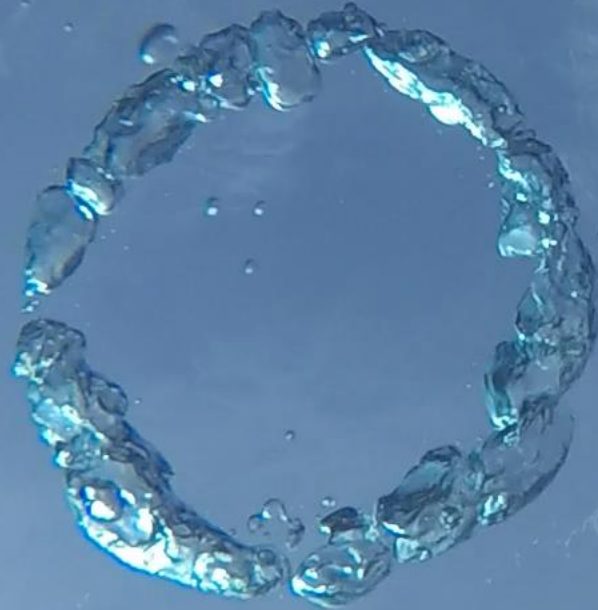


CALTRANS EROSION CONTROL

JACK BROADBENT



INTRODUCTION



Caltrans Mission, Vision, Goals, Values, and Priorities

OUR VISION

A brighter future for all through a world-class transportation network

OUR MISSION

Provide a safe and reliable transportation network that serves all people and respects the environment

Toks Omishakin, Recent Caltrans Director

- Caltrans owns and operates over 15,000 center line miles / 52,144 lane miles of highways
- The annual vehicle miles traveled on our system is 332 Billion miles
- Caltrans has 19,887 employees
- Caltrans manages about \$10 Billion dollars per year of active construction projects



EROSION CONTROL BASIC CONCEPTS

Basic Concept of Soil Erosion
control:

Top – Middle - Toe

- Protect top from over land flow
- Stabilize Middle
- Manage drainage at base

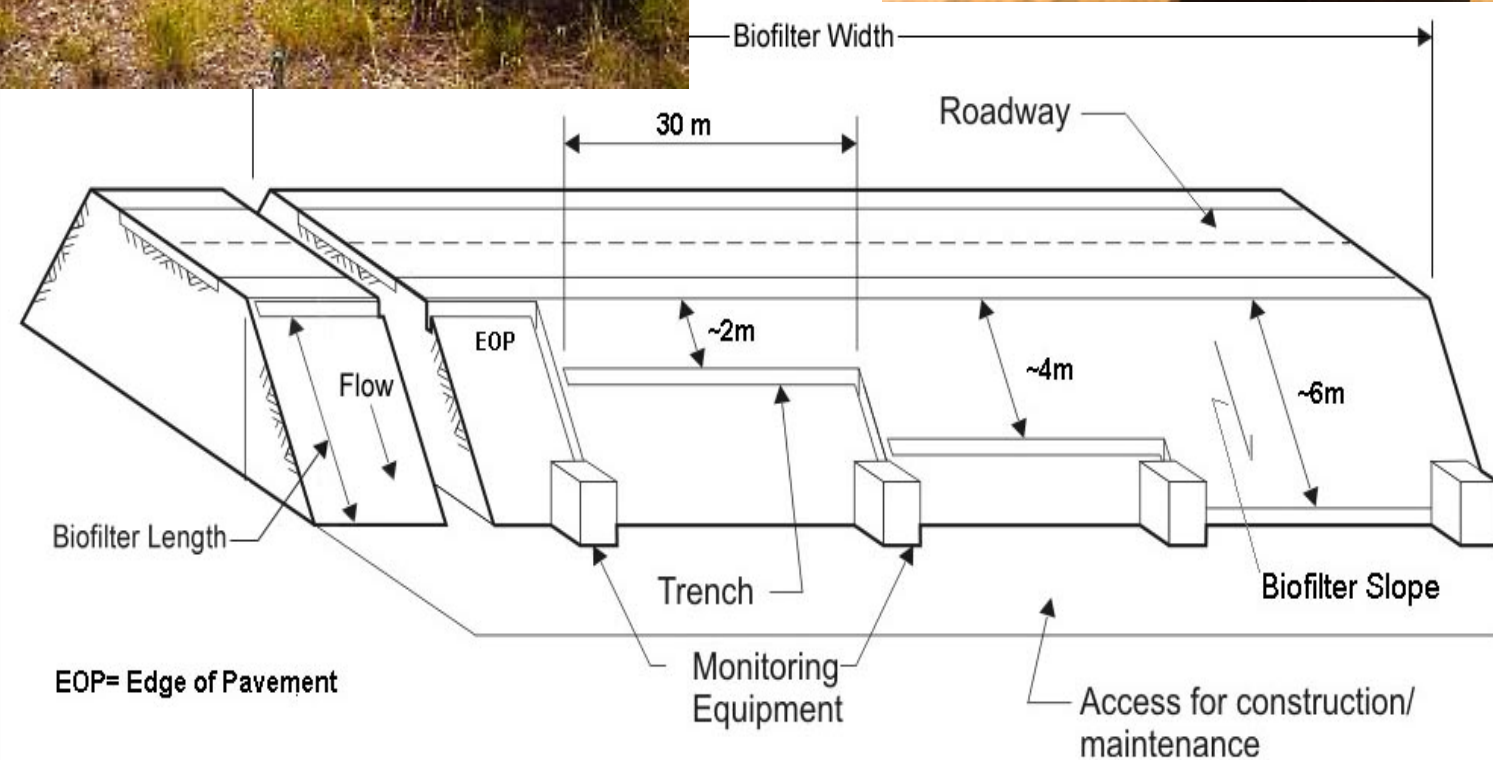


LOW IMPACT DEVELOPMENT CONCEPTS

Basic Concept of Low Impact Development:

Slow Water Down – Spread
Water Out – Soak Water In

- Interrupt flow
- Spread out concentrated flows
- Infiltrate into the soil



REVEGETATION CONCEPTS

Basic Concept of Revegetation

Soil – Water – Vegetation

Controlling factors on
vegetative growth:

- Soil type
- Infiltration and water holding capacity
- Reference site and plant species



EROSION CONTROL BMP's

Temporary and Permanent
Caltrans Erosion Control BMP's

- Standard Plans
- Standard Specifications
- Standard Bid Items
- Erosion Control Toolbox



STANDARD PLANS

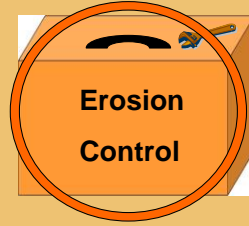
STANDARD SPECIFICATIONS

- Landscape Standard Plans (Sheets H1 to H10)
- Erosion Control Standard Plans (Sheets H51 to H52)
- Water Pollution Control Standard Plans (Sheets T51 to T67)
- Water Pollution Control, Section 13
- Landscape Standards, Section 20
- Erosion Control Standards, Section 21
- Bid Items



	Landscape and Erosion Control Plans
H1	Landscape and Erosion Control Symbols
H2	Landscape Details
RSP H3	Landscape Details
RSP H4	Landscape Details (Riser Sprinkler Assembly)
H5	Landscape Details (Swing Joint and Protector)
RSP H6	Landscape Details
RSP H7	Landscape Details
RSP H8	Landscape Details
RSP H9	Landscape Details
H10	Irrigation Controller Enclosure Cabinet
RSP H51	Erosion Control Details - Fiber Roll and Compost Sock
H52	Rolled Erosion Control Product

EROSION CONTROL TOOLBOX



Erosion Control Toolbox | Caltrans

- Improve Soil Health
- Provide Soil Cover
 - Short Term Soil Cover
 - Long Term Soil Cover
- Sediment Control
- Vegetation
- Steep Slope Techniques



