconnection and Wetland Creation in an Urban Watershed

Presented by:

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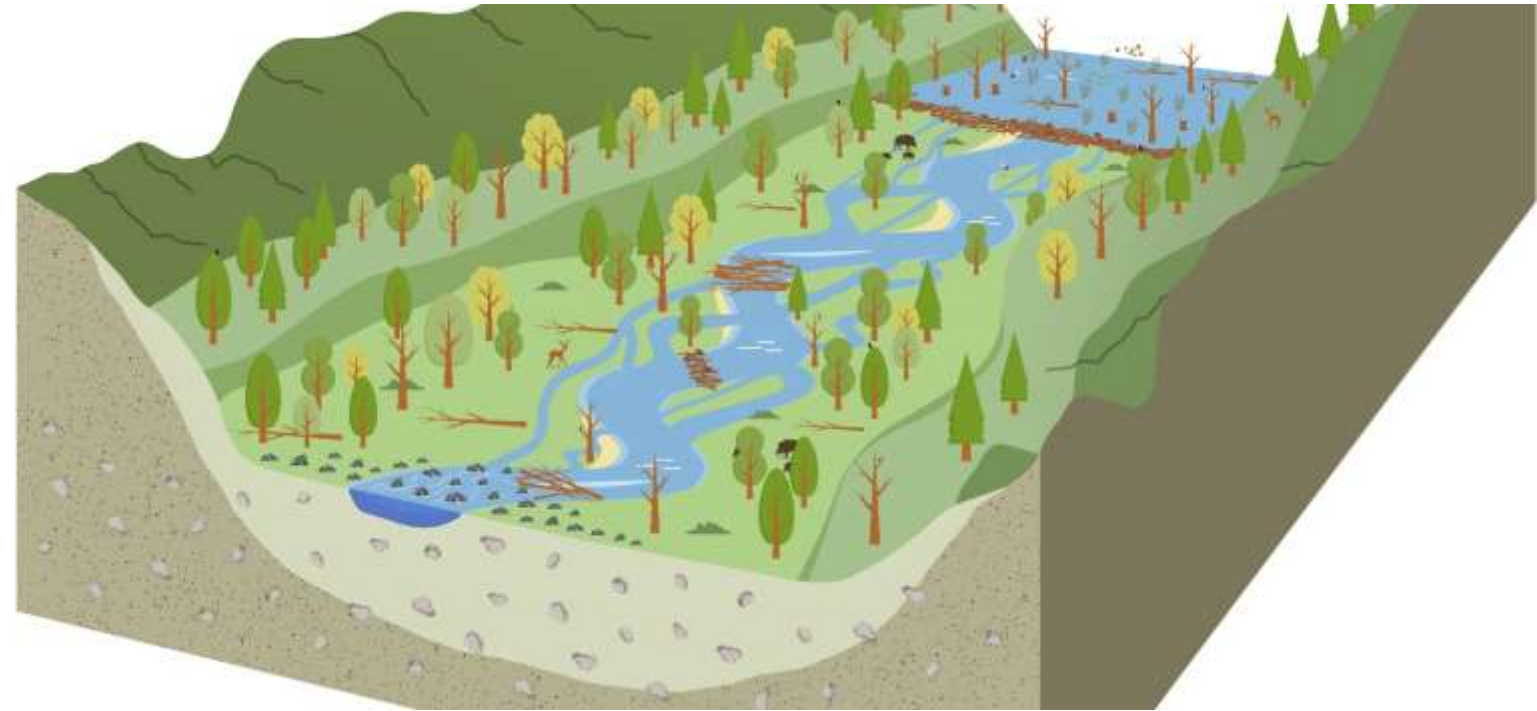
Agenda

- Existing Condition
- Design and Modeling
- Construction
- 1 Year Later



Floodplain Reconnection

- Offset Entrenchment
- Raised Water Table
- Increased Hyporheic Zone
- Sediment / Nutrient Treatment
- Wetland Complex Creation



Source: Länsstyrelsen Östergötland, Sweden

Broad Creek Stream Restoration



Location

Broad Creek Park near Parole, Maryland.



Watershed

0.58 Acres, Highly Urbanized



Stream Valley

Wide with steep walls; Approximately 4,000 linear feet of stream restored.



Partnership with Arundel Rivers Federation

Arundel Rivers Federation and Anne Arundel County Bureau of Watershed Protection and Restoration.



