CLEAR WATER ALABAMA | SEPTEMBER 24TH, 2025

STORMWATER RESEARCH FACILITY UPDATES

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STORMWATER RESEARCH FACILITY

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ENGINEERING


Channelized Flow Demos
Floc Flume
Skimmer Testing
Floating Turbidity Curtain
Floc Shed
Track-out Control
Sediment Barriers
Diversion Swale
Rainfall Simulator
Inlet Protection
J-Hooks
Tree Protection
Sediment Basin
Ditch Checks + Floc
Hydroseeding
Erosion Control Blankets
Vegetation Plots
Vegetated Buffer
Stockpile Mgm't
Rainfall Simulators
Slope Drains
Level Spreader
Ditch Checks
Silt Fence
TRM's
Straw Blowing
Slope Interrupters
Sodding
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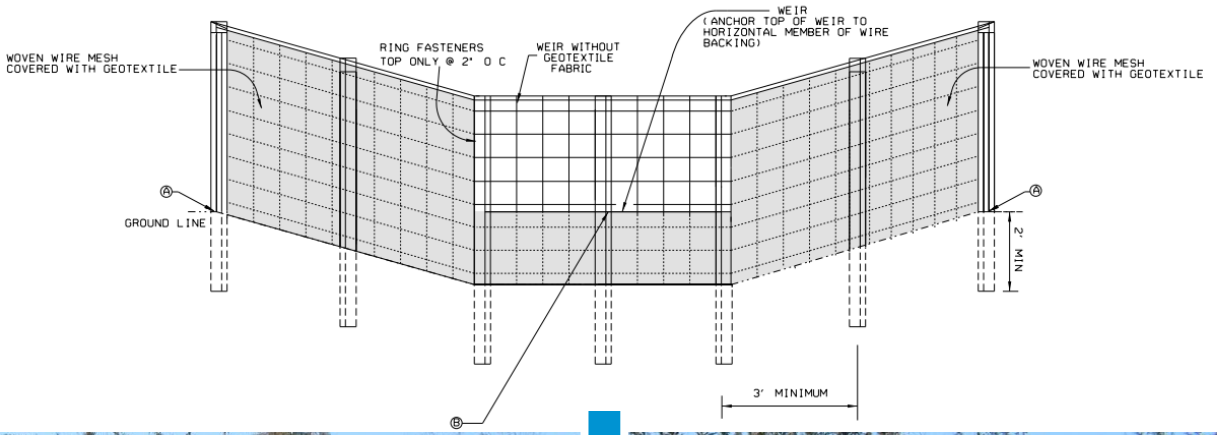
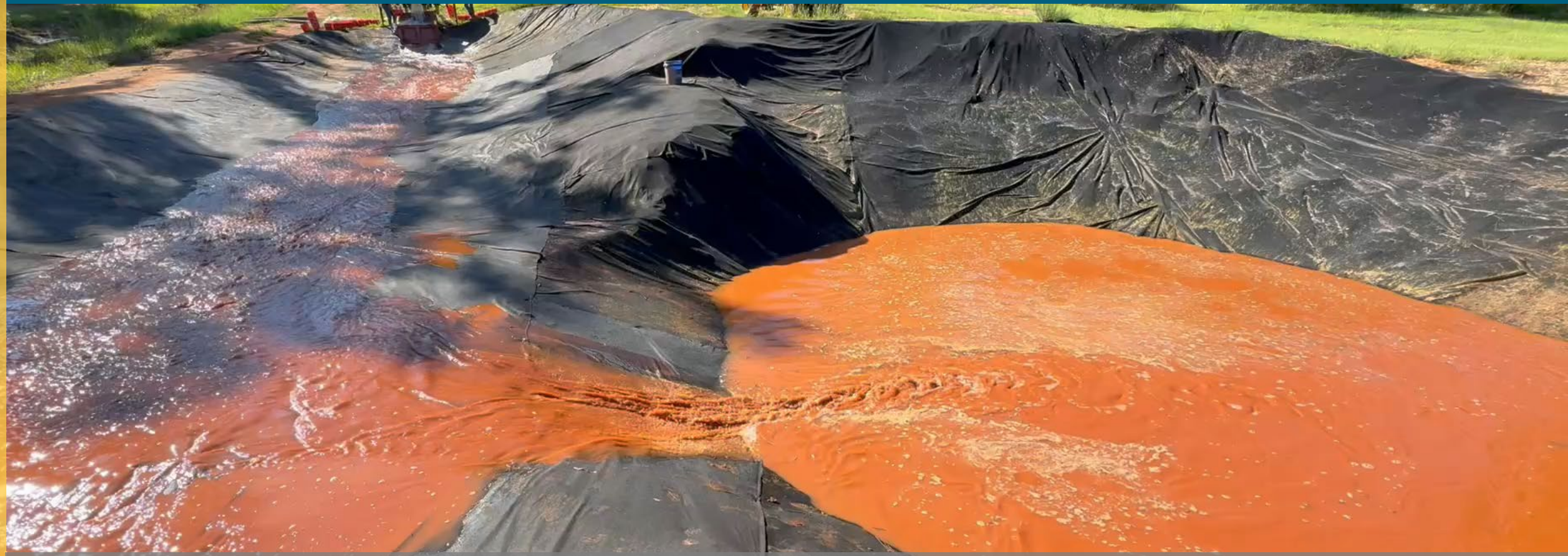
ALDOT
Alabama Department of Transportation
U.S. Department of Transportation
Federal Highway Administration
ADEM
Alabama Department of Environmental Management
NCHRP
NEBRASKA
Good Life. Great Journey.
DEPARTMENT OF TRANSPORTATION
EPA
IOWA DOT
SMARTER | SIMPLER | CUSTOMER DRIVEN
USDA
United States Department of Agriculture
odot
transportation.ohio.gov
USGS
science for a changing world

FROM RESEARCH TO IMPLEMENTATION



EVALUATION OF NDOT'S CONSTRUCTION STORMWATER DETENTION MEASURES USING FULL-SCALE TECHNIQUES



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NDOT DETENTION BASED PRACTICES

Practice	Description	Drainage Area	Sizing	Dewatering Mechanism
Silt Trap	Excavated ditch across the path of water to form ponding area, often includes silt check	< 1 ac	1 ft deep by 6 ft wide	None
Sediment Trap	Excavation with stabilized embankment	≤ 5 ac	134 yd^3/ac typ. 67 yd^3/ac min. 2:1 min. L:W	Riprap spillway w/weir height of 1 ft and length depending on drainage area
Sediment Basin	Excavation or embankment across a drainage way	> 5 ac	Vol. equivalent to the local 2-yr, 24-hr storm or 3,600 ft^3/ac	Emergency spillway and dewatering device that pulls from the top of impoundment

BACKGROUND

Detention measures capture sediment by impounding runoff and facilitate settling.

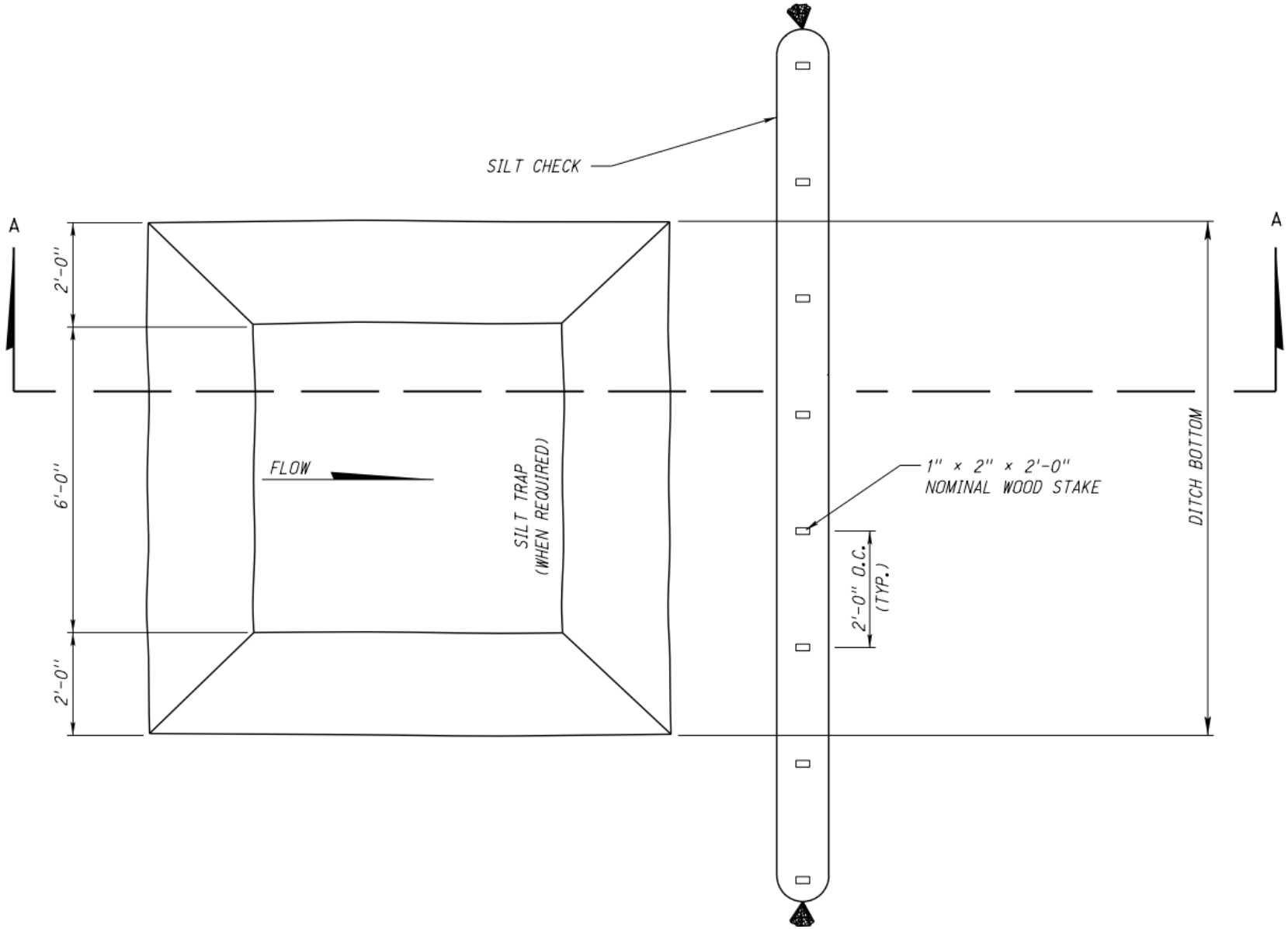
PROBLEM STATEMENT

NDOT detention measures have not been scientifically evaluated. Opportunities exist to enhance performance and design guidance.

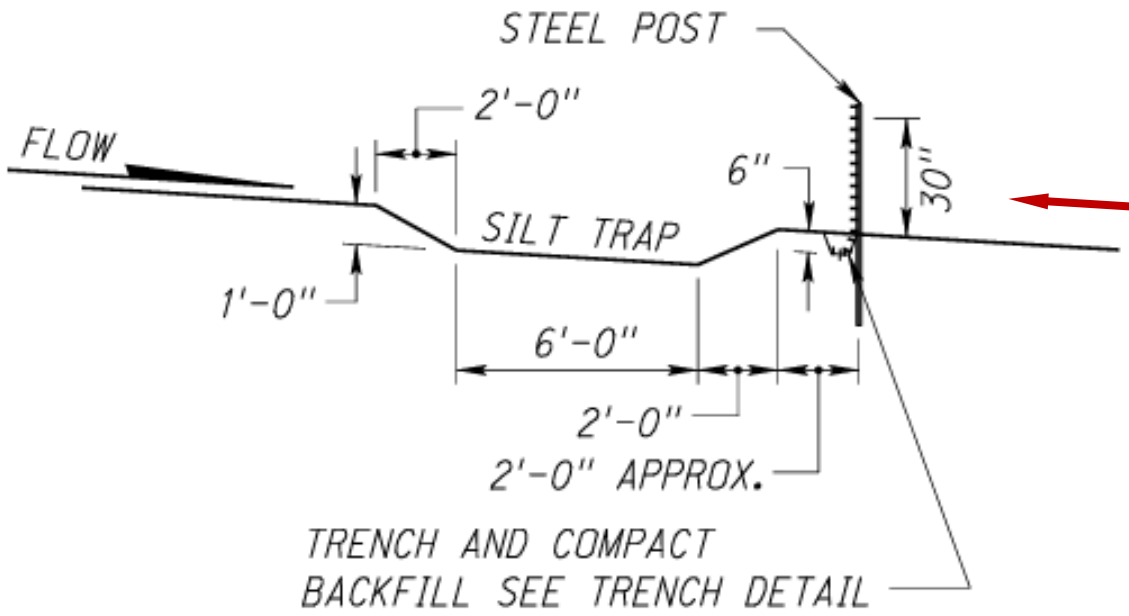
RESEARCH OBJECTIVES

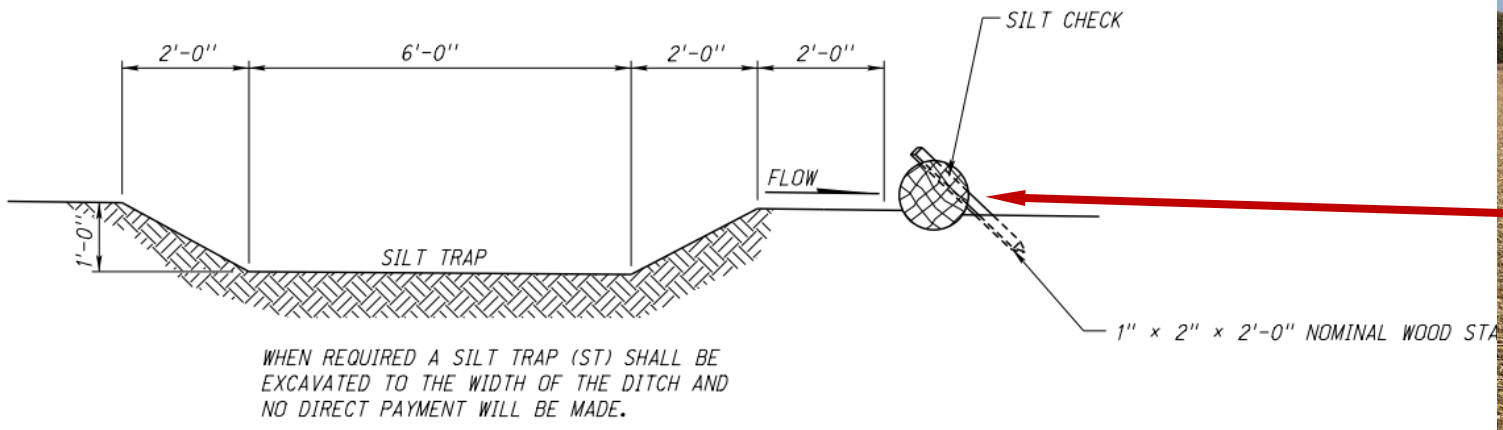
- Develop full-scale testing methodology for performance comparison of detention practices
- Evaluate detention practices and modified installations through full-scale testing that mimics NDOT highway construction conditions
- Develop implementable design guidance

SILT TRAP


SILT CHECK
A
A
2'-0"
6'-0"
2'-0"
FLOW
SILT TRAP
(WHEN REQUIRED)
1" x 2" x 2'-0"
NOMINAL WOOD STAKE
2'-0" O.C.
(TYP.)
DITCH BOTTOM

SILT TRAP

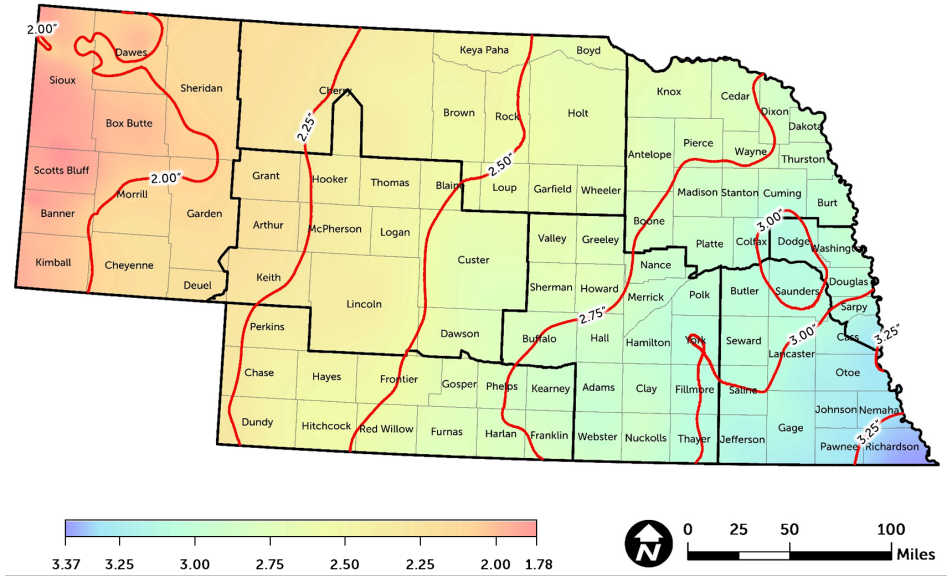




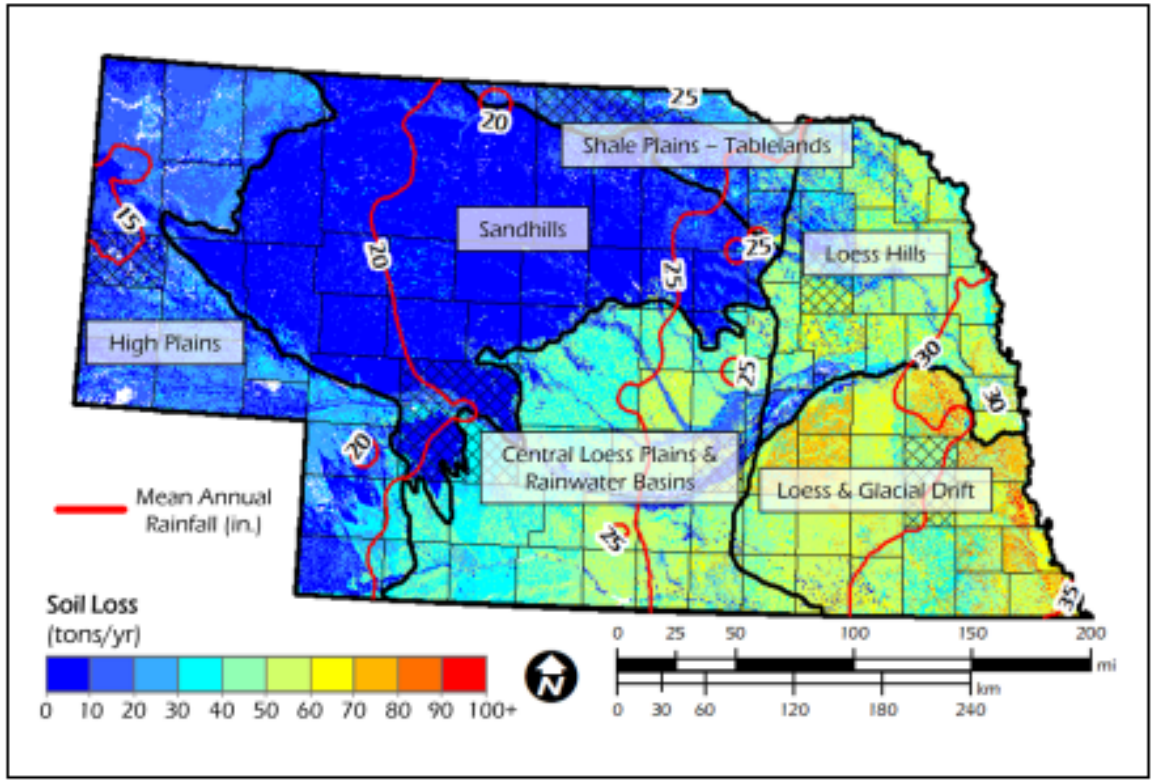
WHEN REQUIRED A SILT TRAP (ST) SHALL BE EXCAVATED TO THE WIDTH OF THE DITCH AND NO DIRECT PAYMENT WILL BE MADE.