EROSION CONTROL TOOLBOX

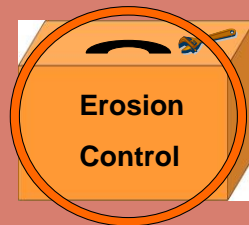


Improve Soil Health & Cover

- Preserve topsoil
- Imported Topsoil
- Compost
- Roughen soil
- Decompact Soil
- Incorporate Materials



EROSION CONTROL TOOLBOX

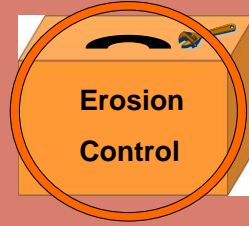


Improve Soil Health & Cover

- Duff
- Mulch
- Hydraulic Biotic Growth Medium
- Mycorrhizae



EROSION CONTROL TOOLBOX



Soil Cover

- Straw
- Hydromulch / Hydroseed
- Bonded Fiber Matrix
- Fiber Reinforced Matrix
- Rolled Erosion Control

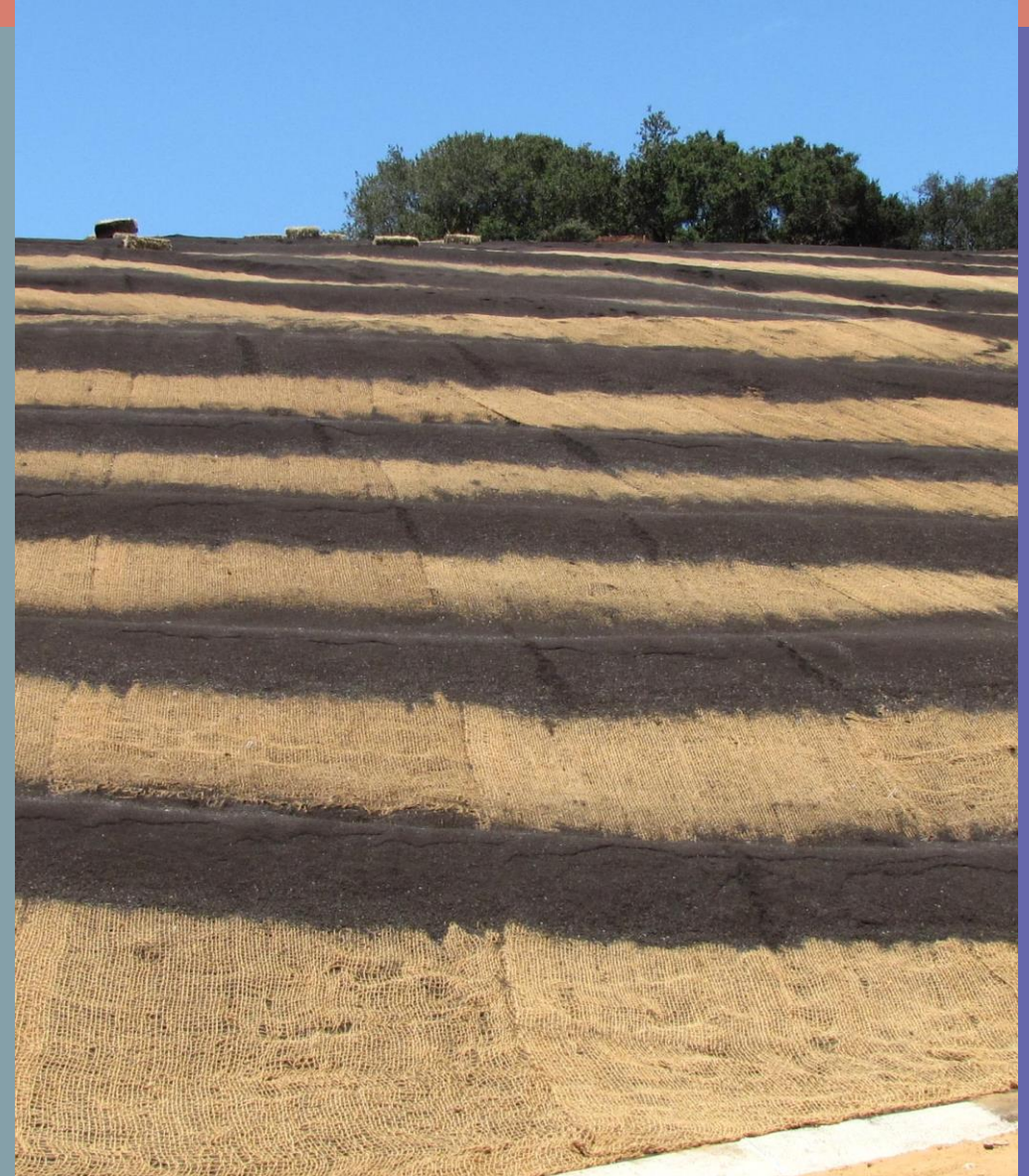
Products (Jute Mesh, Coir
Netting, Blankets & Turf
Reinforced Mats)