Project Funding

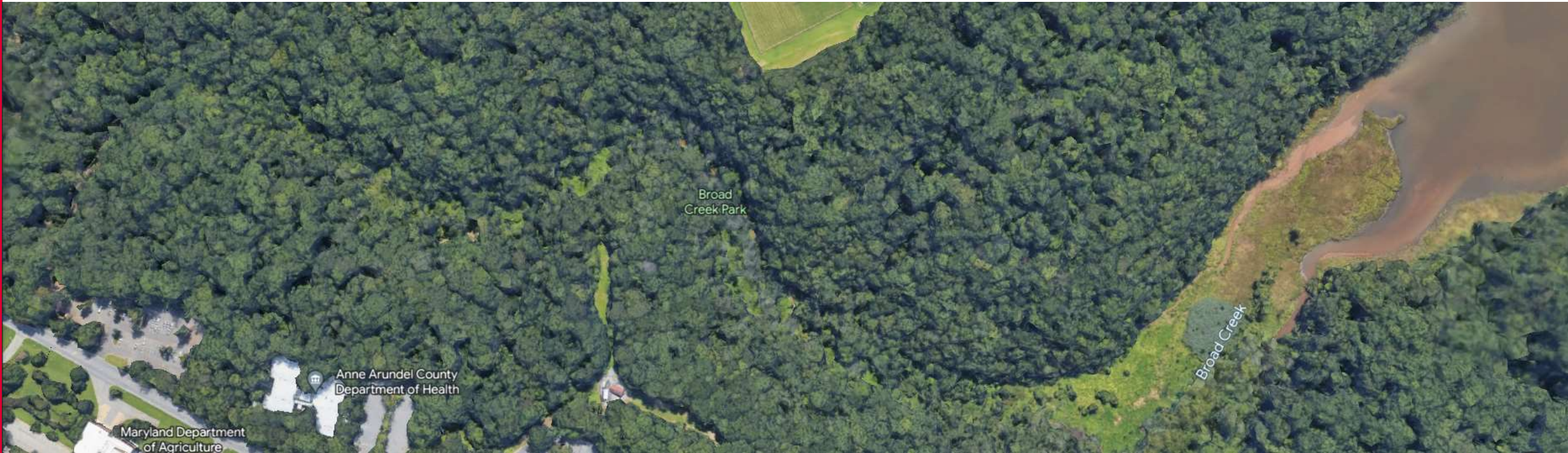
- Maryland Department of Natural Resources (DNR),
- Chesapeake Bay Foundation,
- Arundel Rivers Federation, and Anne Arundel County.



2-Dimensional Modeling

Optimized stream design to minimize fill required.

Broad Creek Park



- Drains to South River
- Significant Discharge
- High Profile Project Location

Stream Assessment

- Desktop and Field Assessments
 - Rosgen Level II Assessment
 - Geomorphic Survey
 - Bedload
 - BANCS
- Stream In Poor Condition
 - Deeply Incised (Gc4 Type)
 - Low base flow
 - Ferrous Flocculent
 - Accelerated Erosion