SECTION A-A

DESIGN EXPERIMENTAL DETENTION MEASURES AND DEVELOP FULL-SCALE TESTING METHODOLOGY



Factors	Loess Hills	Loess Hills & Loess and Glacial Drift
avg K	0.375	0.357
avg P (in)	2.823	2.737
avg CN	88.125	86.680



FULL-SCALE TESTING METHODOLOGY

	Drainage Area (ac)	Total Volume for Peak 30 min (ft^3)	Peak Flow (cfs)	Average Flow for Peak 30 min (cfs)	Sediment Yield for Peak 30 min (lbs)
Loess Hills & Loess and Glacial Drift	0.50	841	0.97	0.47	1,184
	1.00	1,682	1.94	0.93	1,470

→ Silt Trap

→ Sediment Trap

Per Test	Silt Trap	Sediment Trap
Drainage Area (ac)	**0.5**	**1.0**
Avg Flow Rate (cfs)	**0.5**	**1.0**
Sediment Load (lb)	**1,100**	**1,470**

FULL-SCALE TESTING METHODOLOGY

Sample Collection – Water Quality

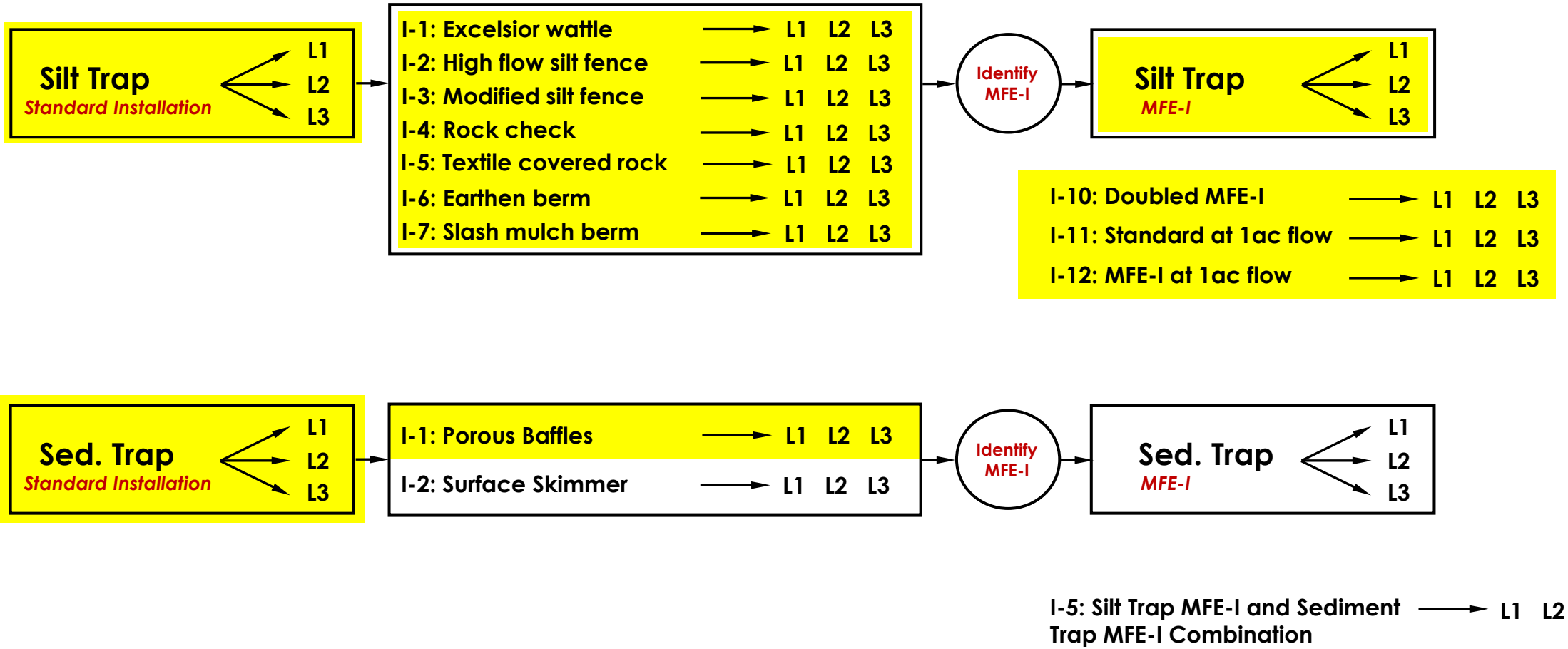
Sediment Introduction – NE Condition Simulation

Test Apparatus – Flow & Sediment Regulation


SILT TRAP
CHANNEL
SEDIMENT
TRAP
CHANNEL

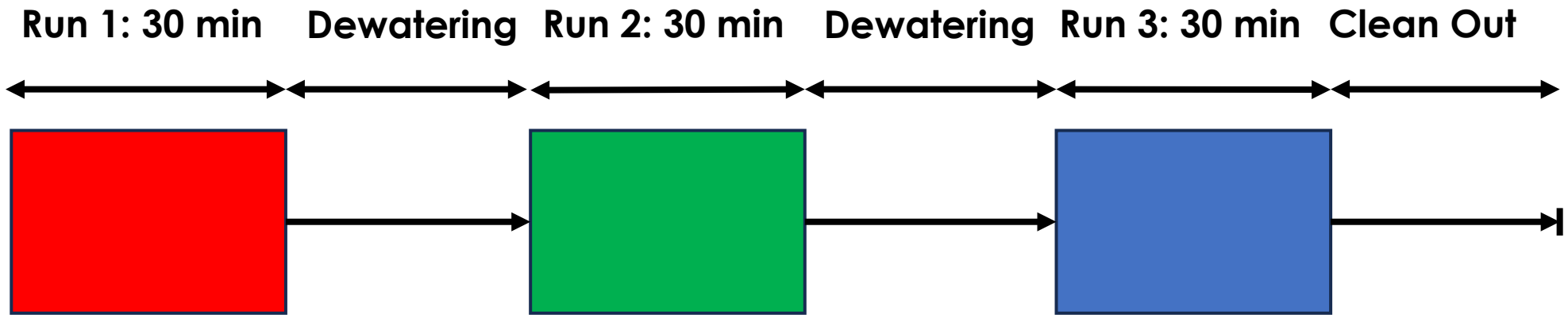
CONSTRUCTION OF DETENTION MEASURES

SUMMARY OF TESTING



FULL-SCALE TESTING

- Silt Trap: standard installations tested with back-to-back simulated runoff events to simulate filling and dewatering



- Results of standard testing will lead to development of modifications
- Develop and test Most Feasible and Effective - Installations (MFE-I)

NE STANDARD SILT TRAP

EXCELSIOR WATTLE

HIGH POROSITY SILT FENCE

LOW POROSITY SILT FENCE

MODIFIED SILT FENCE

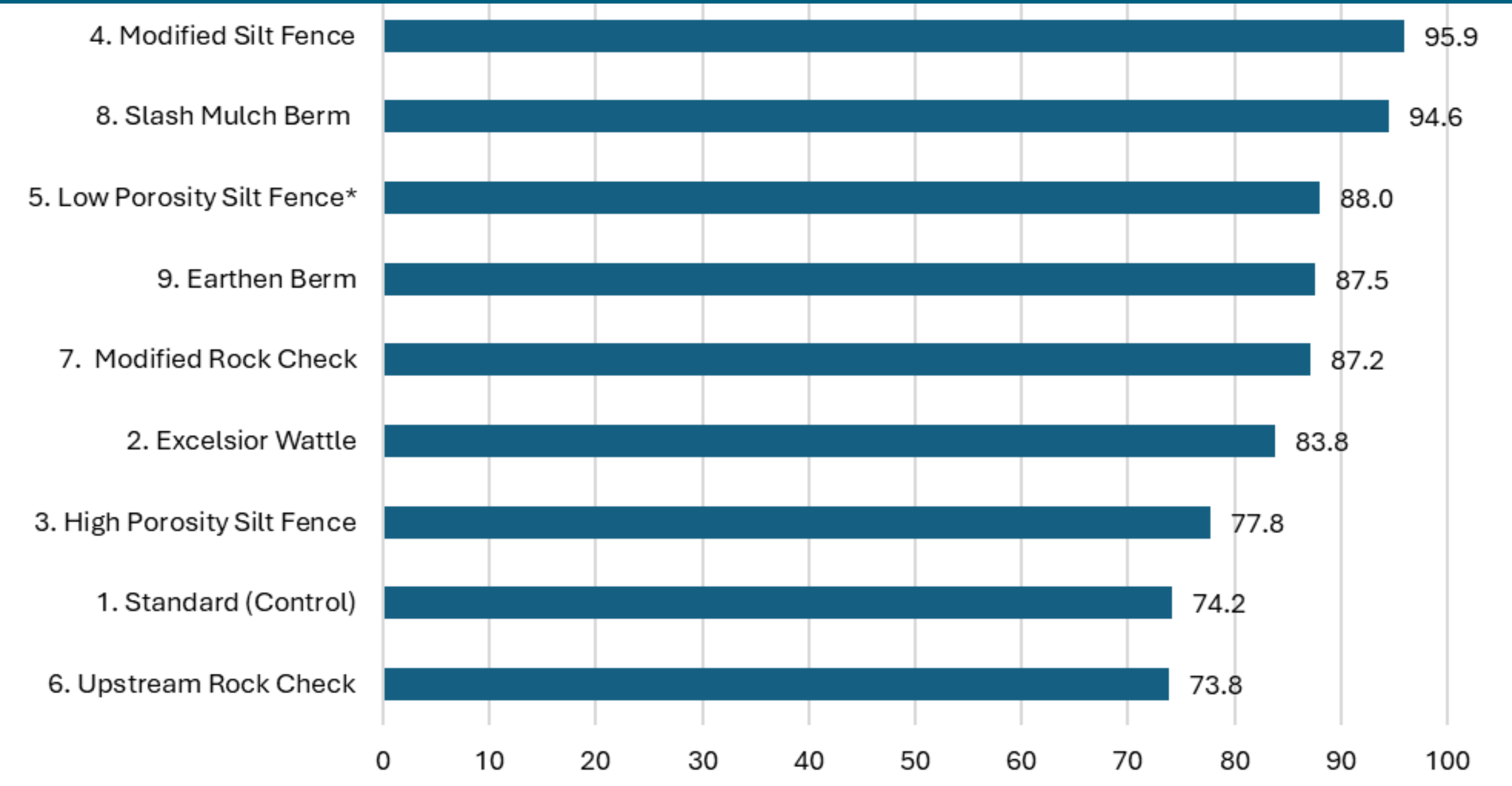
UPSTREAM ROCK CHECK

MODIFIED ROCK CHECK

SLASH MULCH BERM

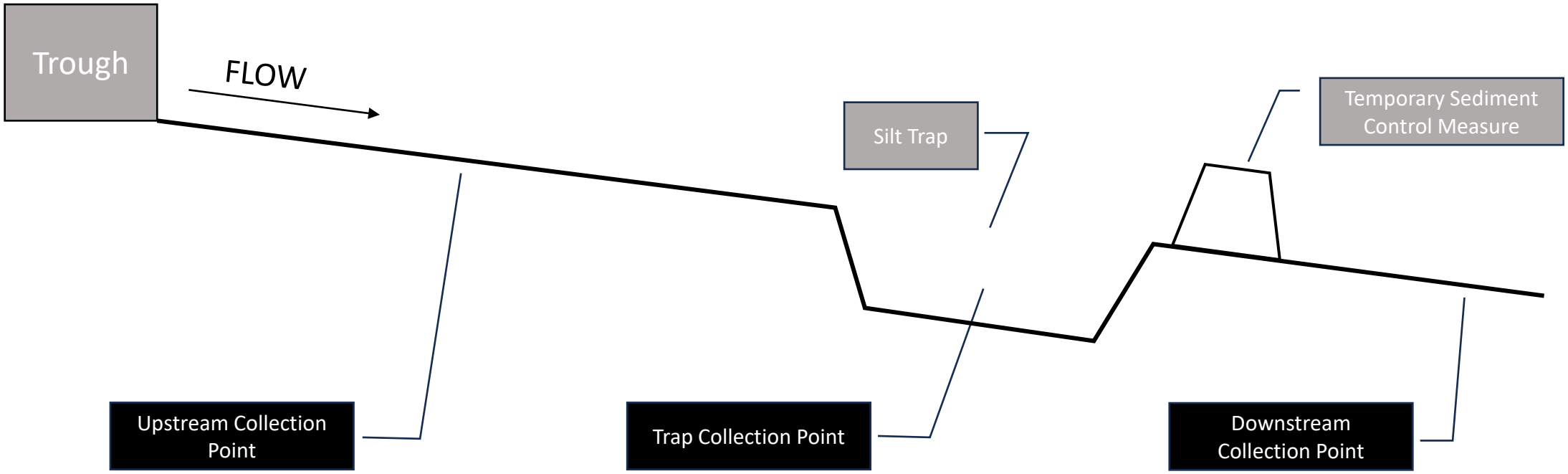
EARTHEN BERM

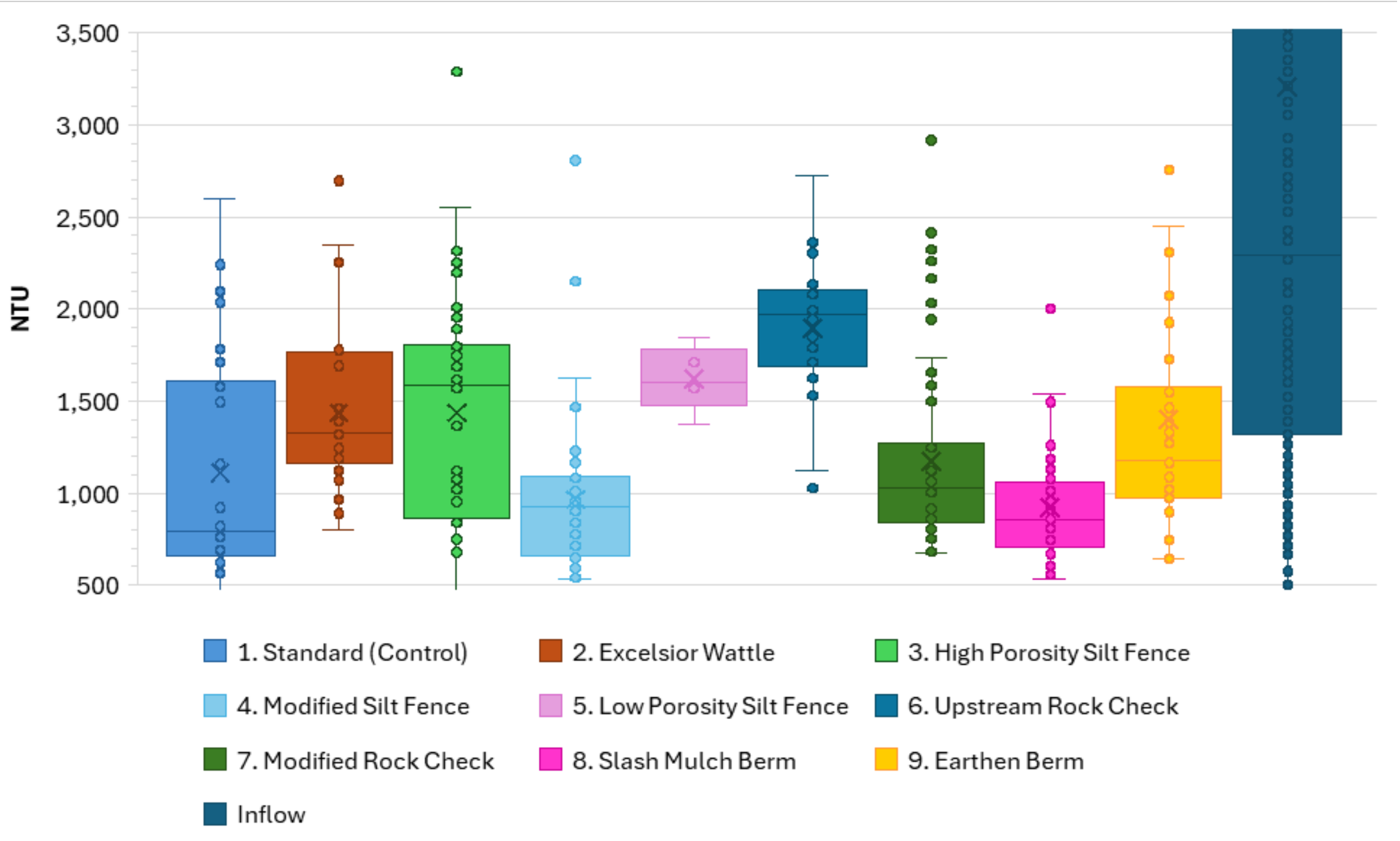
% SEDIMENT CAPTURE

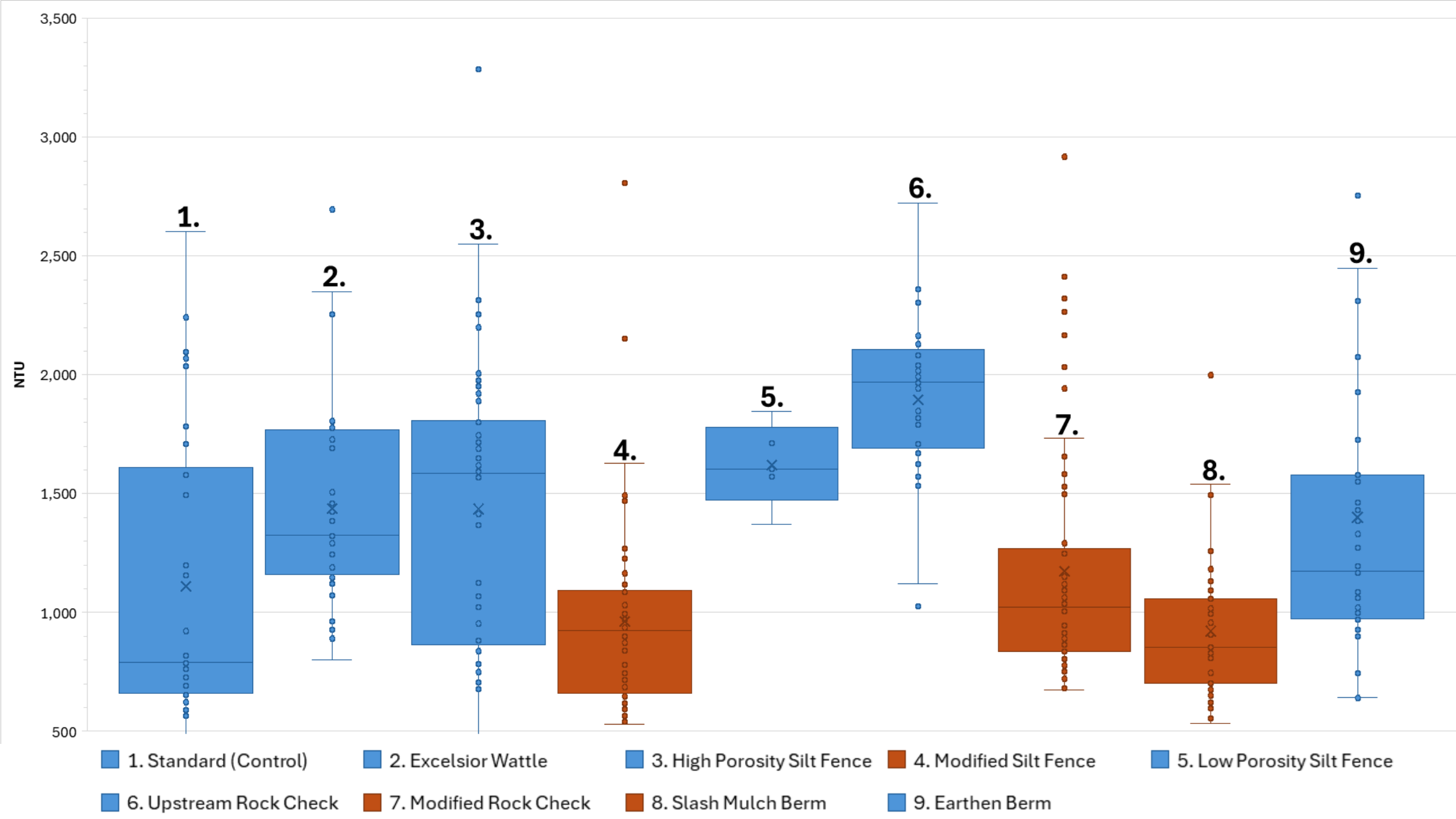


DATA ANALYSIS

Data Collection Locations for a Silt Trap




NTU
3,500
3,000
2,500
2,000
1,500
1,000
500
1. Standard (Control)
2. Excelsior Wattle
3. High Porosity Silt Fence
4. Modified Silt Fence
5. Low Porosity Silt Fence
6. Upstream Rock Check
7. Modified Rock Check
8. Slash Mulch Berm
9. Earthen Berm
Inflow