EROSION CONTROL TOOLBOX

Sediment Control

- Fiber Rolls / Straw Waddles
- Compost Socks
- Compost Berms



ADVANCED SLOPE STABILIZATION

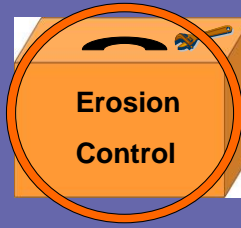


Advanced Slope Stabilization

- Soil flap
- Soil Wrap
- Willow cuttings



EROSION CONTROL PUTTING IT ALL TOGETHER



- Sediment Control
- Improve Soil Health
- Provide Soil Cover
 - Short Term Soil Cover
 - Long Term Soil Cover
- Establish Vegetation



SHOW CASE PROJECT



erode soil near Salinas. Note loss of soil above fence line. Sloped material
way must be hauled away by truck

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

EROSION CONTROL ON CALIFORNIA STATE HIGHWAYS

REPRINT OF A SERIES OF ARTICLES PUBLISHED IN
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EARL WARREN
Governor

CHARLES H. PURCELL
Director of Public Works

GEORGE T. MCCOY
State Highway Engineer

SHOW CASE PROJECT

HIGHWAY 101

PRUNDALE BYPASS

This photo shows how the slopes performed without the use of compost, and only relying on Bonded Fiber Matrix and fiber rolls, during a high energy rain event.

This project has highly erosive soils.



COMPOST BLANKET VS. BFM AND FIBER ROLLS

This is a photo of a different slope after the same rain event.

The top two-thirds of the slope had compost with netting and the bottom third had BFM and fiber rolls.

Not entirely a fair analysis since the top slope had vegetation which illustrates why is it so important to apply permanent erosion control ASAP so as not to rely on temporary EC materials.



COMPOST SOCKS

Here compost socks were used as check dams due to their weight and ability to capture sediment. Unlike fiber rolls they are porous, reducing the flow of water initially, and eventually allowing water to pass through them.

Recommend 12" dia. socks at toe of slopes and 8" dia. at mid-slope.

Rolled Erosion Control Product (Blankets) were used to cover the soil surface.



HIGHWAY 101 PRUNDALE BYPASS

To stabilize slopes, control erosion and establish long-term vegetation we relied on applications of compost blanket. Typically applied at 2 inches thick using fine compost 3/8" minus.



BFM WITH AND WITHOUT COMPOST

This slope however represents a fair comparison on how slopes perform with BFM only vs BFM with compost.

The area on the left has BFM only. The area on the right has a 2" compost blanket with BFM.

As you can see the area with compost and BFM clearly out performed the area with BFM only.



COMPOST BLANKET

Here we used 2" thick compost blanket with punch straw to bind the soil with the straw for added soil protection. Seeding was included.