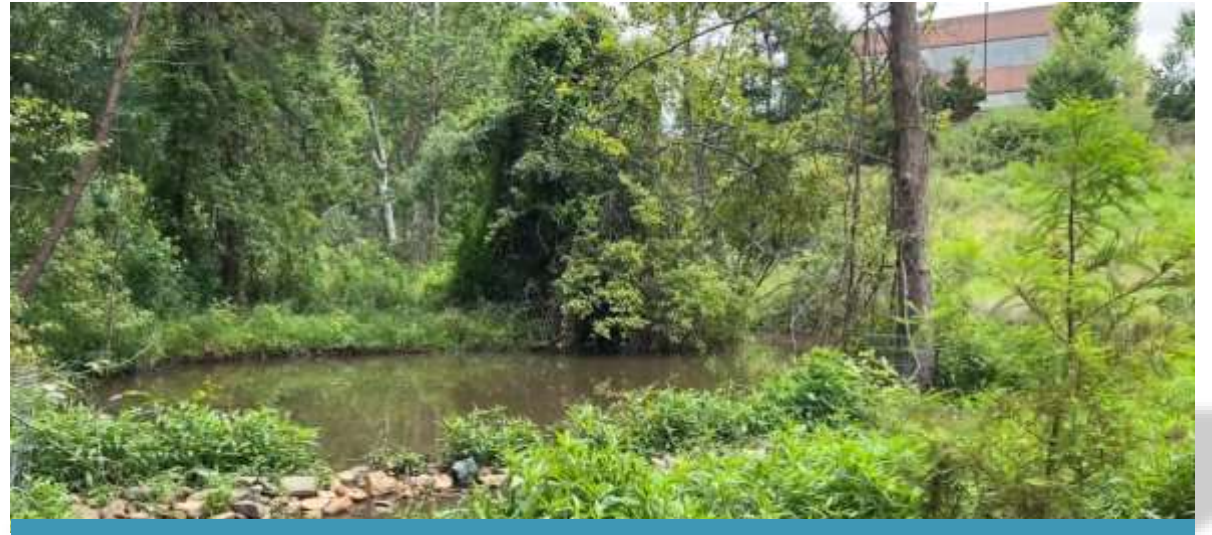
Cascade Structure



Incised Channel at Broad Creek Park

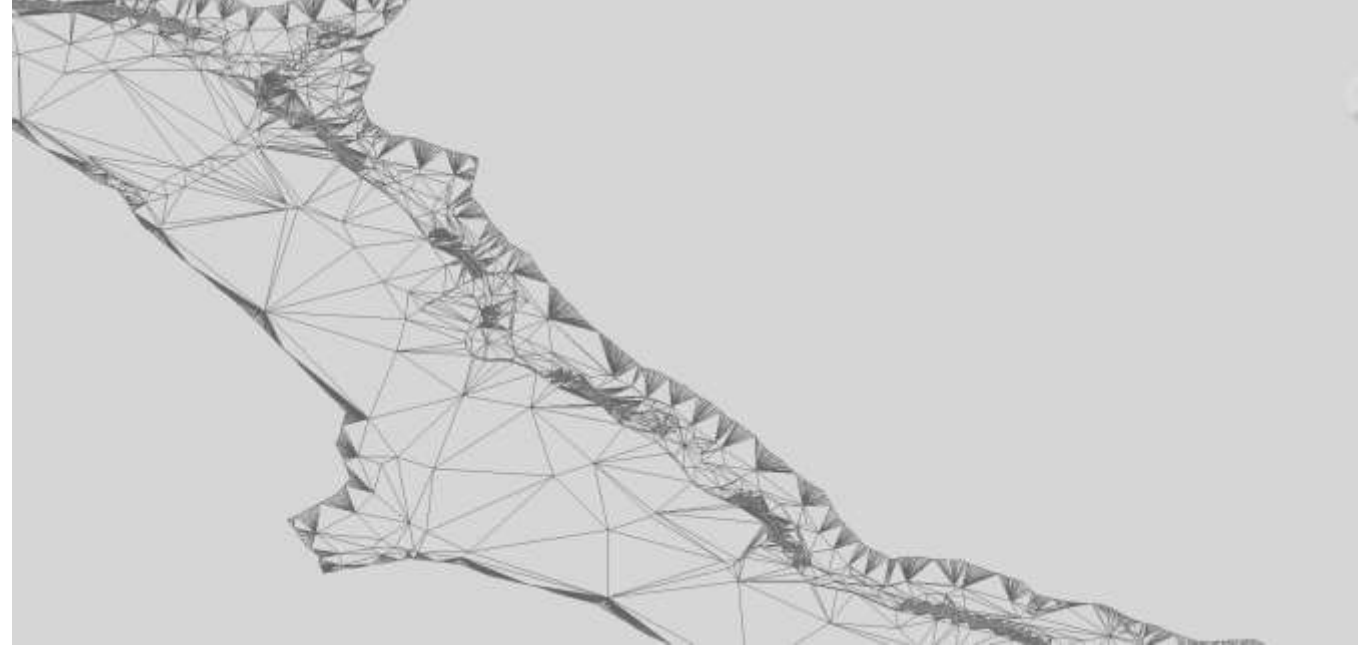
Proposed Design: Structures

- Preferred Design: Valley Restoration
 - Grade Control
 - Dispersed Flow
- Design Objectives
 - Restore Wetlands
 - Reconnect Floodplain
 - Minimize Fill