NTU
3,500
3,000
2,500
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500
1.
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9.
1. Standard (Control)
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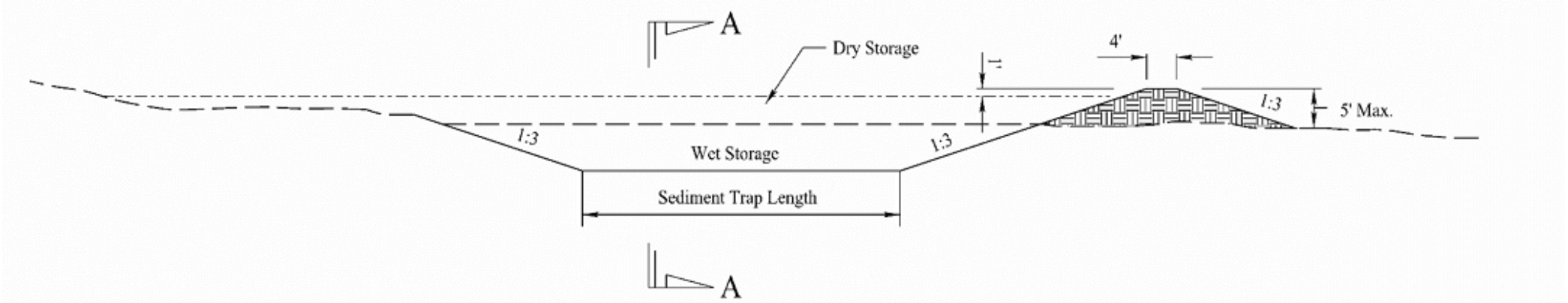
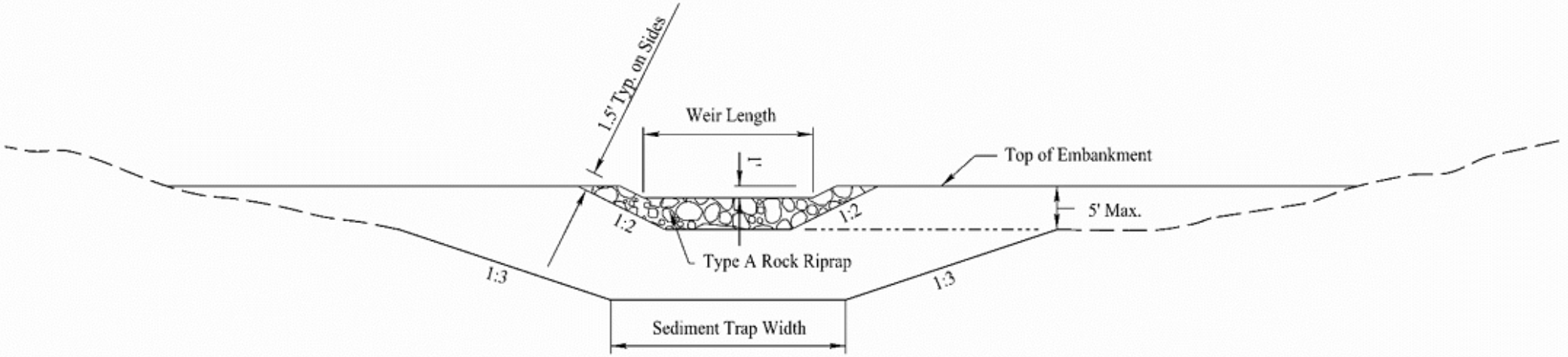
SEDIMENT TRAP



SEDIMENT TRAP

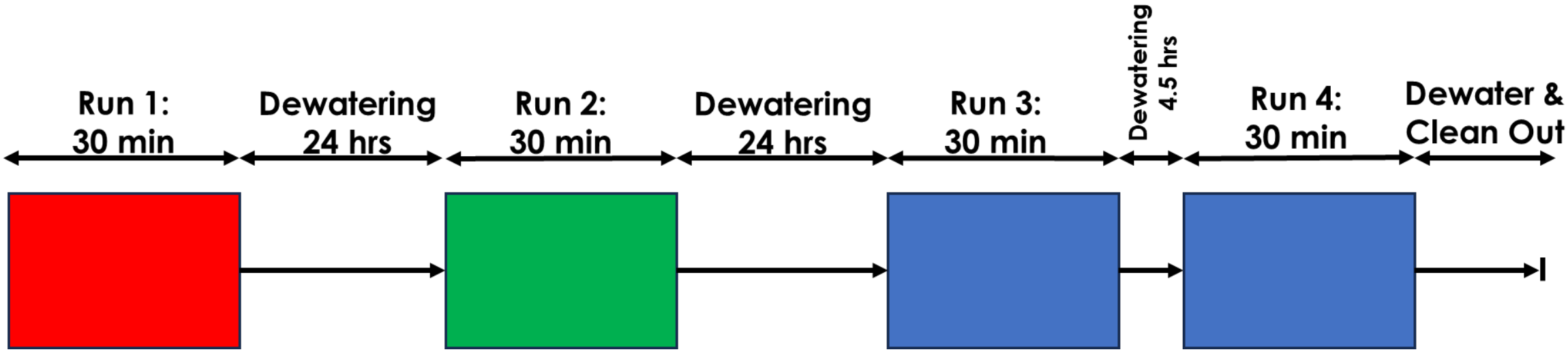


SECTION A-A
(Showing Outlet)

DRAWING NOT TO SCALE

SEDIMENT TRAP FULL-SCALE TESTING

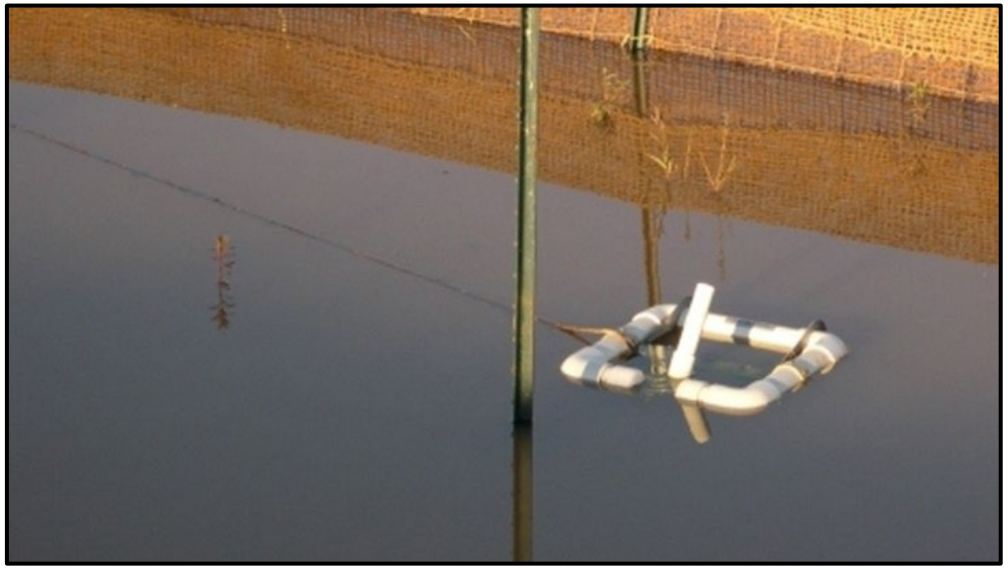
- standard installations tested with back-to-back simulated runoff events to simulate filling & dewatering



- Results of standard testing will lead to development of modifications
- Develop and test Most Feasible and Effective – Installation (MFE-I)

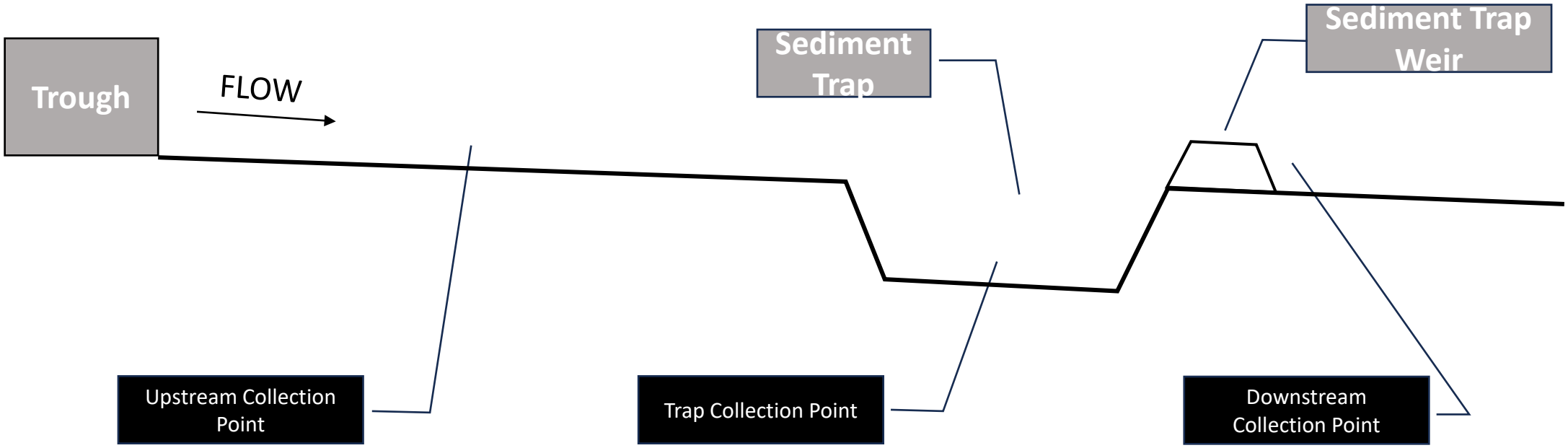
SEDIMENT TRAP TESTING PLAN

1. NE Standard Installation
2. Baffles to dissipate flow energy
3. Surface skimmer for dewatering
4. MFE-I
5. Combination of Silt Trap MFE-I & Sediment Trap MFE-I



DATA ANALYSIS

Data Collection Locations for a Sediment Trap



SEDIMENT TRAP STANDARD

SEDIMENT TRAP STANDARD

24 HOURS AFTER TEST

SEDIMENT TRAP WITH BAFFLES

SEDIMENT TRAP WITH BAFFLES

PROJECT SCHEDULE

Tasks	Description	Year 1					Year 2		
		QTR 1 Jul-Sep	QTR 2 Oct-Dec	QTR 3 Jan-Mar	QTR 4 Apr-Jun	QTR 5 Jul-Sep	QTR 6 Oct-Dec	QTR 7 Jan-Mar	QTR 8 Apr-May
1	Kickoff Meeting								
2	Literature Review								
3	Design Experimental Detention Measures and Develop Full-Scale Testing Methodology								
4	Construction of Experimental Detention Measures								
5	Conduct Full-Scale Testing								
6	Data Analysis								
7	Final Report								

Improving Rock Check Dams Through Full-Scale Testing

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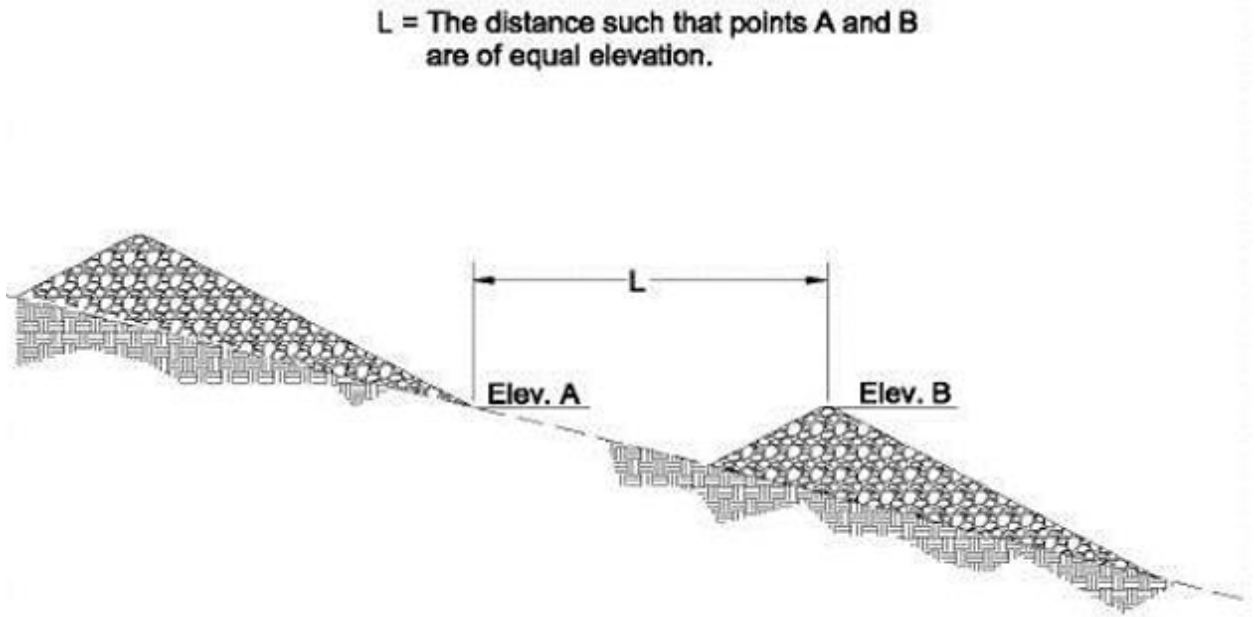
IOWA DOT

BACKGROUND

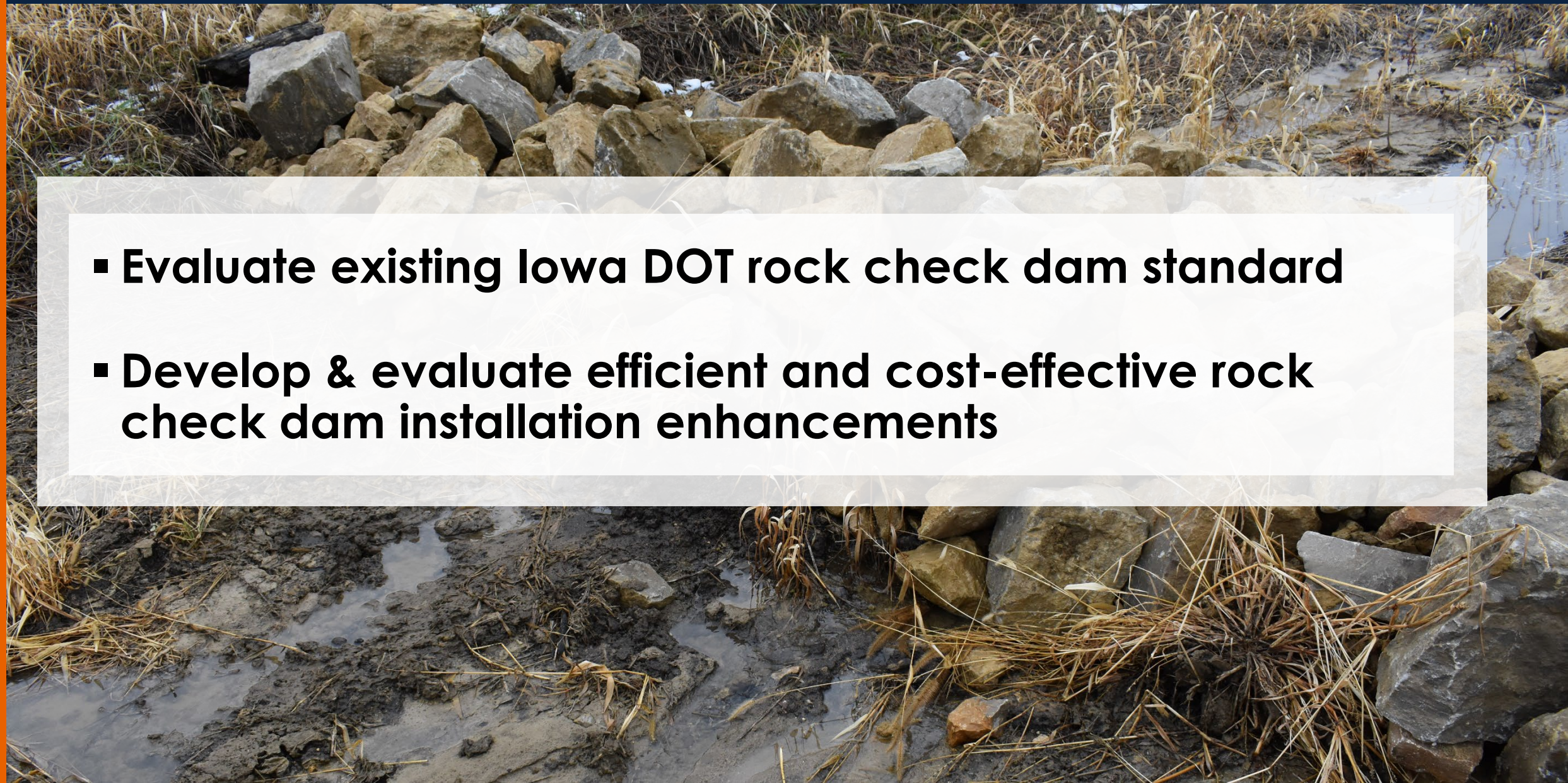
- Ditch checks used to pool flow and slow velocity
  - Converts erosive super critical flow into sub-critical
  - Erosion and sediment control
- Common ditch check practices:
  - Wattles
  - Silt fence
  - Rock check dams
- Rock check dams offer advantages such as being able to withstand high flows

BACKGROUND



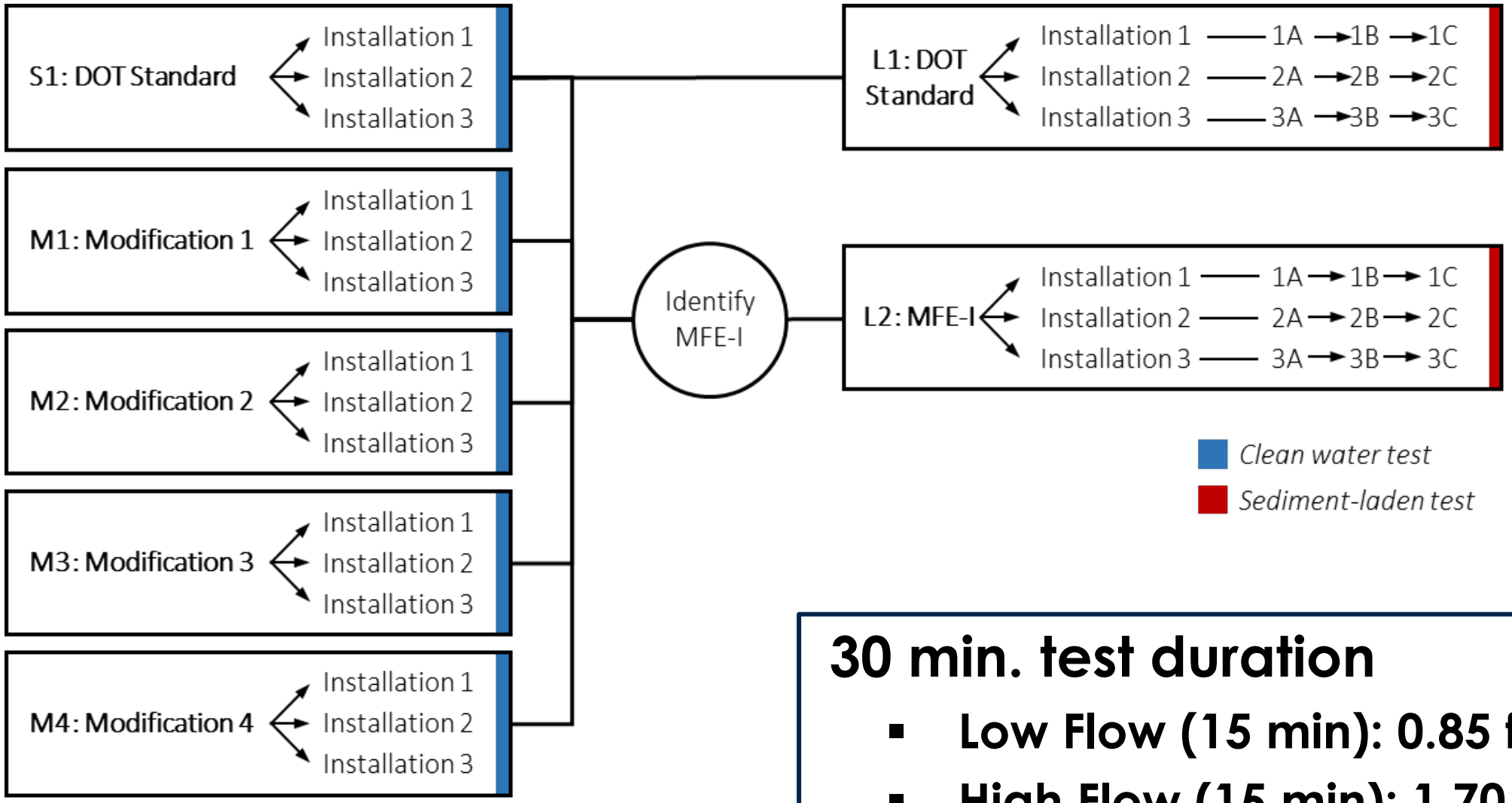
- Spacing guidance based on theoretical ponding length
  - Top of downstream practice at same elevation of bottom of upstream practice
- In practice, many ditch checks do not reach the theoretical impoundment length
  - Leaves portions of the channel unprotected from erosive flows