Rolling 10-foot strip of fill slope after application of straw. (City Creek Road, San Bernardino County)

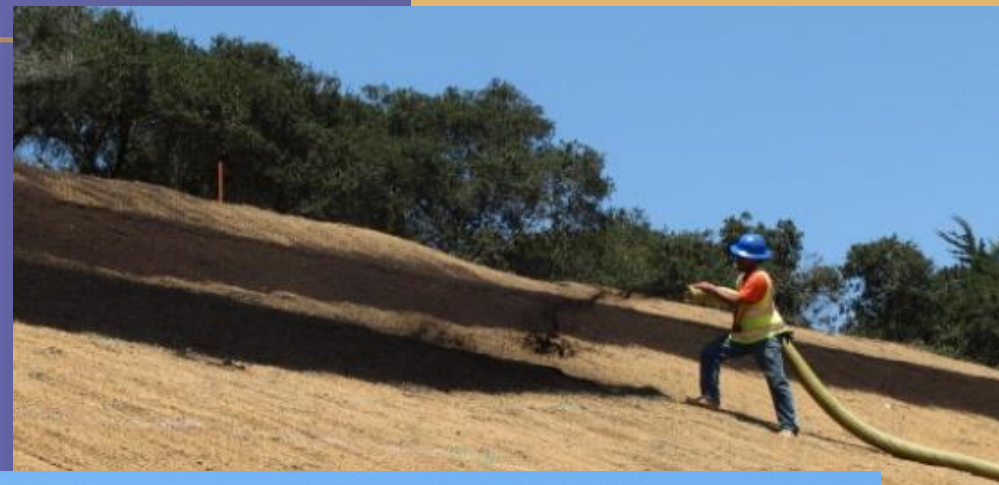


COMPOST BERM LINEAR SEDIMENT BARRIERS

Compost berms were installed as mid-slope sediment barriers in lieu of fiber rolls.

Typically, pneumatically applied. Usually, 2 ft wide and 1 ft high. The shape is not critical if they have enough bulk and mass.

When hydroseeded the vegetation further knits the berm together making for a very effective linear sediment barrier that blends in with the roadside.



COMPOST BERMS

Compost berms are very effective at capturing sediment and filtering water where sheet flow occurs to prevent further erosion.

Compost berms should not be used where there are concentrated flows. Use compost socks or fiber rolls as a first line of defense.



COMPOST BERMS

This is that same slope 6 months later.

The use of compost resulted in the successful establishment of native vegetation the first season.

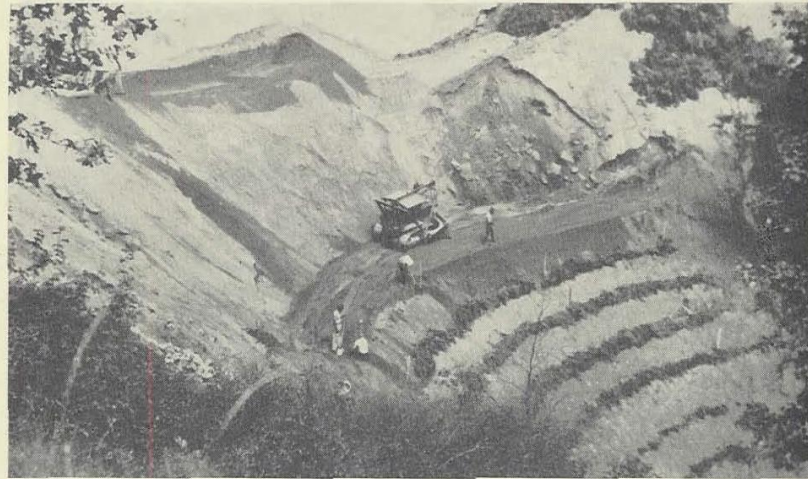


HIGHWAY 101 PRUNDALE BYPASS

This project is located on Highway 101 in Monterey County California. This photo is of one of the interchanges that were constructed.

Over 45,000 cubic yards of compost was applied, on this project, covering over 108 acres.