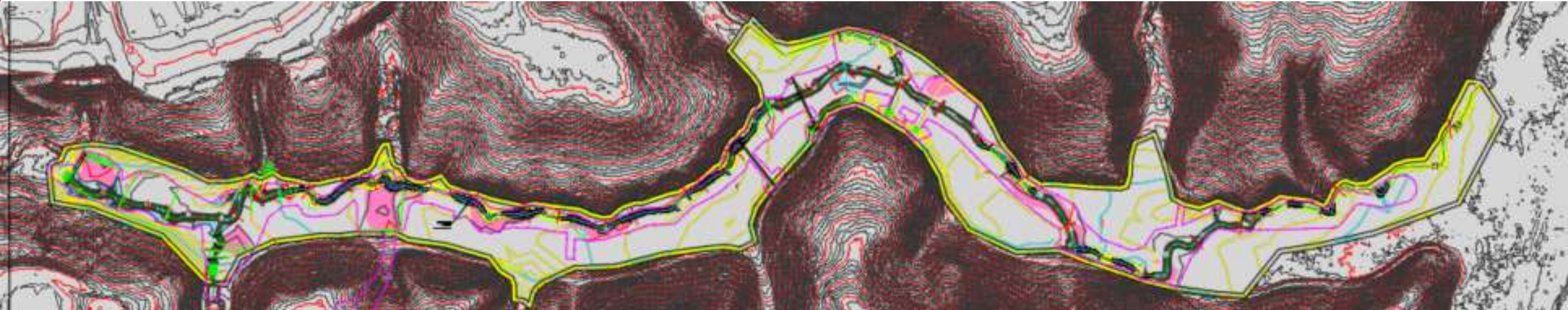


2-Dimensional Modeling

- Design Concept developed using HEC-RAS 2-D modeling
- Detailed proposed condition created in AutoCad Civil 3D



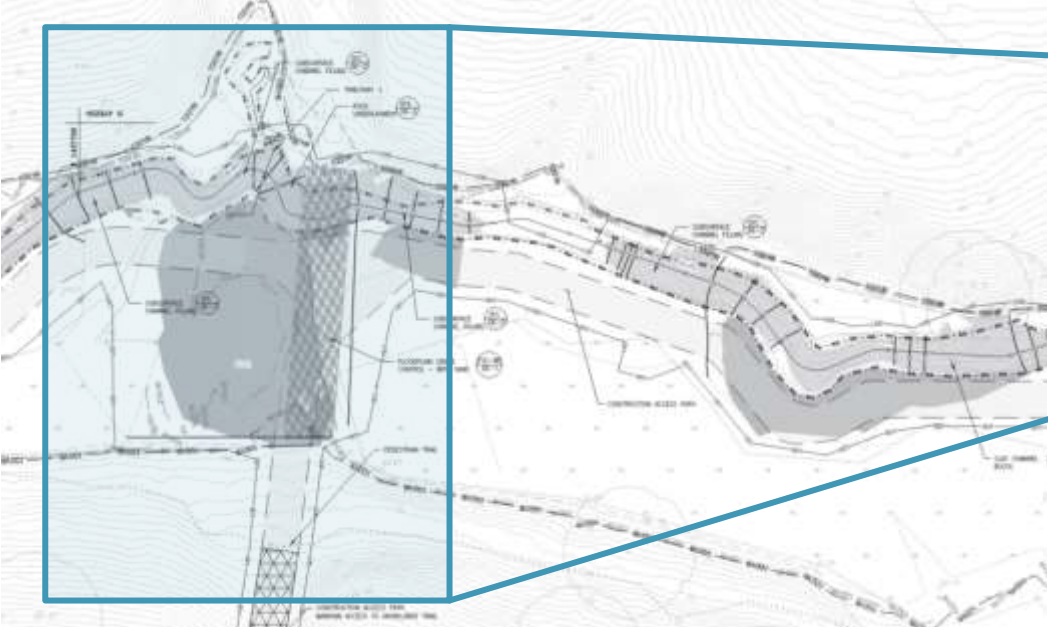
Wireframe view of Upstream Section of Broad Creek