RESEARCH OBJECTIVES



- Evaluate existing Iowa DOT rock check dam standard
- Develop & evaluate efficient and cost-effective rock check dam installation enhancements

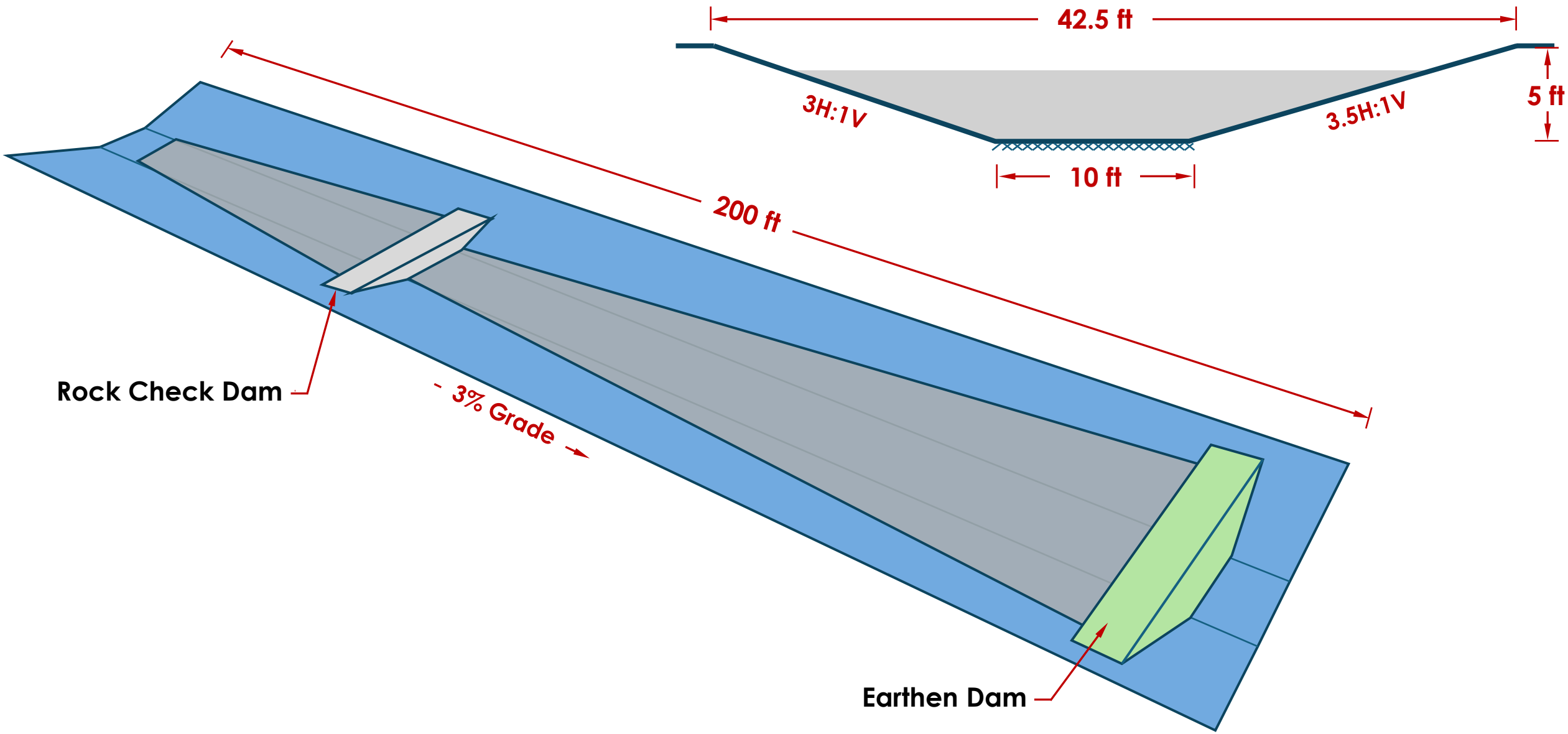
TESTING REGIME



30 min. test duration

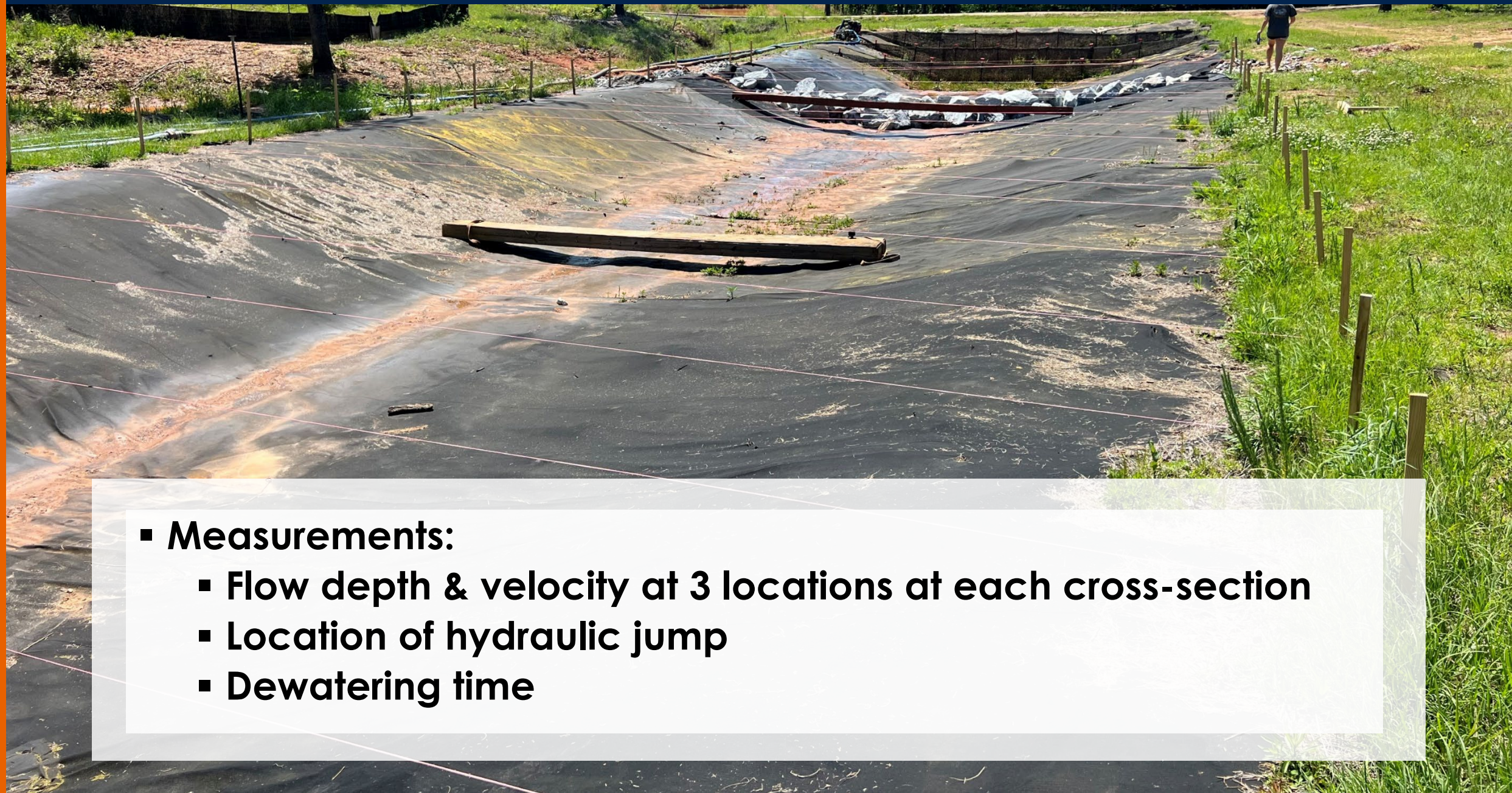
- **Low Flow (15 min): 0.85 ft^3/s**
- **High Flow (15 min): 1.70 ft^3/s**

CHANNEL DESIGN



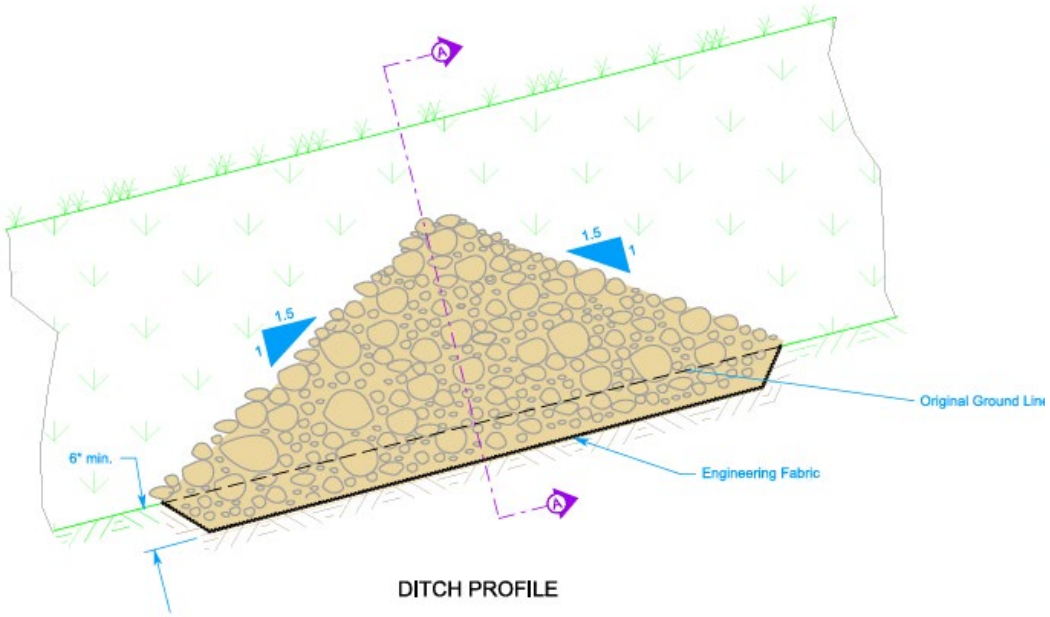
TEST APPARATUS

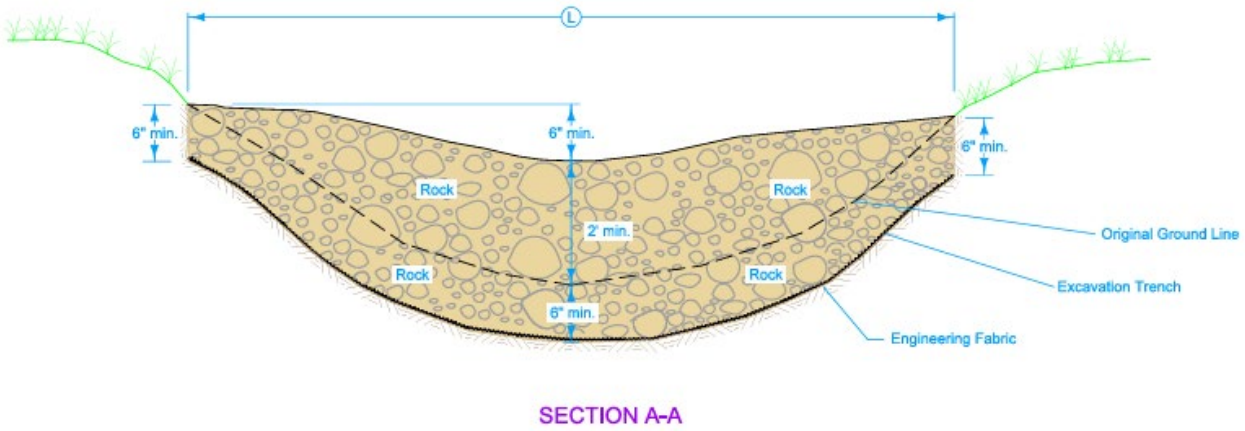
HYDRAULIC TESTING



- Measurements:
  - Flow depth & velocity at 3 locations at each cross-section
  - Location of hydraulic jump
  - Dewatering time

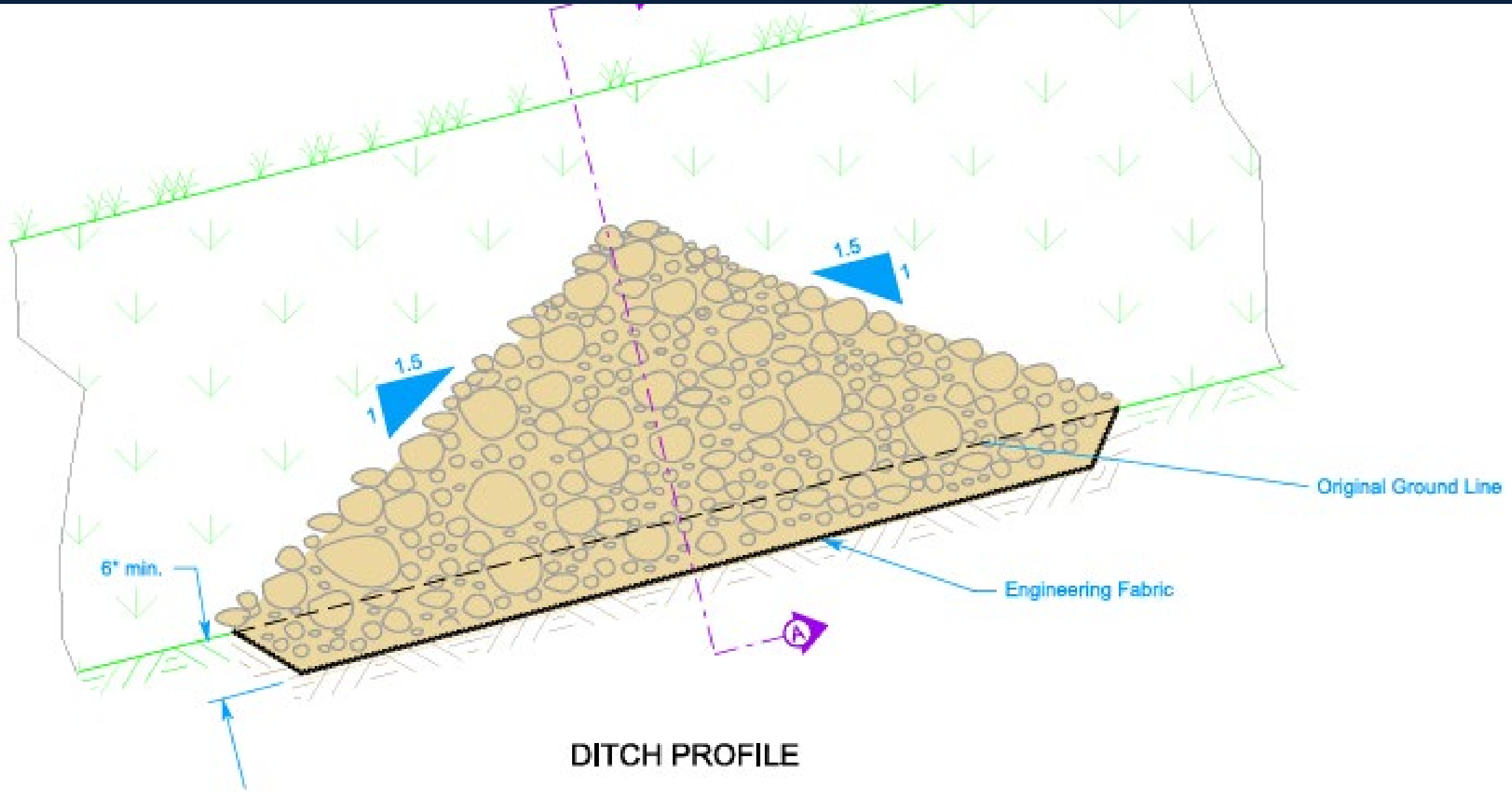
IOWA DOT STANDARD INSTALLATION





- Class D Revetment
  - Top size of 250 lbs | Min. 50% over 90 lbs | Min. 90% over 5 lbs
- Geotextile underlay
- No overlay or choker stone

IOWA DOT STANDARD INSTALLATION

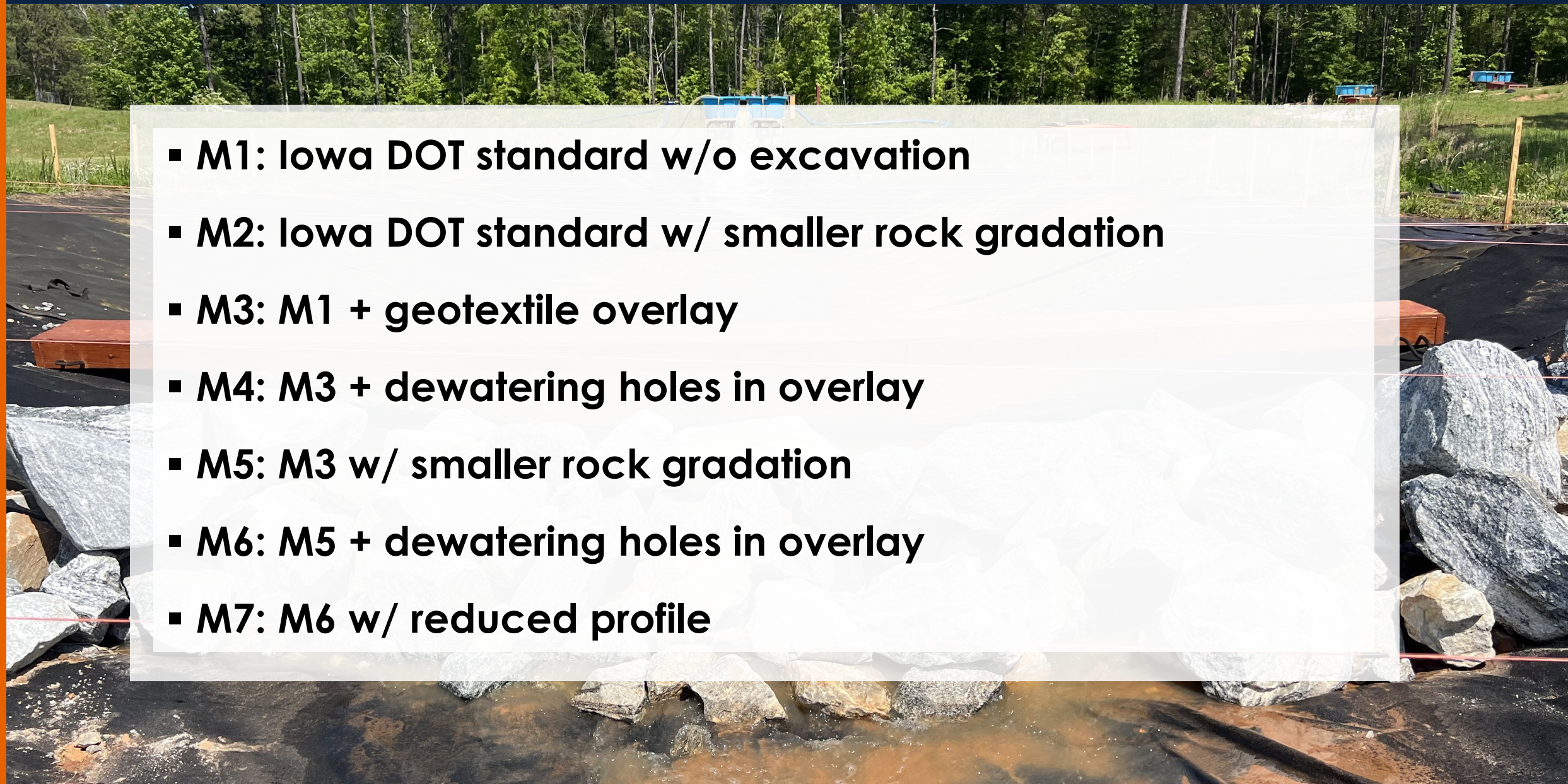


DITCH PROFILE

EVALUATED INSTALLATIONS

- Iowa DOT standard installation
- 7 modified installations w/ adjusted components
  - Removal of excavation
  - Smaller gradation of rock
  - Geotextile overlay
  - Dewatering holes in geotextile overlay
  - Reduced bottom width perpendicular to flow