Reworking fill slope face with bulldozer and installing brush layers. (Near Weaverville, Trinity County)

BUCKHORN SUMMIT ROUTE 299



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LESSONS LEARNED

Top of Slope

- Over Land Flow
- Slope Rounding
- Brow ditch

Middle of Slope

- Slope Angle
- Soil Health
- Soil Cover
- Seep Erosion

Toe of Slope

- Shoulder Area
- Base Gabions



LESSONS LEARNED

ADVANCED SLOPE

STABILIZATION NEEDED

TOP OF SLOPE

- Control Overland Flow
- Brow Ditch
- Slope Rounding



LESSONS LEARNED

ADVANCED SLOPE

STABILIZATION NEEDED

MIDDLE OF SLOPE

Slope Steepness

Natural Angle of Repose

1:1.5 max slope inclination

Soil Health

Compost incorporation / mixing

Seep Erosion

Willow cuttings

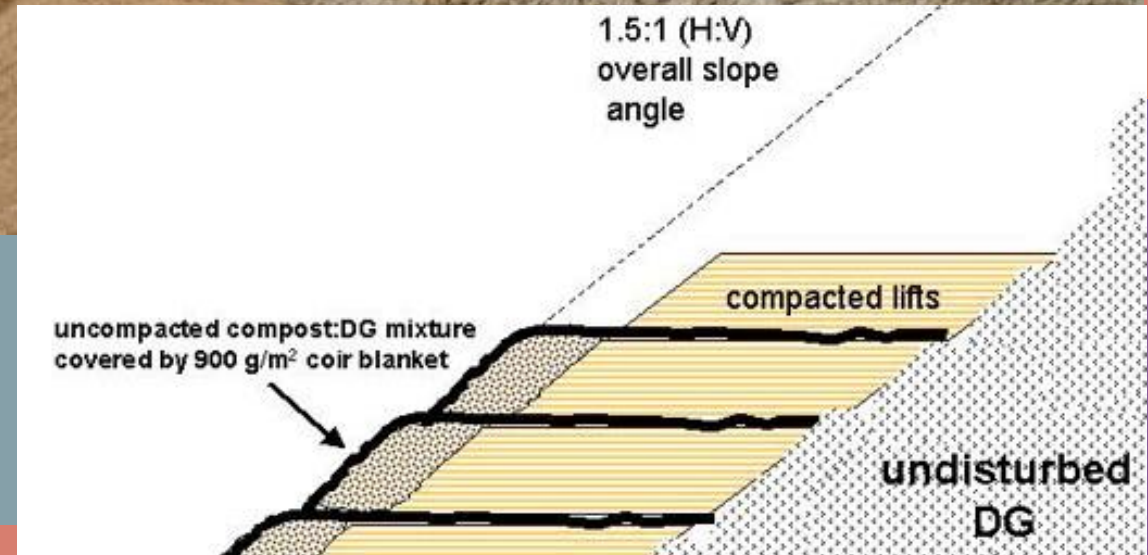
Soil Cover

Blankets

Native plant seeding



 Caltrans



LESSONS LEARNED

ADVANCED SLOPE

STABILIZATION NEEDED