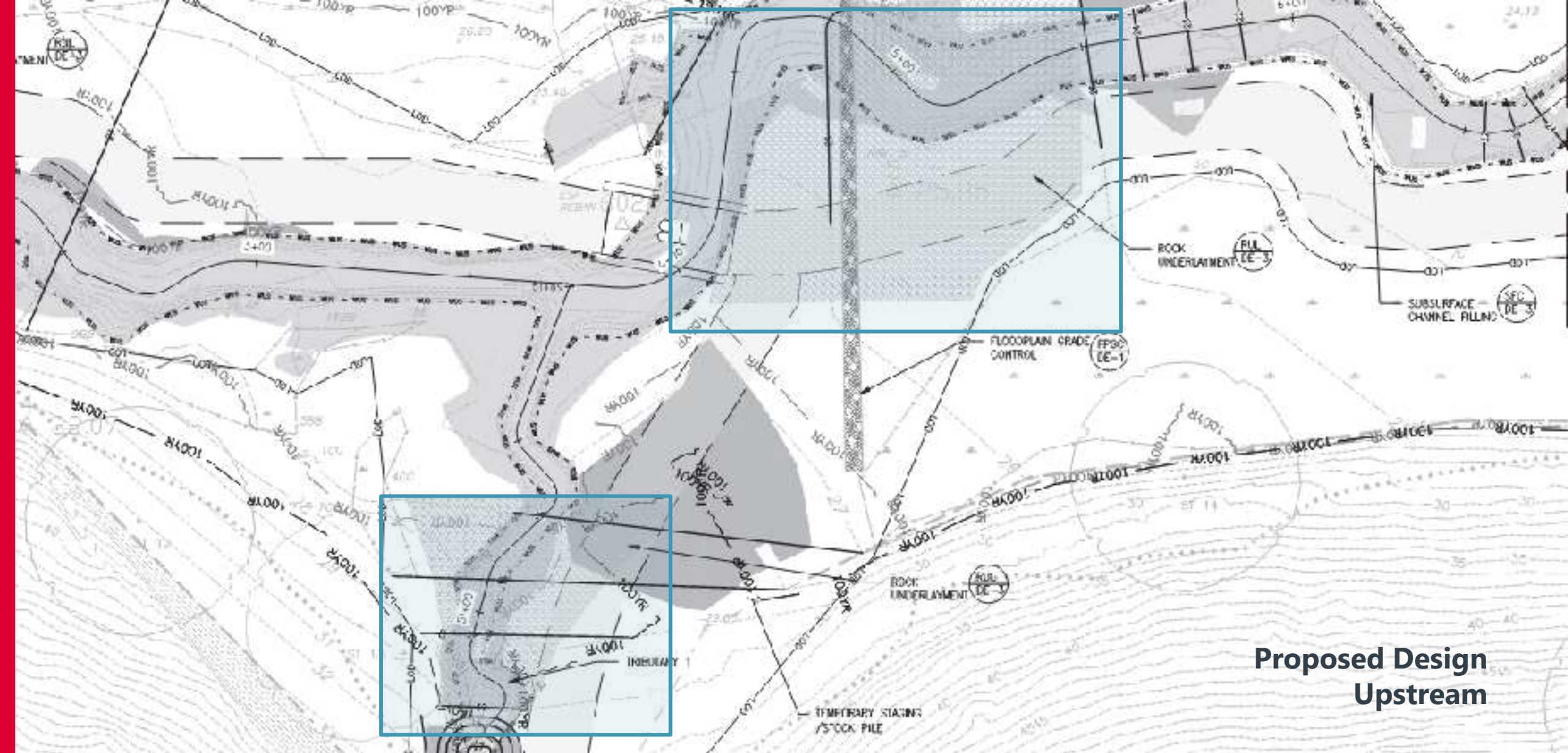
Broad Creek Model with cut and fill areas shown