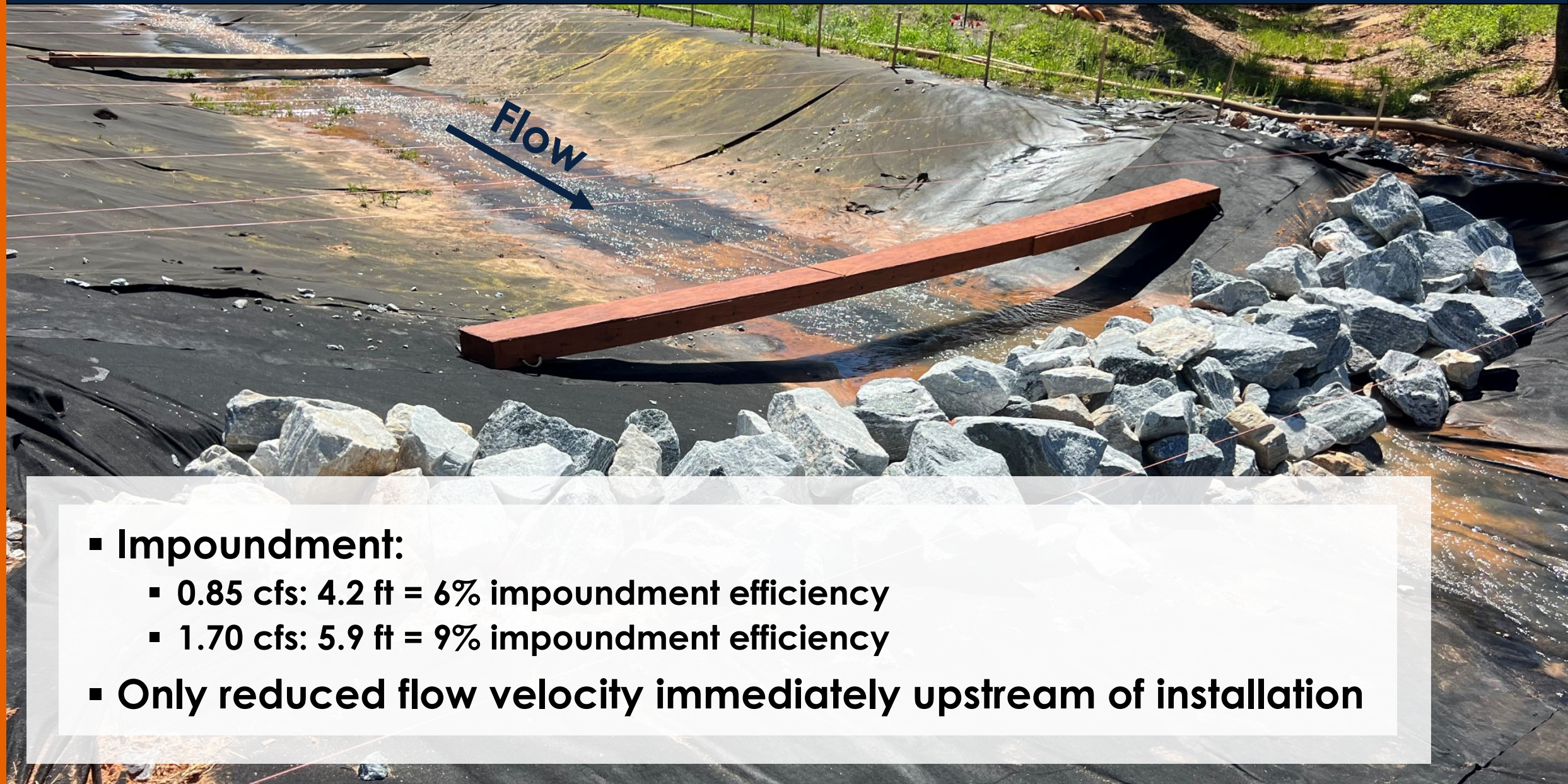
EVALUATED MODIFICATIONS



- M1: Iowa DOT standard w/o excavation
- M2: Iowa DOT standard w/ smaller rock gradation
- M3: M1 + geotextile overlay
- M4: M3 + dewatering holes in overlay
- M5: M3 w/ smaller rock gradation
- M6: M5 + dewatering holes in overlay
- M7: M6 w/ reduced profile

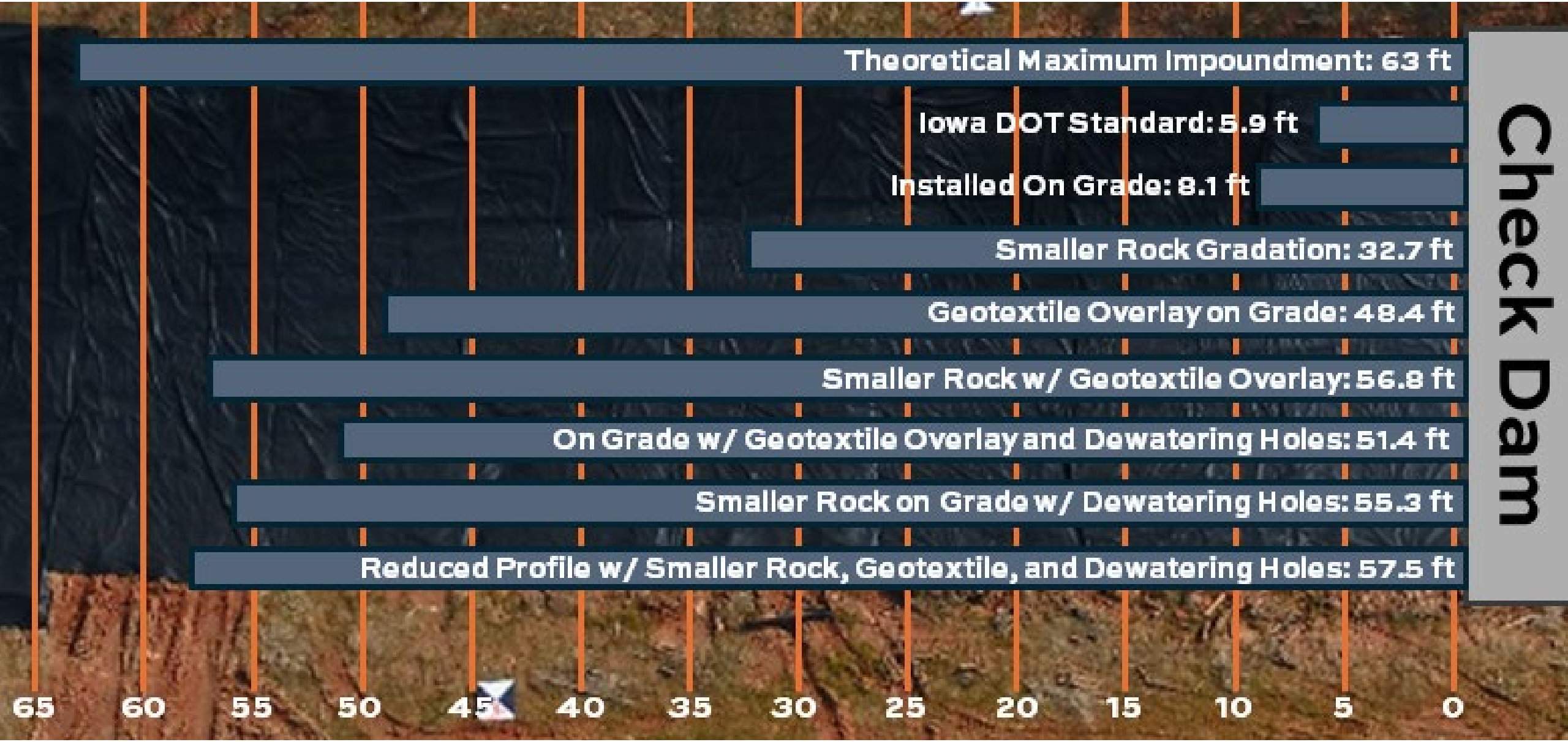
Hydraulic Testing Results

STANDARD INSTALLATION



- Impoundment:
  - 0.85 cfs: 4.2 ft = 6% impoundment efficiency
  - 1.70 cfs: 5.9 ft = 9% impoundment efficiency
- Only reduced flow velocity immediately upstream of installation

PERFORMANCE COMPARISON



INSTALLATION COMPARISON: 1.70 FT^3/S

Installation	Modification(s)	Avg. Impoundment Length (ft)	Max. Impoundment Depth (ft)	Impoundment Length Efficiency (%)	Cross-sections w/ sub-critical flow	Approximate Material Cost
Standard	-	5.9	0.6	9%	1	$673
M1	Installed on Grade	8.1	0.64	13%	1	$424
M2	Smaller Rock Gradation	32.7	1.05	52%	4	$539
M3	Geotextile Overlay	48.4	1.99	77%	12	$516
M4	Dewatering Holes	51.4	2.09	82%	11	$516
M5	Smaller Rock w/ Overlay	56.8	1.85	90%	11	$433
M6	Smaller Rock w/ Dewatering Holes	55.3	1.83	88%	12	$433
M7	M6 w/ Reduced Profile	57.5	1.85	90%	12	$304

HYDRAULIC TESTING CONCLUSIONS

- Excavation beneath installation provides little benefit while increasing cost
- Smaller Iowa DOT erosion stone outperforms standard Class D Revetment
- Addition of a geotextile overlay is vital to ensure installation impound flow and protect channels from erosion
- Dewatering holes in geotextile overlays reduce dewatering times without adversely impacting performance
- Reducing the width of installation can reduce material cost without impacting performance
- Additional erosion control practices may be necessary if the soil of the channel is particularly erosive
- Highest-performing rock check dams did not protect the entire channel from erosive flows

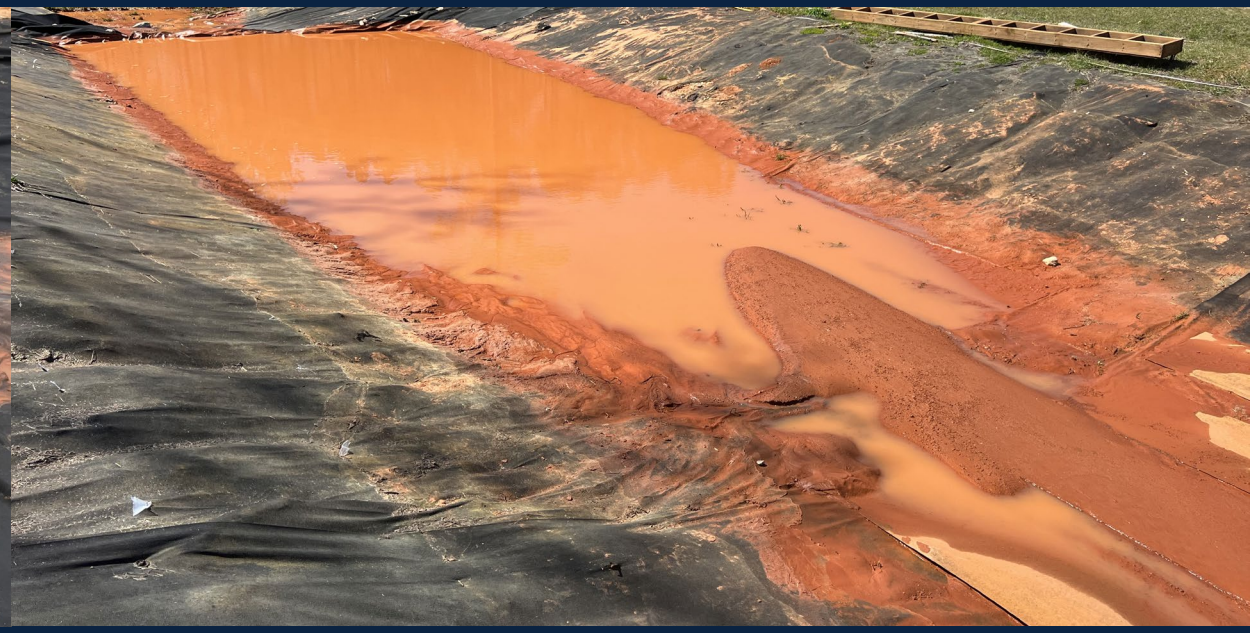
HYDRAULIC TESTING CONCLUSIONS

Installation with no excavation, smaller Iowa DOT erosion stone, geotextile overlay with dewatering holes, & a reduced width was chosen as the MFE-I

Sediment Retention Testing Results

SEDIMENT-LADEN TESTING

Standard

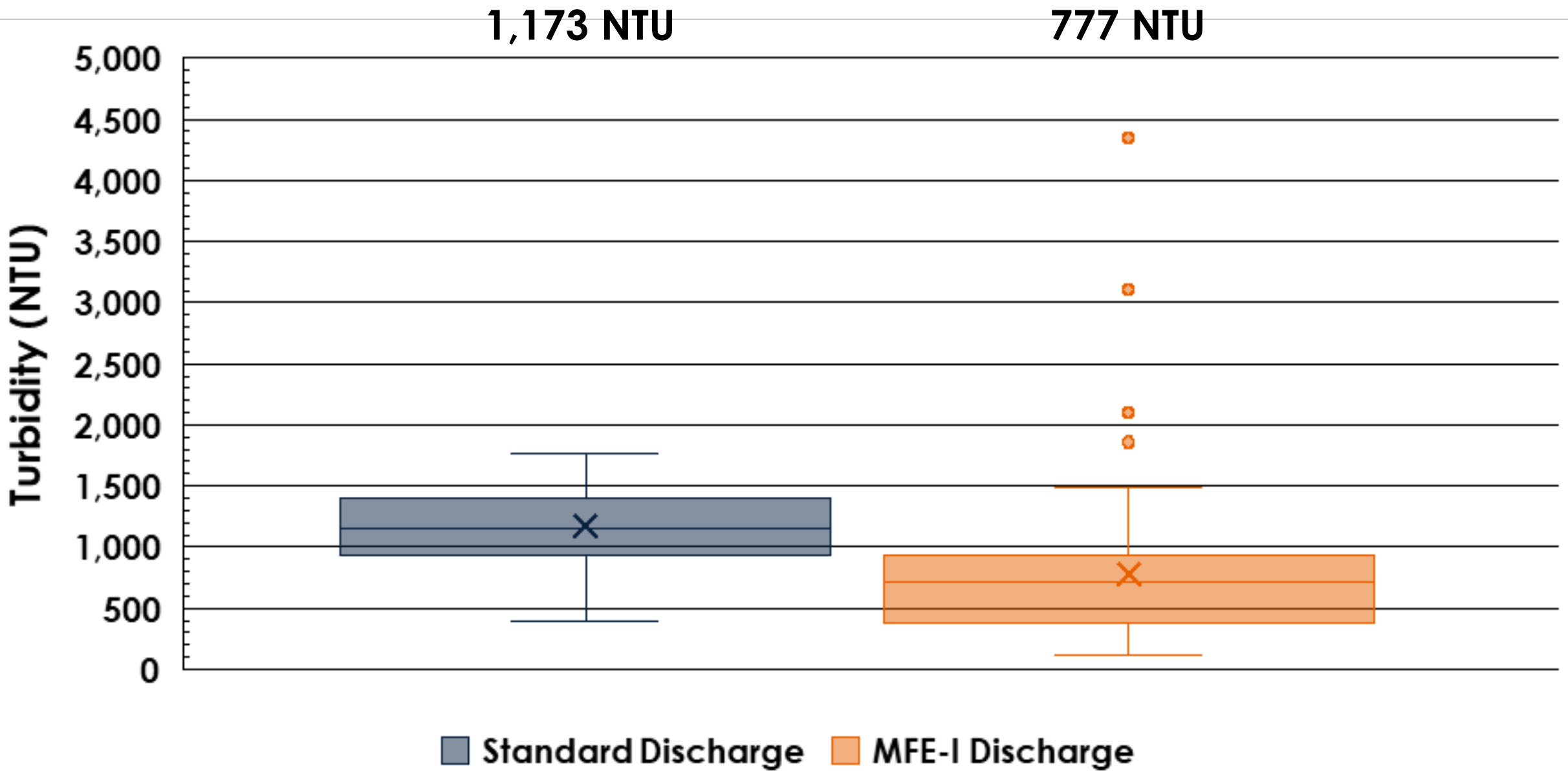


MFE-I

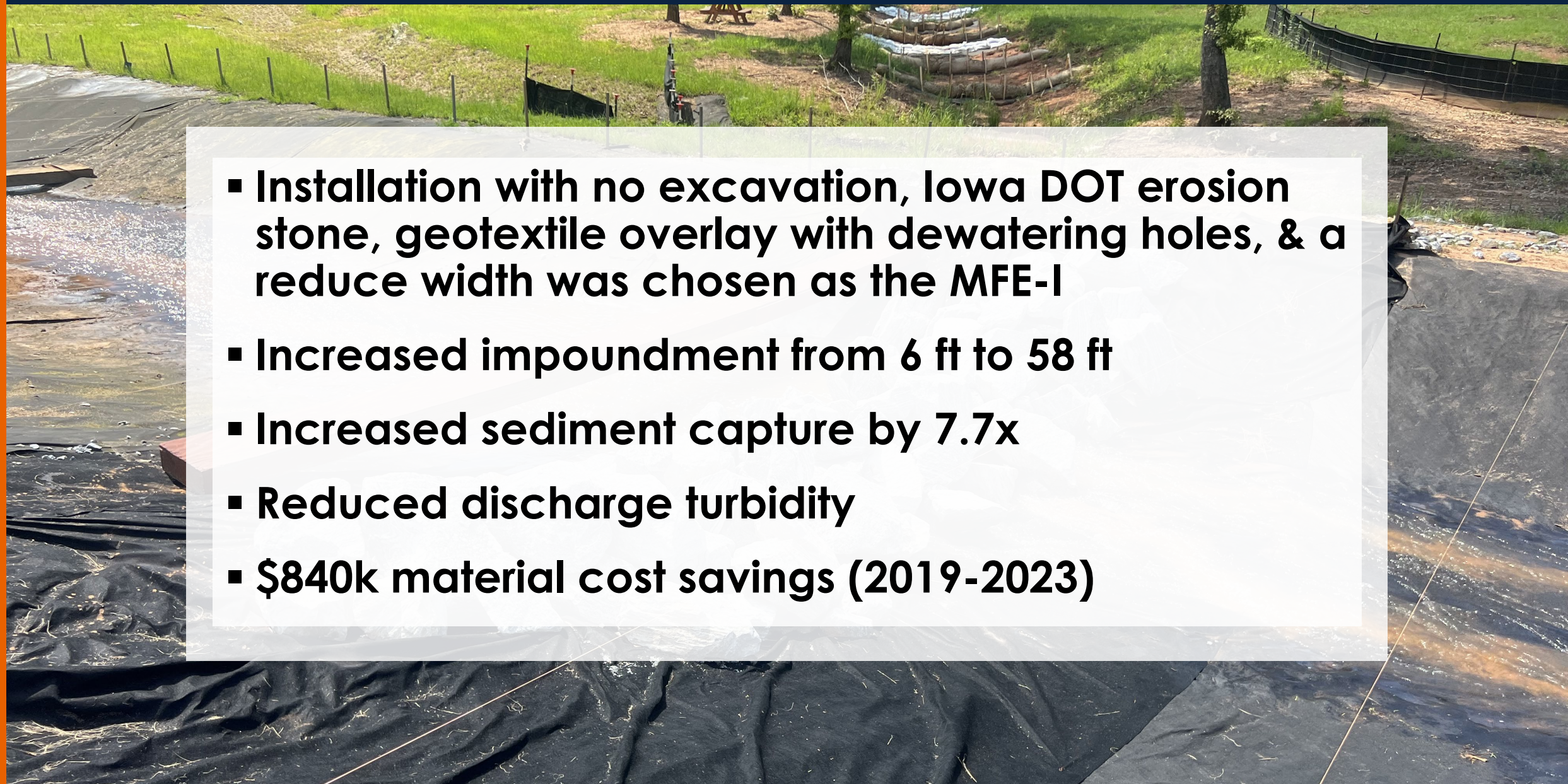
- 9.4% sediment capture
- All immediately upstream of the installation