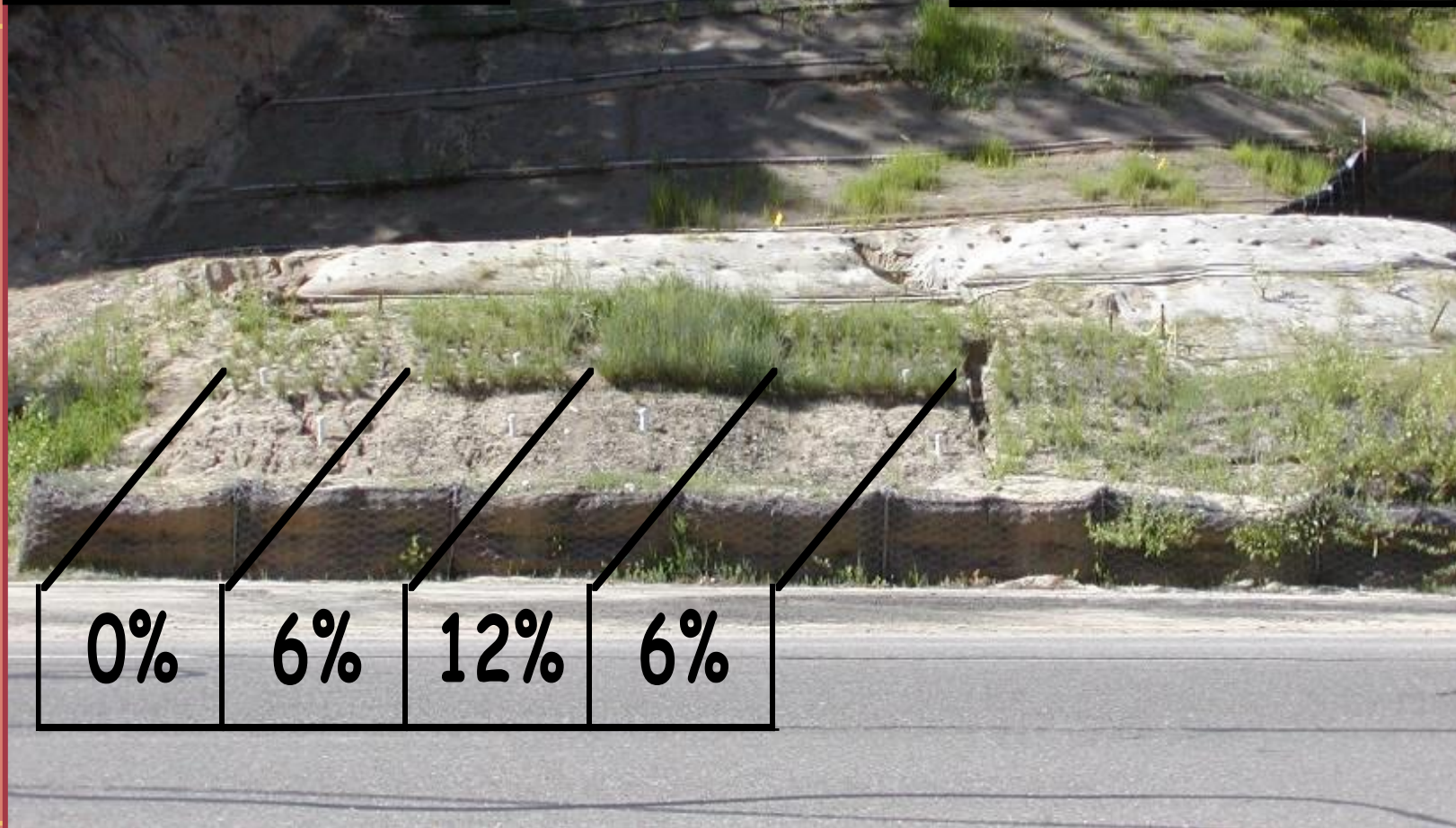


MIDDLE OF SLOPE

Soil research

Table 1. Infiltration Determined by Rainfall Simulation (mm/hr)*

Treatment	Initial	Final	Final
		Veg	No Veg
Control	29.00	33.20	29.86
6 % Compost	32.88	38.20	36.76
12 % Compost	39.53	38.27	39.22
24 % Compost	46.37	47.23	37.20
Reference Site	50.60	50.60	50.60



LESSONS LEARNED

ADVANCED SLOPE

STABILIZATION NEEDED

MIDDLE OF SLOPE

Addressing Soil Health

- The 25% Compost admixture was also used, tractor compaction only, on “fill / cut” construction (biotechnical)
- Minimally-Compacted slope is alternatively reinforced with Coir Net (9gr/m²), willow brush layering and seeding



LESSONS LEARNED

ADVANCED SLOPE

STABILIZATION NEEDED

- TOE OF SLOPE

Wider Shoulder

Gabions as a retaining wall



LESSONS LEARNED

Place

Know the area

People

Culture
Experts

Project

Scope
Schedule
Cost



THANK YOU

Discussion and Questions