2-Dimensional Modeling Continued

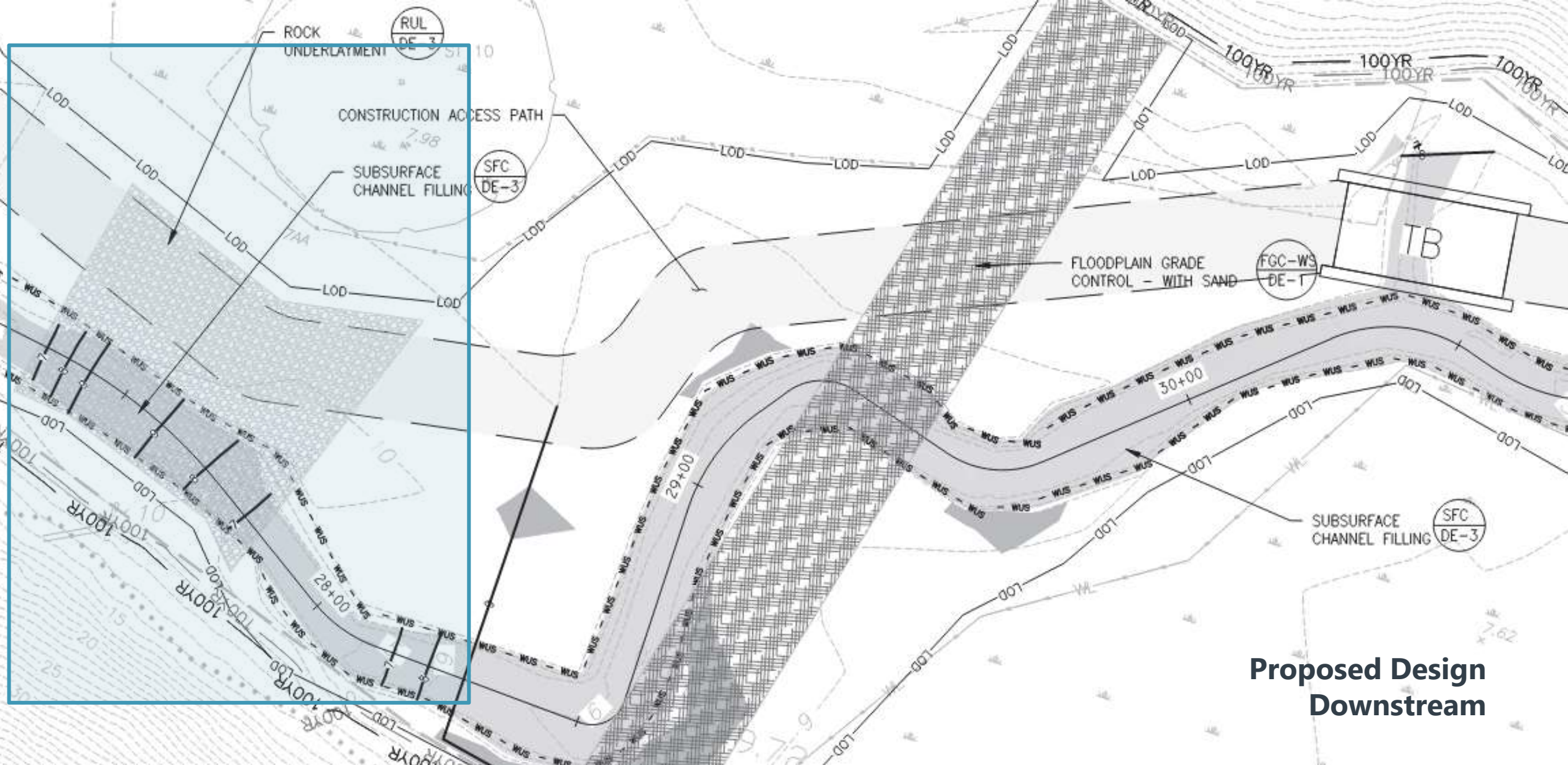
- HEC-RAS 2D analysis to determine areas of high shear stress – additional armoring added