- 72.4% sediment capture
- Visibly coarse material at the hydraulic jump

WATER QUALITY

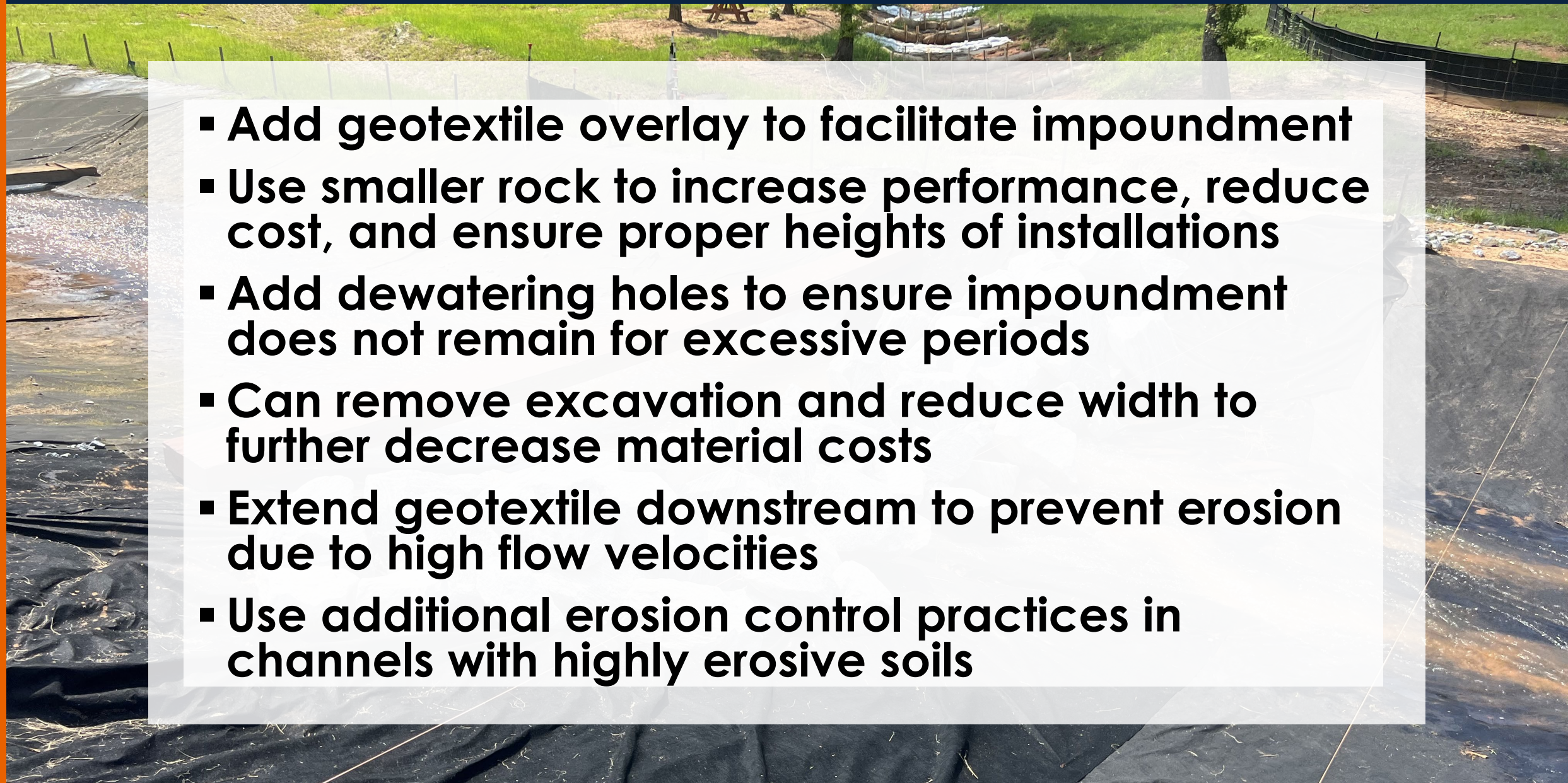


CONCLUSIONS



- Installation with no excavation, Iowa DOT erosion stone, geotextile overlay with dewatering holes, & a reduce width was chosen as the MFE-I
- Increased impoundment from 6 ft to 58 ft
- Increased sediment capture by 7.7x
- Reduced discharge turbidity
- $840k material cost savings (2019-2023)

RECOMMENDATIONS



- Add geotextile overlay to facilitate impoundment
- Use smaller rock to increase performance, reduce cost, and ensure proper heights of installations
- Add dewatering holes to ensure impoundment does not remain for excessive periods
- Can remove excavation and reduce width to further decrease material costs
- Extend geotextile downstream to prevent erosion due to high flow velocities
- Use additional erosion control practices in channels with highly erosive soils

NCHRP 24-52

GUIDELINES FOR RESILIENT E&SC PRACTICES

NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

AUBURN
STORMWATER

FAGAN
FAGAN CONSULTING LLC

RESEARCH OBJECTIVE

develop guidelines for selecting, placing, designing, & maintaining E&SC practices

- Acquire deeper insight into current & emerging techniques in designing E&SC practices
- Develop new design & installation methods & evaluate their performance against standard designs through full-scale testing
- Develop & disseminate guidelines for selecting, placing, designing, & maintaining E&SC practices

AUBURN
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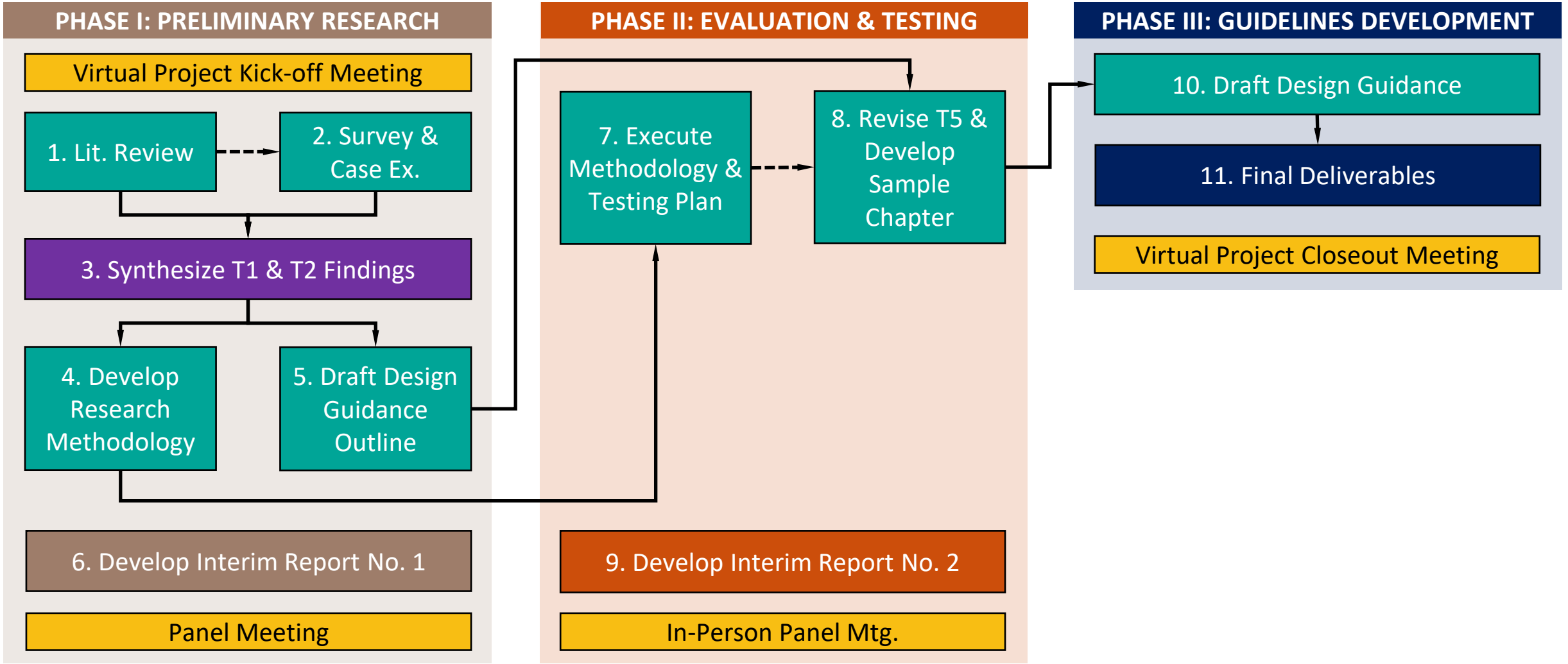
RISK: potential for an unwanted outcome resulting from an incident, event, or occurrence, as determined by its likelihood and associated consequences

- Resist hazards or withstand impacts from weather events and natural disasters
- Reduce the magnitude or duration of impacts of a disruptive weather event or natural disaster
- Have absorptive capacity, adaptive capacity, and recoverability to decrease project vulnerability to weather events or other natural disasters
- The consideration of incorporating natural infrastructure.

RESILIENCY: a system's ability to anticipate, prepare for, or adapt to conditions or withstand, respond to, or recover rapidly from disruptions with minimal or acceptable performance loss

FIVE PILLARS OF CONSTRUCTION STORMWATER MANAGEMENT

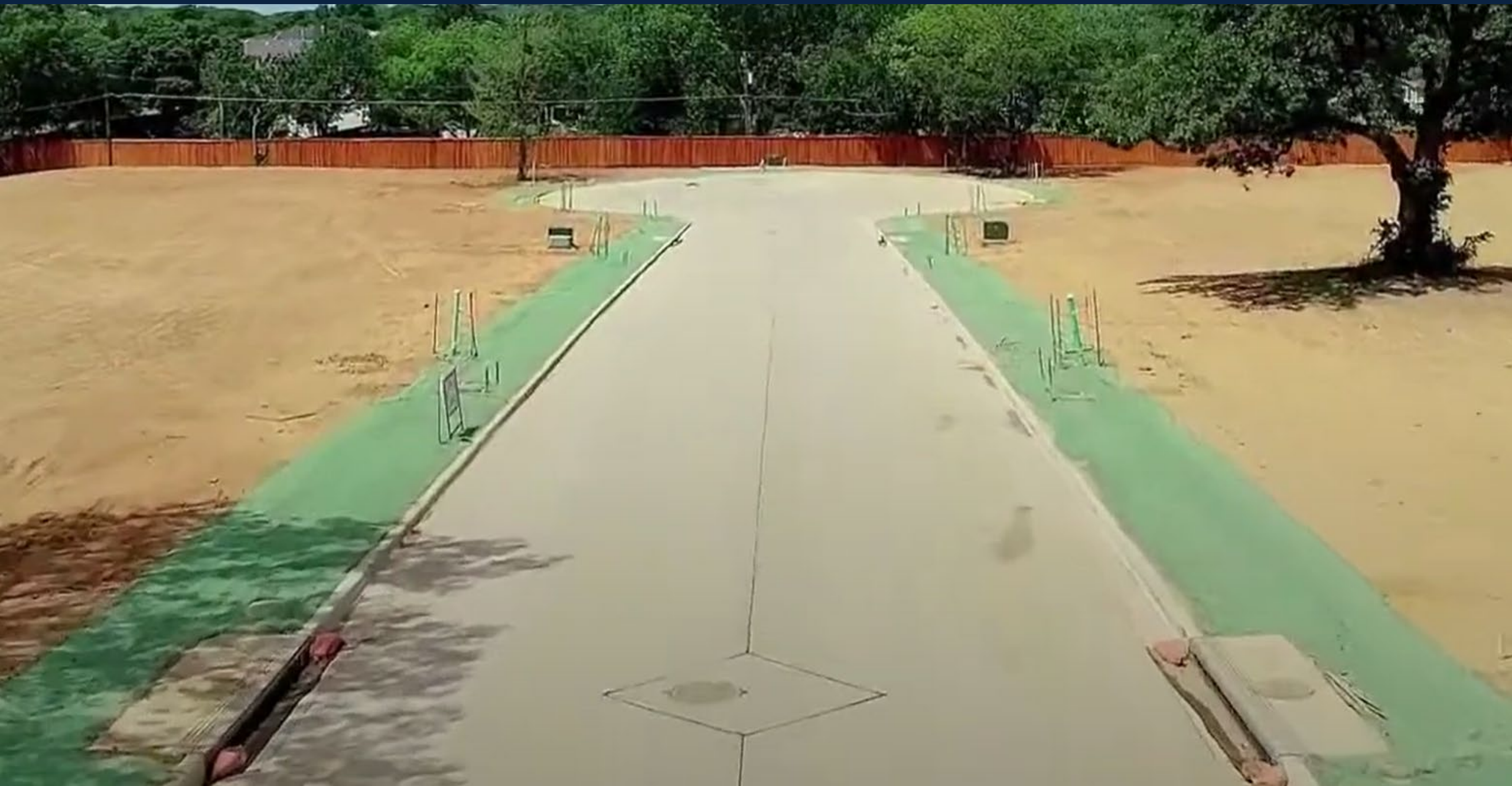
PROJECT TASKS



PROJECT #1:
PERFORMANCE OF ALTERNATIVE SEDIMENT BARRIER PRACTICES

- Growing concern with plastic-based sediment barrier practices
- Can use non-structural or more sustainable practices to aid vegetated buffers in sediment capture
  - ECBs, natural silt fence materials, etc.
  - Will identify testable materials
- Some innovative/sustainable SBs have been evaluated

CURLEX SILTTRAP (AMERICAN EXCELSIOR)



BIO SILT FENCE

BIO SILT FENCE

PROJECT #2

SLASH MULCH BERMS FOR INLET PROTECTION & DITCH CHECKS

- **Composed of shredded/chipped wood material**
- **Incorporates natural infrastructure by using a recycled waste material**
  - **Removes need for potentially plastic-based E&SC practices**

PROJECT #2

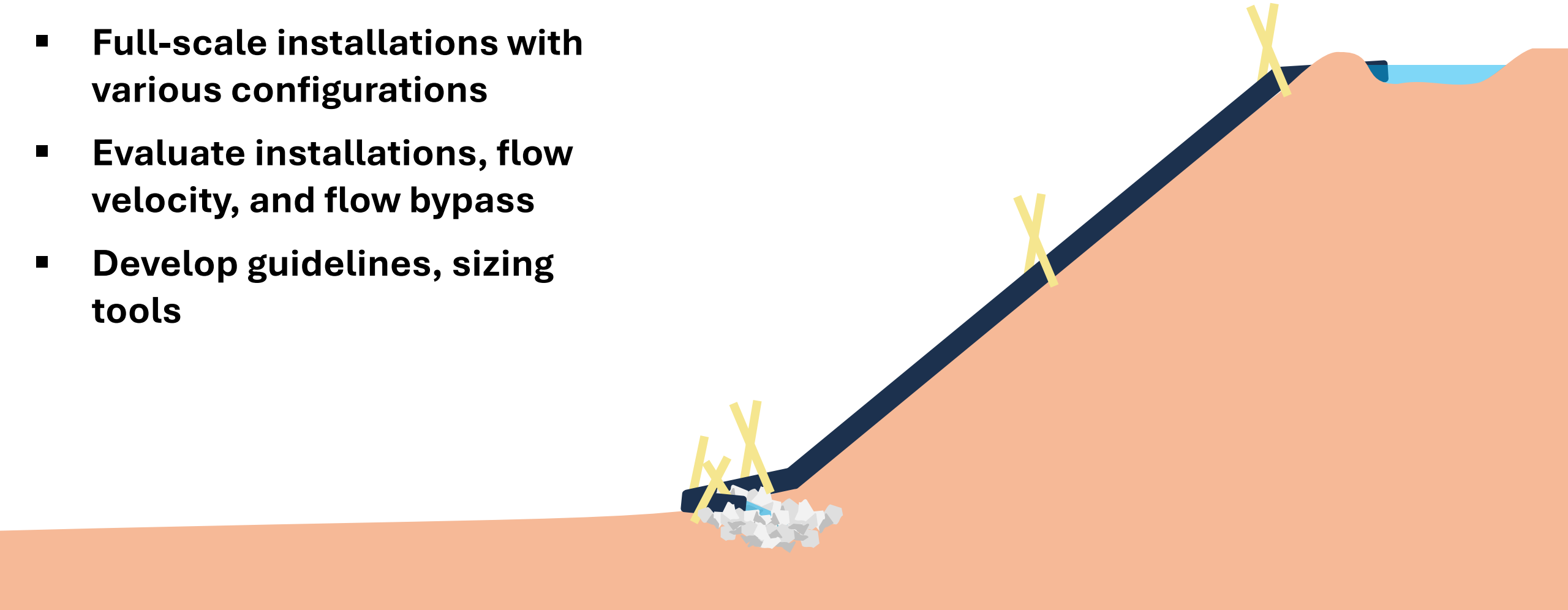
SLASH MULCH BERMS FOR INLET PROTECTION & DITCH CHECKS

- **Have shown to be effective through evaluations at the AU-SRF in sediment barrier applications**
  - **98.2% sediment capture**
- **Some agencies have specs for ditch check applications**
- **No research has been conducted in ditch check or inlet protection applications**

PROJECT #3

SLOPE DRAINS

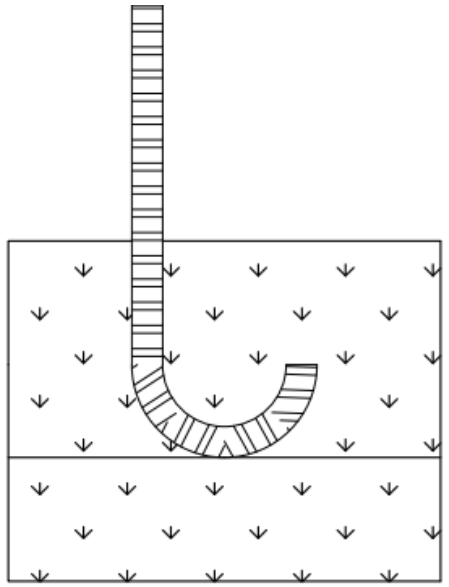
- No existing publications on slope drain performance
- Full-scale installations with various configurations
- Evaluate installations, flow velocity, and flow bypass
- Develop guidelines, sizing tools



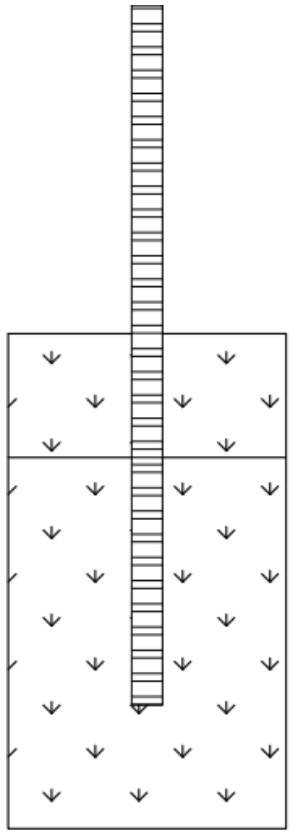
PROJECT #3

SLOPE DRAINS

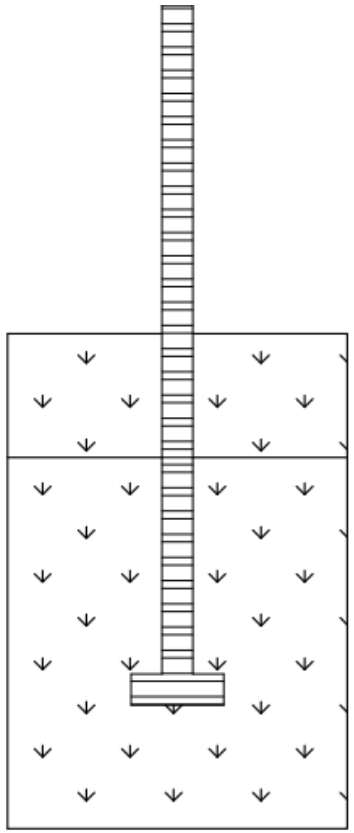
- **Testing in 2 parts: inlet and outlet treatments**
- **Evaluate slope drains of different diameters with flow rates according to calculated capacity**



J-Hook



Straight Pipe



Tee

PROJECT #4

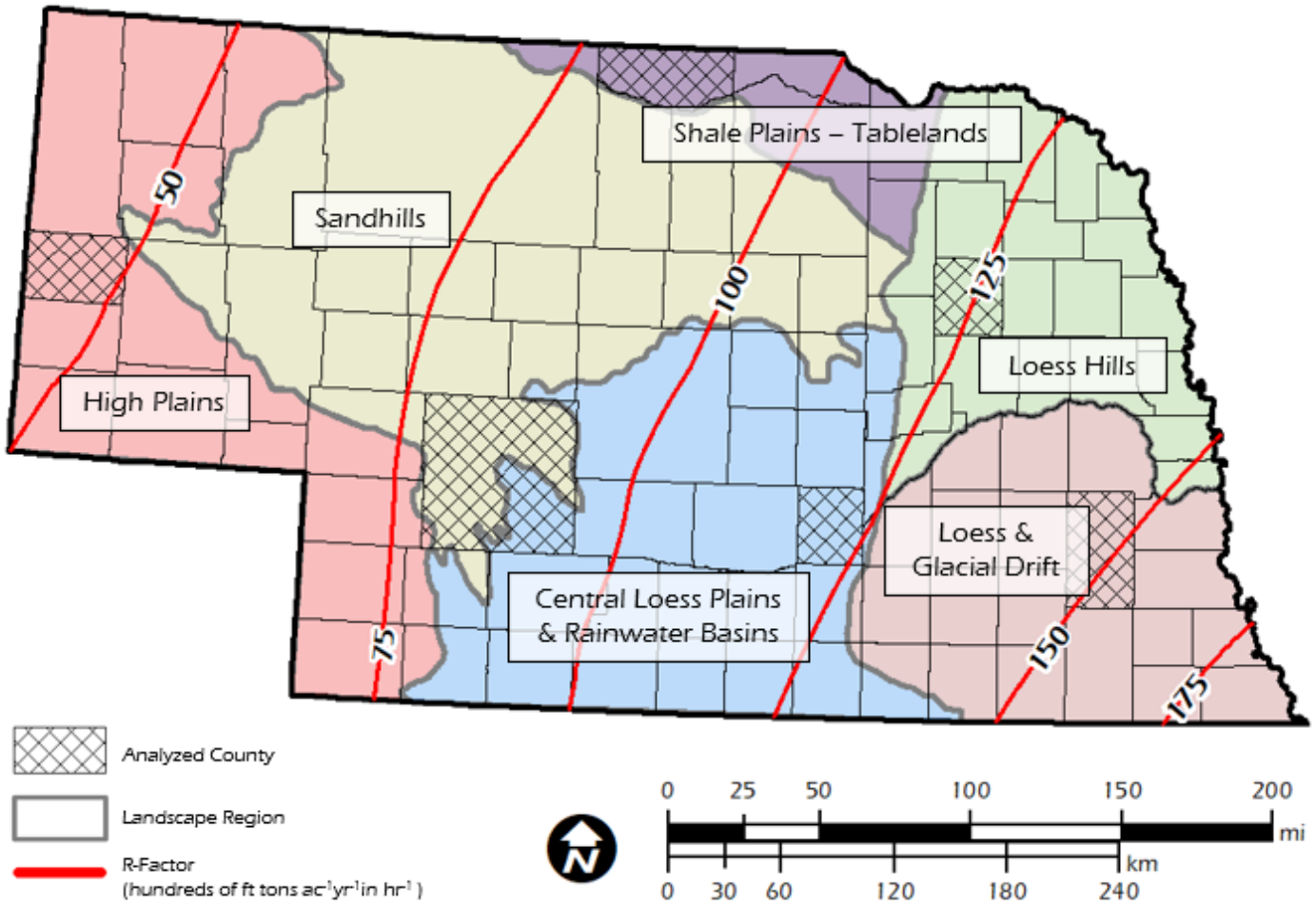
MODELING OF VEGETATED BUFFERS FOR SEDIMENT CAPTURE

- **CGP requires 50 ft buffers when within 50 ft of a WOTUS or equivalent sediment controls**
- **Lack of guidance on sediment removal capabilities**

PROJECT #4

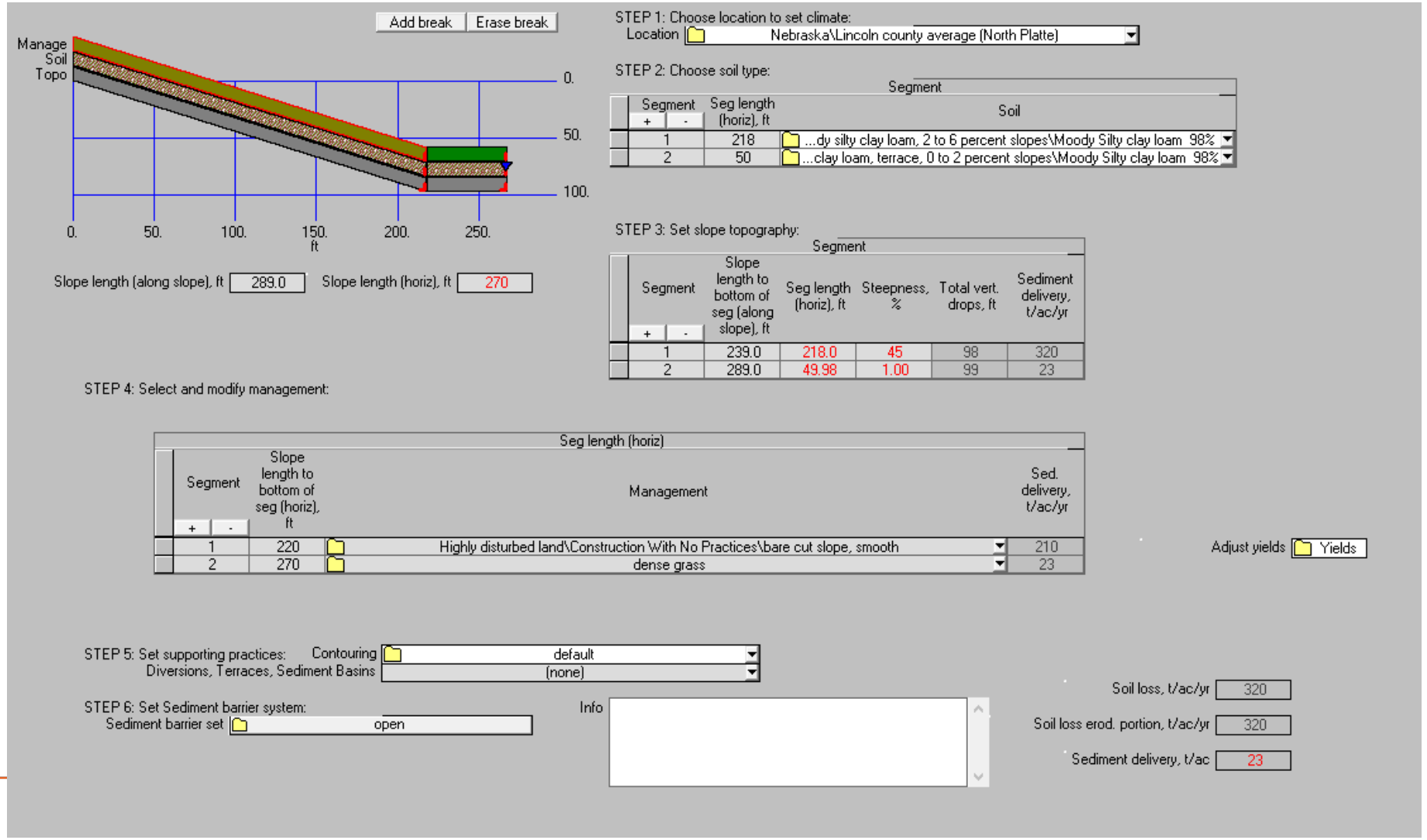
MODELING OF VEGETATED BUFFERS FOR SEDIMENT CAPTURE

- **Past testing has shown soil type, vegetation density/type, and buffer width influence sediment capture**
- **11,664 vegetated buffer configurations representative of Nebraska were modeled**
  - **Avg. sediment capture: 92.6%**



PROJECT #4
MODELING OF VEGETATED BUFFERS FOR SEDIMENT CAPTURE

- **USDA's RUSLE2**
- **Use methodology outlined in Roche et al., 2023**
- **Using factors representative of the entire U.S.**



PROJECT #5

OPTIMIZATION OF CONSTRUCTION SCHEDULING AND LIMIT/DELAYING DISTURBANCE THROUGH REGIONAL AND SEASONAL ANALYSIS

- **Maximum permissible exposed acreage may be outlined**
- **Identical acreage can have vastly different soil losses and sediment loading based on location & time of year**

INNOVATING WITH ELECTROFLOCULATION

FAGAN
FAGAN CONSULTING LLC

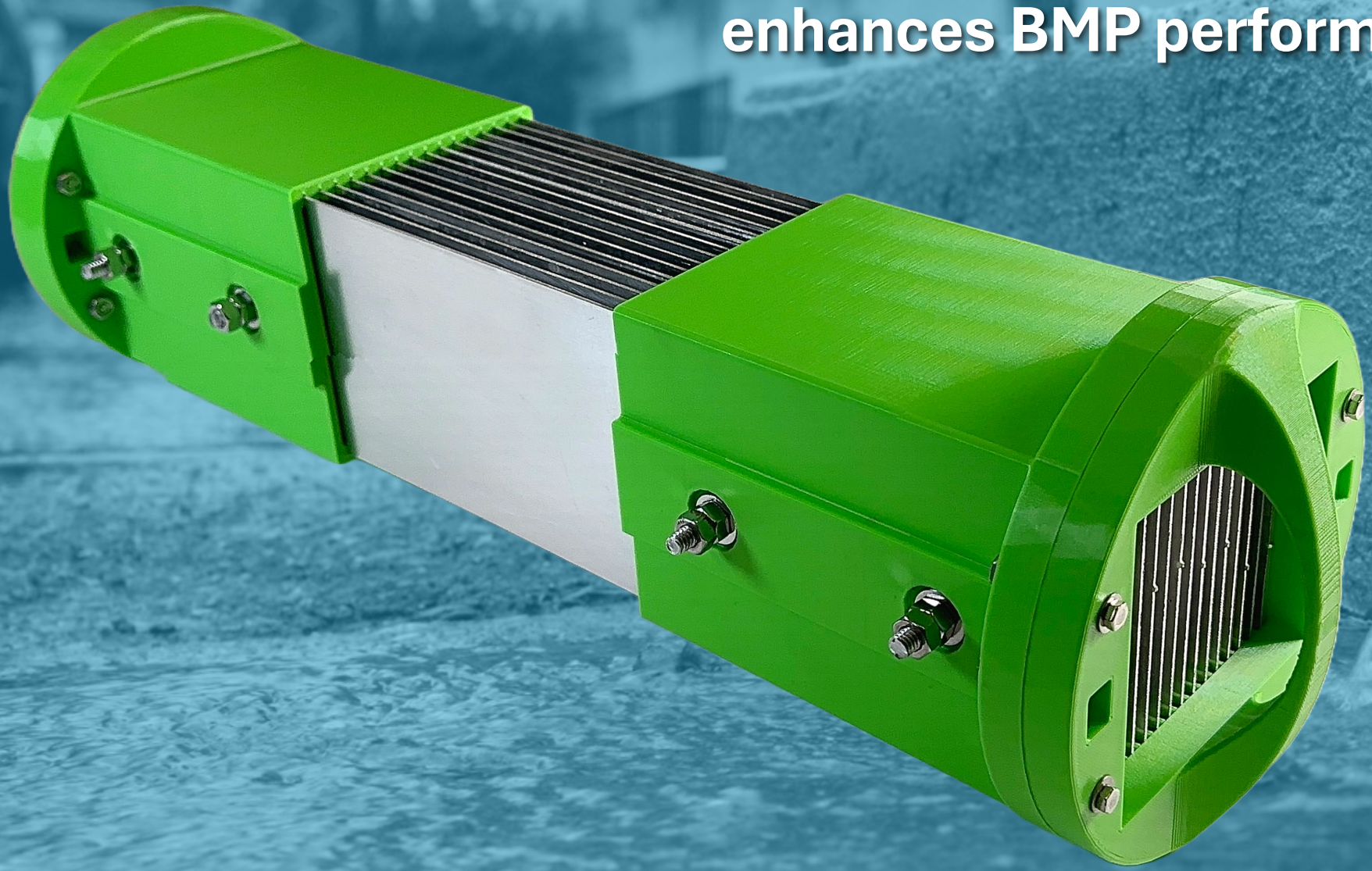
FHWA

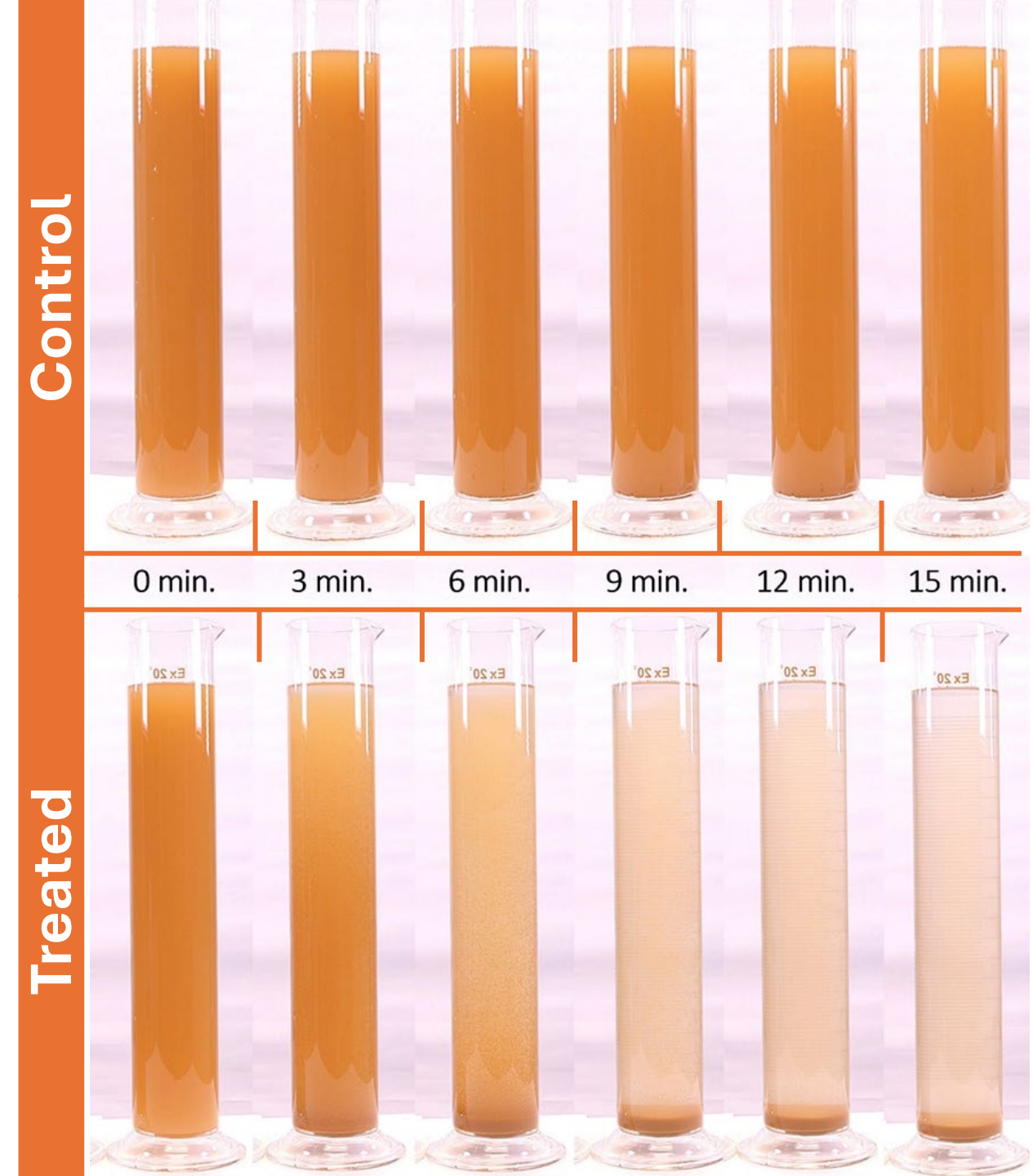
INNOVATE
ALABAMA

SBIR
America's Seed Fund

The Electric Floc Generator

enhances BMP performance by up to 90%



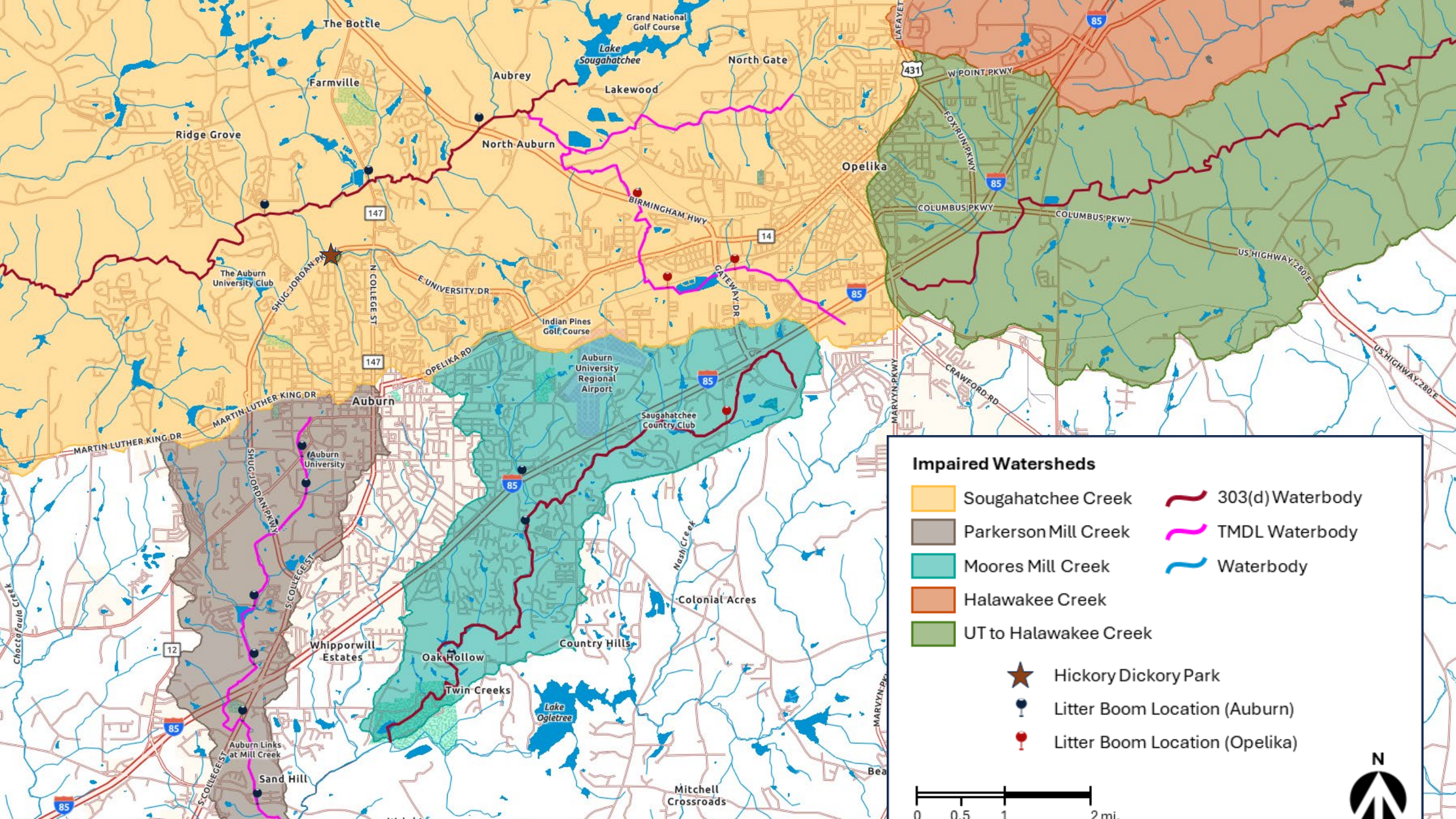

Control
Treated
0 min.
3 min.
6 min.
9 min.
12 min.
15 min.