Brad Creek H&H results – 10-year shear stress



**Proposed Design
Upstream**



**Proposed Design
Downstream**

Construction Constraints

- Steep / Narrow Access
- Wetland Avoidance
- Sequence of Construction

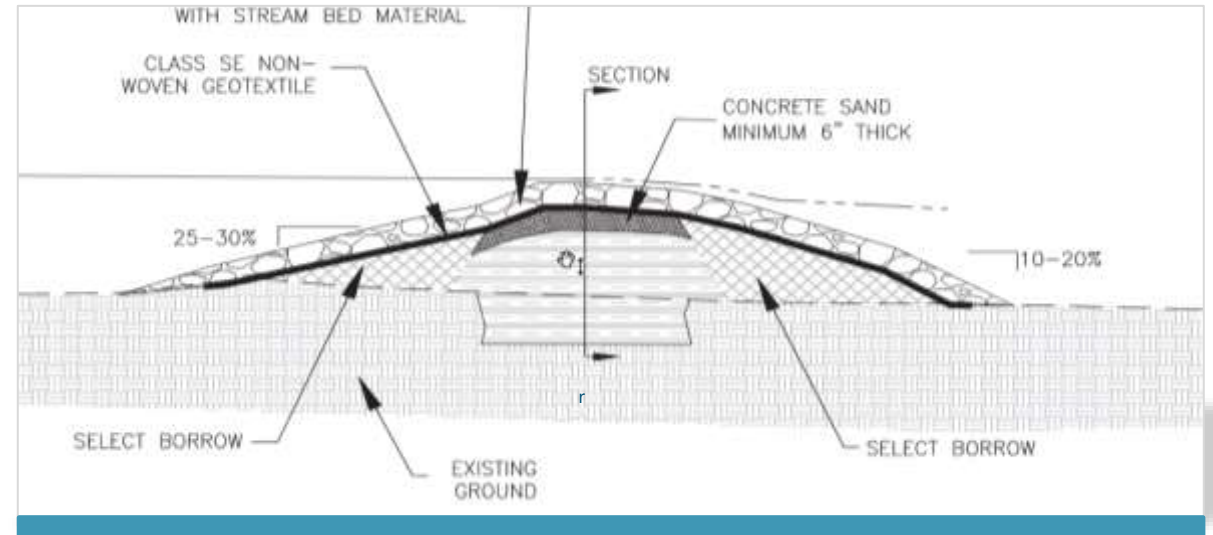


Timber Mat Bridge



Proposed Treatments

- Clay Channel Blocks
 - Tied Into Bed
 - Keyed Into Banks
 - Sand Layer
 - Minimizes Fill
 - Creates Pools
 - Direct Flows



Clay Channel Block Detail View



Broad Creek July 2023

Valley Treatments

- Clay Channel Block Construction



Excavation for Clay Channel Block core.



Installation of stone, riprap and geotextile



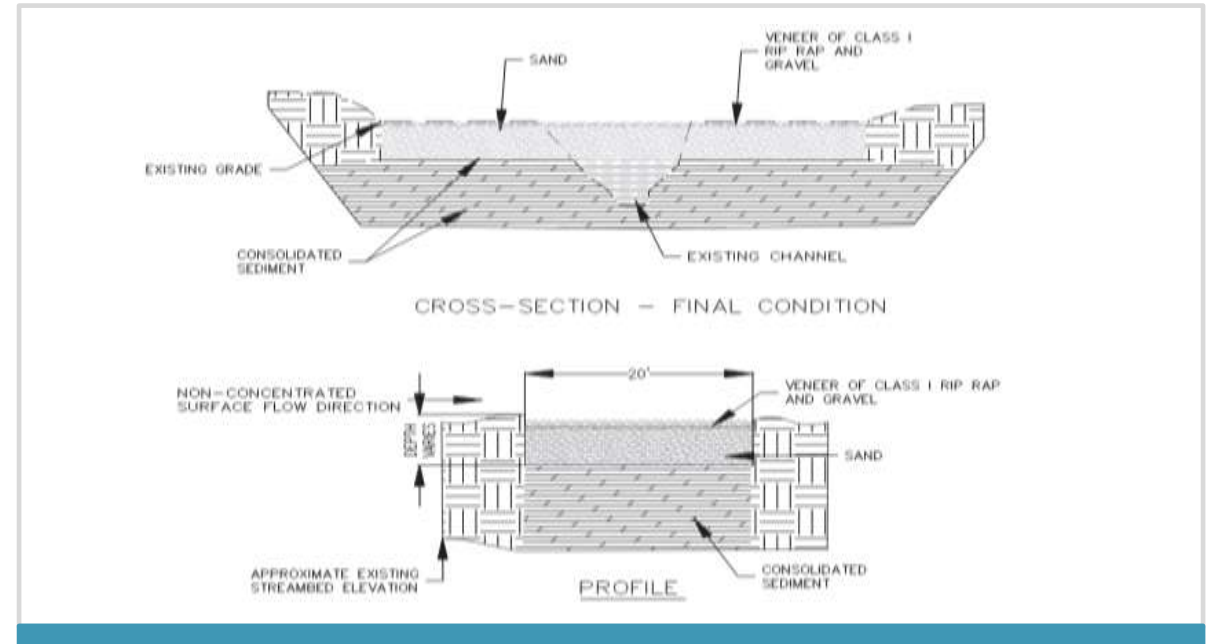
Placement of compost and soil stabilization matting



Vegetation beginning to establish on channel block surface.

Floodplain Grade Controls

- Spread flow
- Prevent Downcutting
- Compacted Sand Base
- Creates Wetlands



Floodplain Grade Control Construction



Excavation



Placement and Compaction of Sand



Placement of stone and gravel veneer



Vegetative Establishment

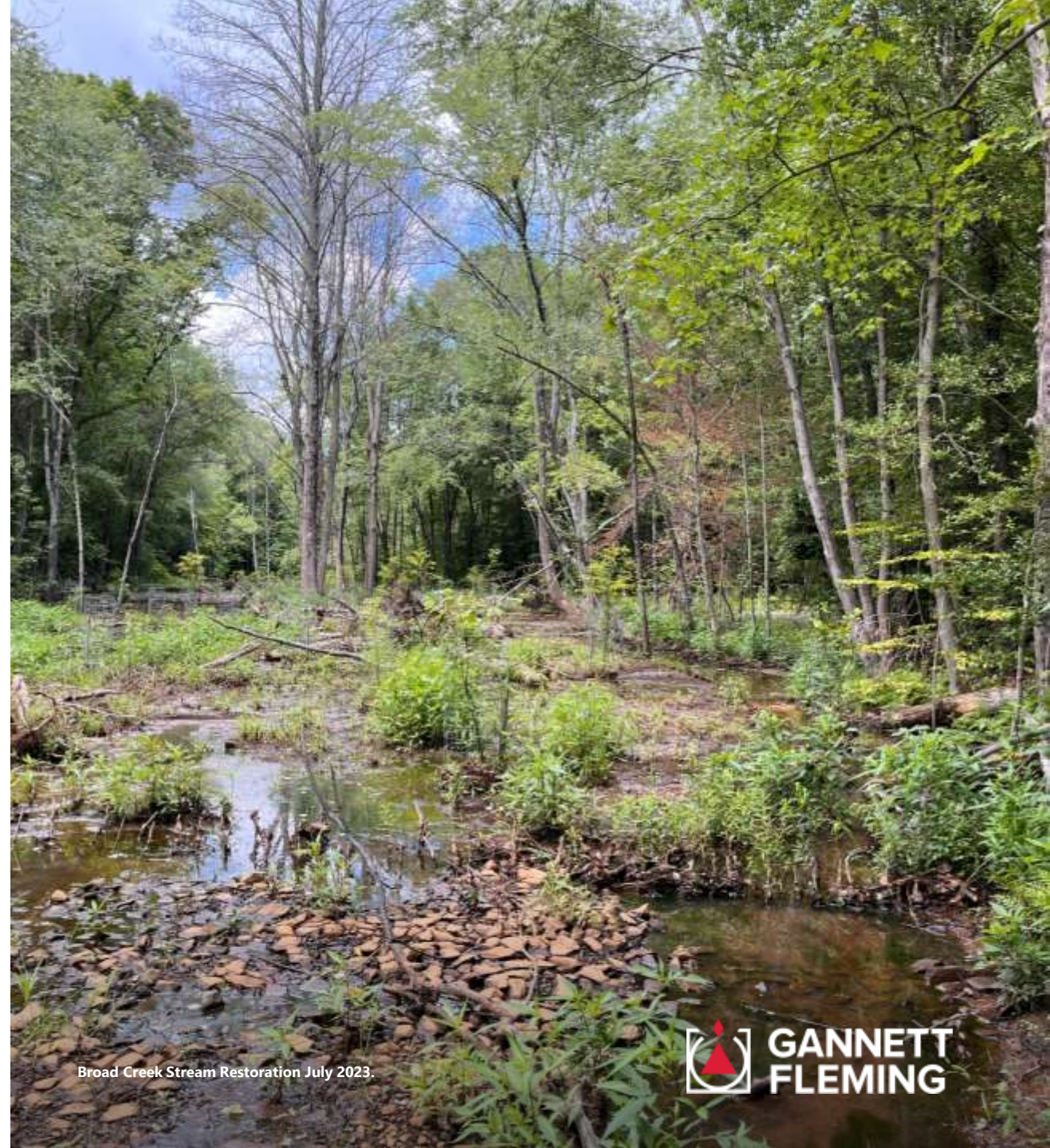
Rock Underlayment

- High Stress Areas (2D Modeling)
- Stone Layer with SSM and Topsoil
- Planted with Willow Stakes



Proposed Treatments (Continued)

- Vegetate Well (Full Sun)
- Protect From High Flows (Pullout / Debris)
- No downcutting observed



Post Construction Monitoring

- Identified Vegetative Species
 - Duck potato (*Sagittaria Latifolia*)
 - Devil's beggarticks (*bidens frondosa*), Broadleaf cattail (*Typha latifolia*)
 - Iris sp.
 - Willows (*Salix sp.*)
 - Cardinal flowers (*Lobelia cardinalis*), sensitive fern (*Onoclea sensibilis*)
 - Straw colored flatsedge (*cyperus strigosus*).
- Identified Animal Species
 - Red eared slider (*tachemys scripta elegans*)
 - Pickerel frog (*lithobates palustris*).



Red Eared Slider

Broad Creek – 1 Year Later

- CCBs Minimize Channel Fill (Offline)
- FGCs Evenly Spread Water
- Underlayment Prevents Downcutting
- Wetland Seed Bank
- Stable Floodplain Roughness
- Nutrient and Sediment Retention





View from Floodplain Grade Control Facing Upstream



THANK YOU!

Questions ?