00:03:09:19

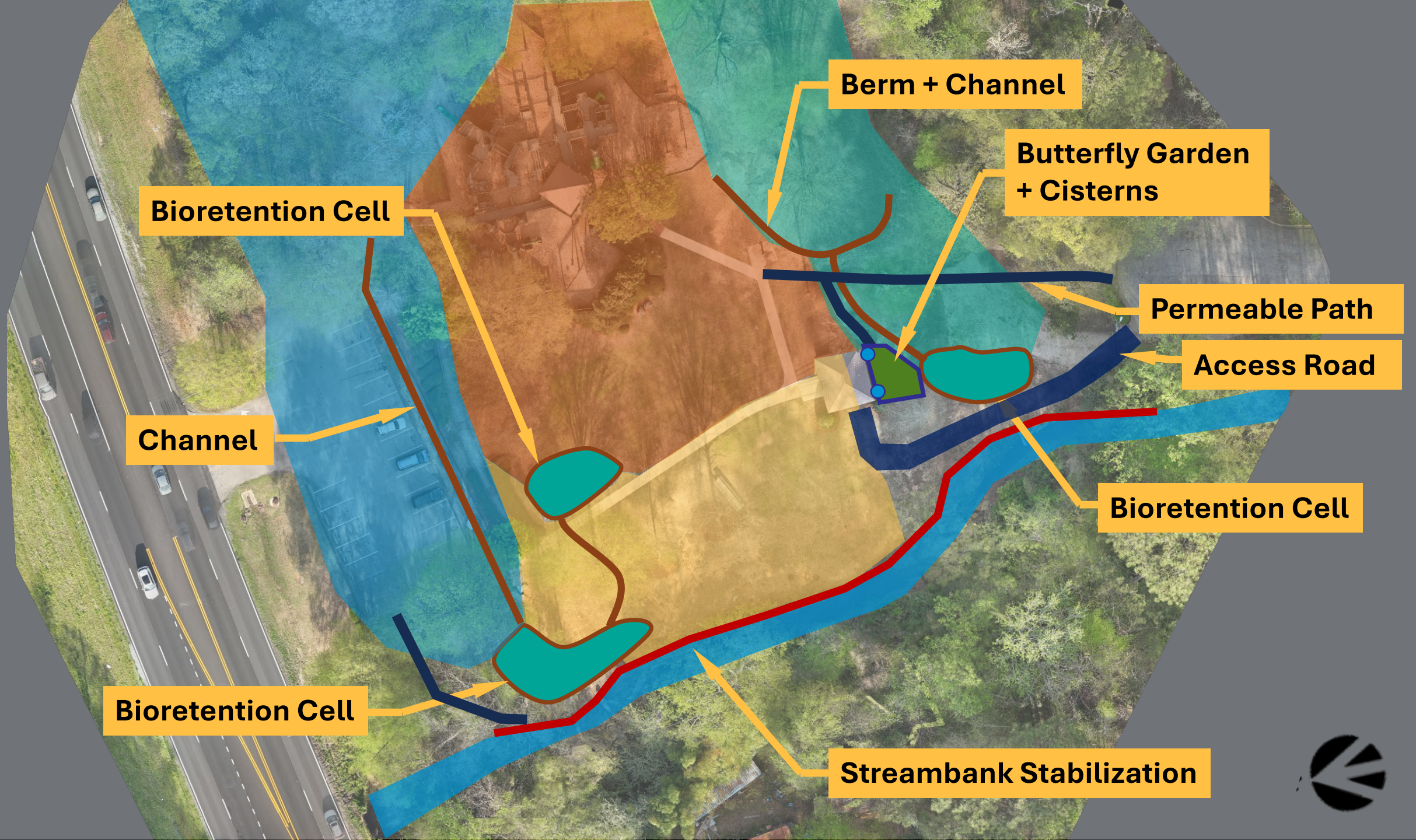
STORMWATER IMPLEMENTATION

ADEM

AUBURN STORMWATER


Impaired Watersheds
Sougahatchee Creek
Parkerson Mill Creek
Moores Mill Creek
Halawakee Creek
UT to Halawakee Creek
303(d) Waterbody
TMDL Waterbody
Waterbody
Hickory Dickory Park
Litter Boom Location (Auburn)
Litter Boom Location (Opelika)
0
0.5
1
2 mi
N
The Bottle
Grand National Golf Course
Lake Sougahatchee
Aubrey
North Gate
Lakewood
Farmville
Ridge Grove
North Auburn
Opelika
W POINT PKWY
FOX RUN PKWY
COLUMBUS PKWY
US HIGHWAY 280 E
BIRMINGHAM HWY
GATEWAY DR
E UNIVERSITY DR
N COLLEGE ST
SHUG JORDAN PKWY
The Auburn University Club
Indian Pines Golf Course
OPELIKA RD
Auburn University Regional Airport
Saugahatchee Country Club
MARTIN LUTHER KING DR
Auburn
(Auburn University
MARVYN PKWY
CRAWFORD RD
Nash Creek
Colonial Acres
Country Hills
Whipporwill Estates
Oak Hollow
Twin Creeks
Lake Ogletree
Auburn Links at Mill Creek
Sand Hill
Mitchell Crossroads
Choctafaula Creek
147
14
85
431
12

HICKORY DICKORY PARK


Berm + Channel
Butterfly Garden
+ Cisterns
Bioretention Cell
Permeable Path
Access Road
Channel
Bioretention Cell
Bioretention Cell
Streambank Stabilization


HITACHI


TACHI
CONCRETE MIX
CONCRETE MIX


TL10V2
TAKEUCHI
800-UR-RENTS

Part Shade BRC 3 - Plants to Order: 216

X	Scientific Name	Common Name	Count
Vn	*Viburnum nudum*	Possumhaw Viburnum / Smooth Witherod	2
I.ve	*Ilex verticillata*	Winterberry Holly	2
I.vi	*Itea virginica*	Virginia Sweetspire	3
Cf	*Calycanthus floridus*	Sweetshrub / Carolina Allspice	1
Po	*Physocarpus opulifolius*	Ninebark	3
Hd	*Hypericum densiflorum*	Bushy St. John's Wort	3
Cg	*Clinopodium georgianum*	Georgia Calamint	11

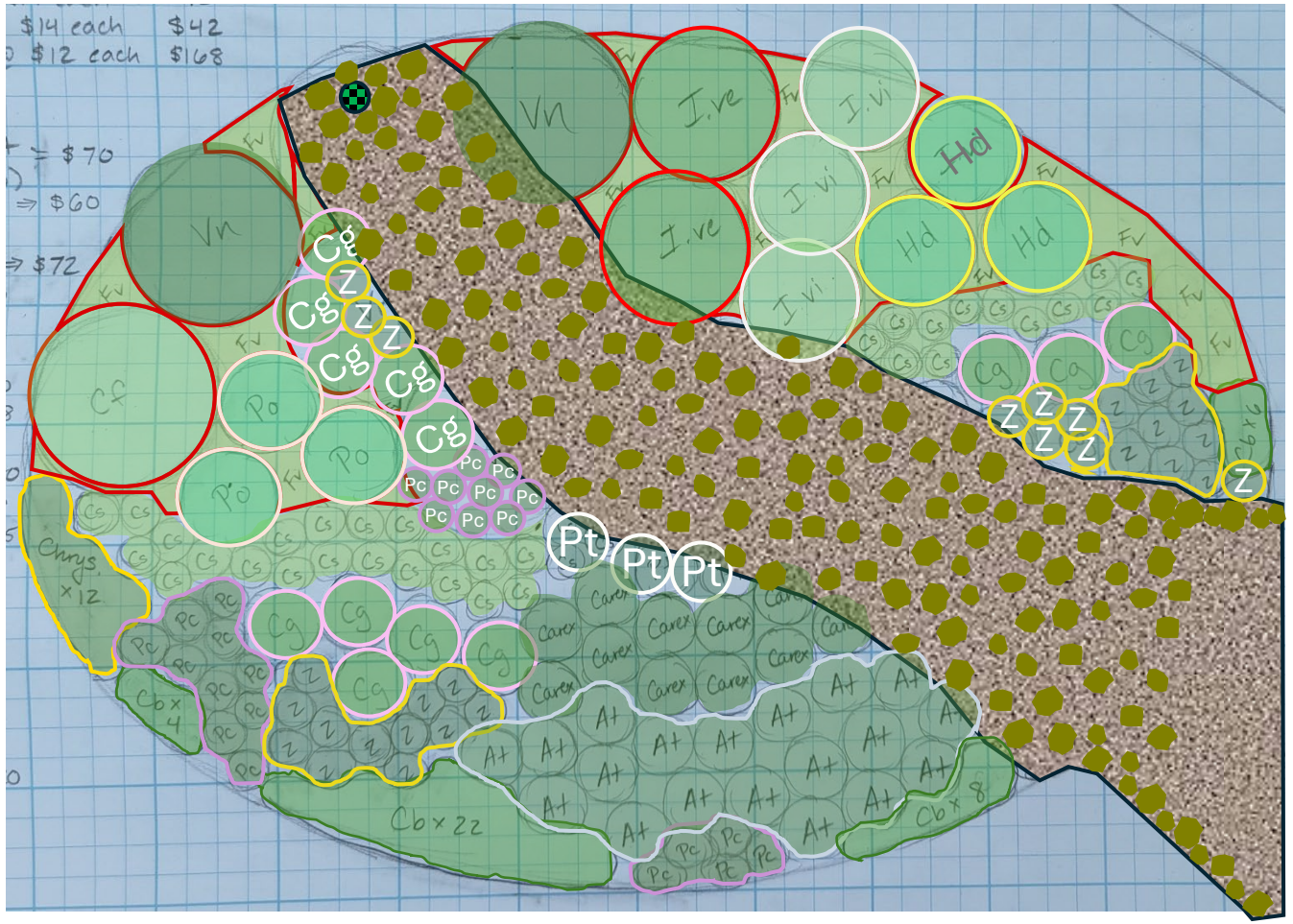
Subtotal (Shrubs): 25

Abbr.	Scientific Name	Common Name	Count
Cs	*Chasmanthium sessiliflorum*	Longleaf Woodoats	36
Carex	*Carex cherokeensis / Carex vulpinoidea*	Cherokee Sedge / Fox Sedge	11
Cb	*Carex blanda*	Eastern Woodland Sedge	40

Subtotal (Grasses & Sedges): 87

Abbr.	Scientific Name	Common Name	Count
Fv	*Fragaria virginiana*	Wild Strawberry	15
Pt	*Pycnanthemum tenuifolium*	Narrowleaf Mountain Mint	3
Z	*Zizia aurea*	Golden Alexander	31
At	*Amsonia tabernaemontana*	Eastern Bluestar	19
Pc	*Penstemon calycosus*	Calico Beardtongue	24
Chrys	*Chrysogonum virginianum*	Green-and-Gold	12

Subtotal (Herbaceous Perennials): 104




EGPW


BENEFITS OF RAINWATER HARVESTING
Environmental benefit:
Reduces transfer of contaminants from urban environments to streams.
Combats erosion and downstream flooding.
RAIN BARREL
WORKSHOP
at Kiesel Park
AUBURN
AUBURN
ADEM


SAVE WATER
USE A RAIN BARREL
AUBURN
AUBURN

Elizabeth White's post

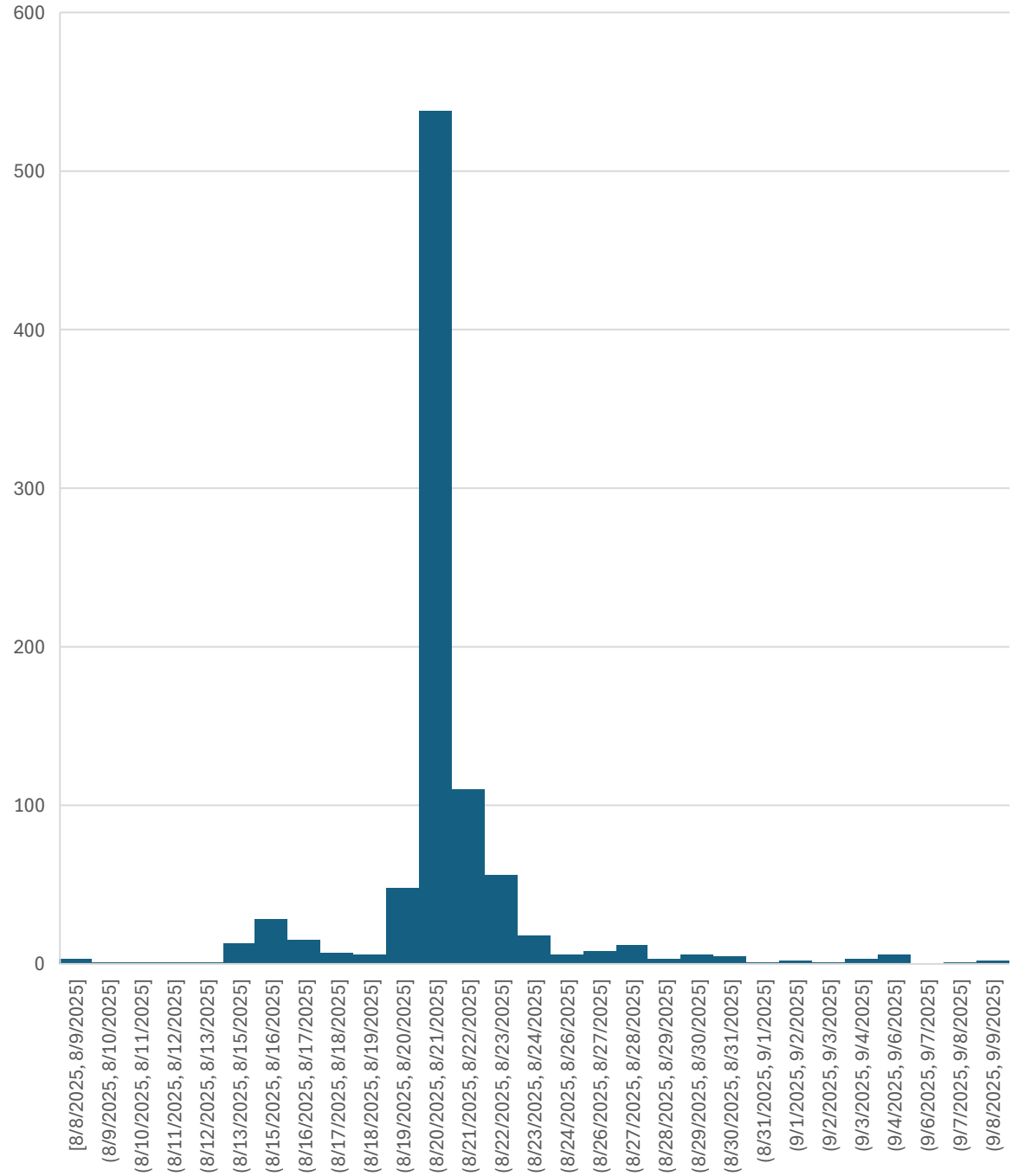
Elizabeth White
August 20 ·

💧🌱 FREE Rain Barrels in Auburn! 🌱💧

This weekend at Kiesel Park, Auburn families can learn how to turn stormwater into savings — and take home a rain barrel worth nearly $80... for FREE. ⬇️

Billy Wilson, Mary Beth Sayre and 465 others — 84 comments 96 shares

Like Comment Share



SCOOP THE POOP

PROTECT OUR WATER
PREVENT POLLUTION

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AUBURN
STORMWATER

AU-SRF TRAINING EFFORTS

AUBURN
STORMWATER

DESIGNER CERTIFICATION

ALDOT ADEM

HANDS-ON TRAINING

USDA USDA Rural Development

INSTALLER CERTIFICATION

U.S. Department of Transportation
Federal Highway Administration

STORMWATER WEEK

May 12-14, 2026

AUBURN
STORMWATER

MATT WISENDEN
MDW0113@AUBURN.EDU

IECA
International Erosion Control Association
Protecting Soil and Water Resources

AUBURN STORMWATER | IECA

Installer Training

AUBURN UNIVERSITY
STORMWATER RESEARCH FACILITY

May 12-13, 2026

This 1.5-day event offers classroom and hands-on training for installing construction site erosion and sediment control practices. **Earn 10 PDHs.**

Learn More »»

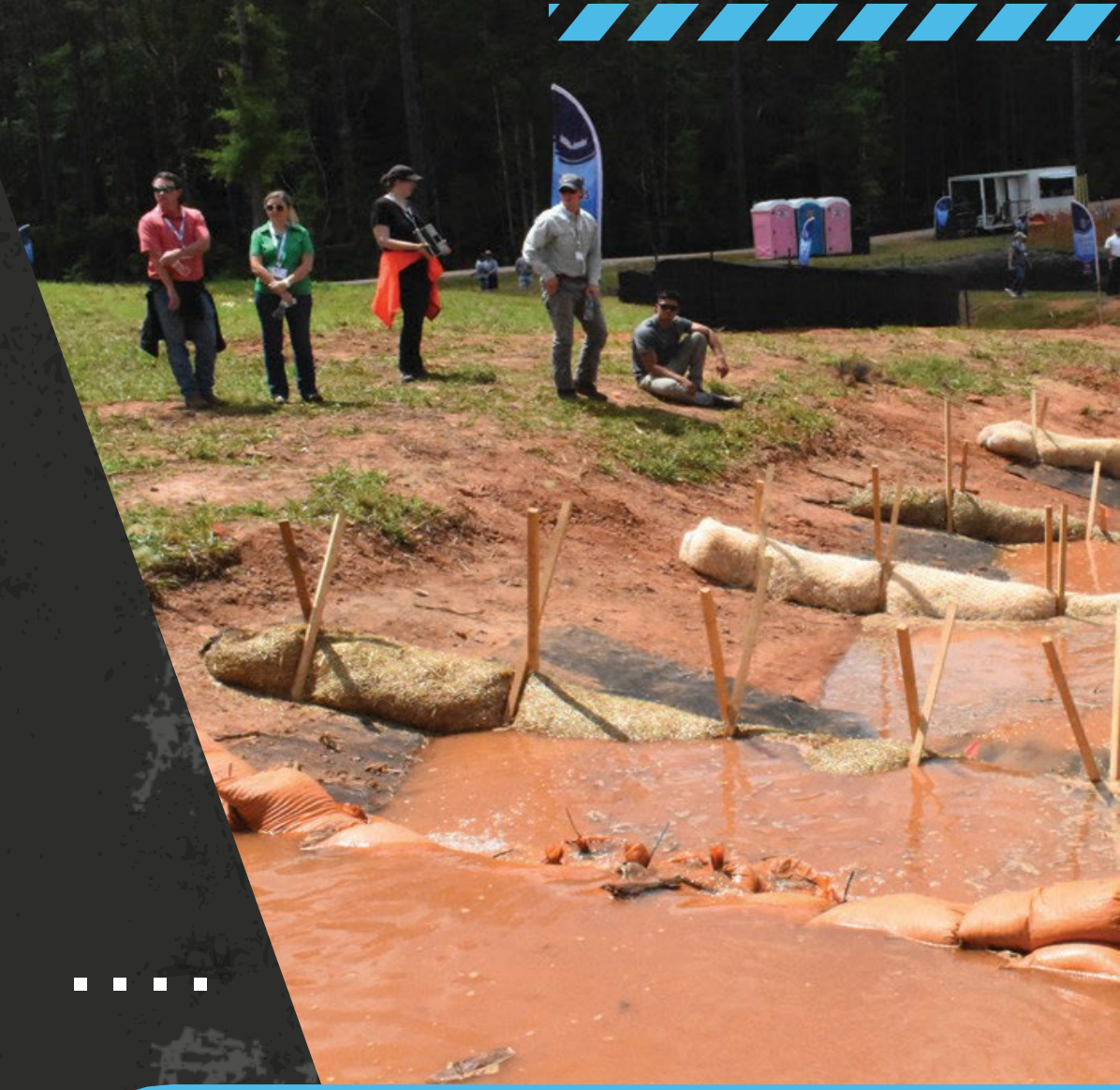
stormwater.auburn.edu

AUBURN STORMWATER | IECA

Field Day

AUBURN UNIVERSITY
STORMWATER RESEARCH FACILITY

May 14, 2026



This field day provides hands-on training and demonstrations of erosion and sediment control practices, including installation techniq_ues and flow testing. **Earn 6 PDHs.**

* Sponsorship and Exhibitor Opportunities Available

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High Definition Stream Survey (HDSS): Transforming Water Resource Management

Register online at: aub.ie/tigerstream
or scan QR code

REGISTER

Sept. 30, 2025 • 11:00 CDT

AUBURN STORMWATER

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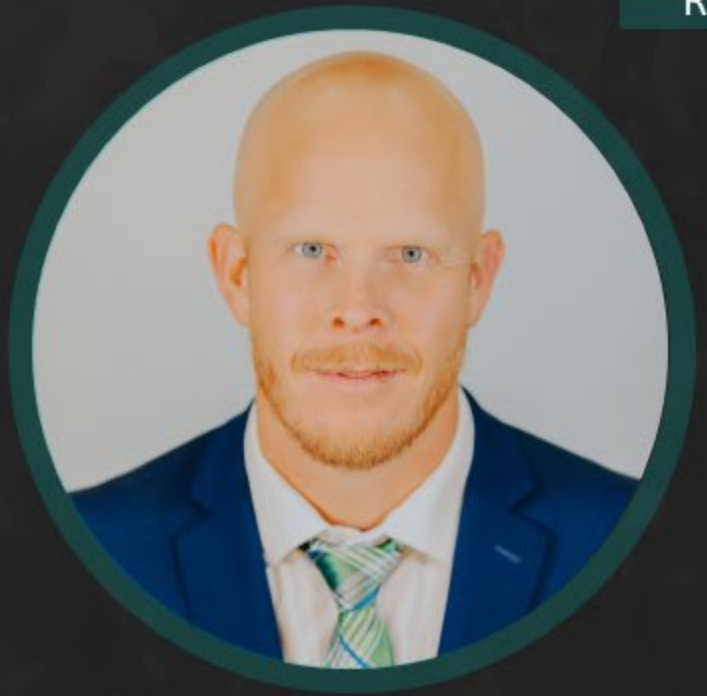

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EDUCATION & OUTREACH PROGRAM MANAGER

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