



## **PROGRESSIVE BIOENGINEERING:**

**The Latest Developments in Non-structural Alternatives for Shoreline Stabilization**





## PROGRESSIVE BIOENGINEERING:

The Latest Developments in Non-structural Alternatives for Shoreline Stabilization

Based on **SITE SPECIFIC** Criteria





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Understanding if a beach has a  
**BASE ELEVATION.**





Based on **SITE SPECIFIC** Criteria



Understanding if a beach has a  
**BASE ELEVATION**.



Understanding the function a  
**FRINGE MARSH** plays.





Based on **SITE SPECIFIC** Criteria



Understanding if a beach has a  
**BASE ELEVATION**.



Understanding the function a  
**FRINGE MARSH** plays.



Understanding near shore  
characteristics such as **FETCH**, **WATER**  
**DEPTHS**, **SAND BARS**, and location  
within a given **LITTORAL CELL**.



**BIOENGINEERING STRATEGIES**  
**Importance of Fringe Marshes**  
**in Coastal Stabilization**



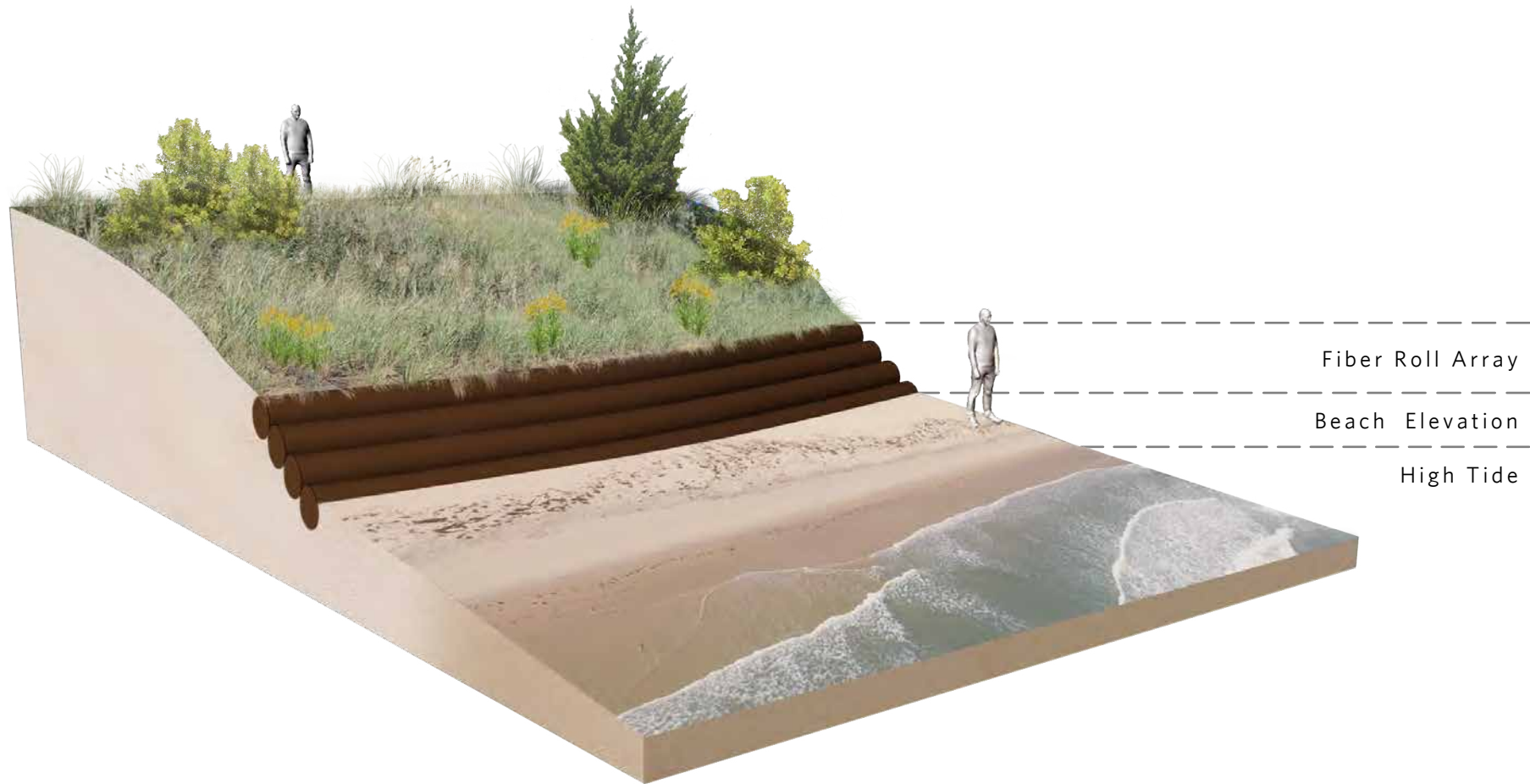
## BIOENGINEERING STRATEGIES

### Importance of Fringe Marshes in Coastal Stabilization

- Woven coir-filled mats used as a growing medium.
- Pre-vegetated to establish prior before installation.

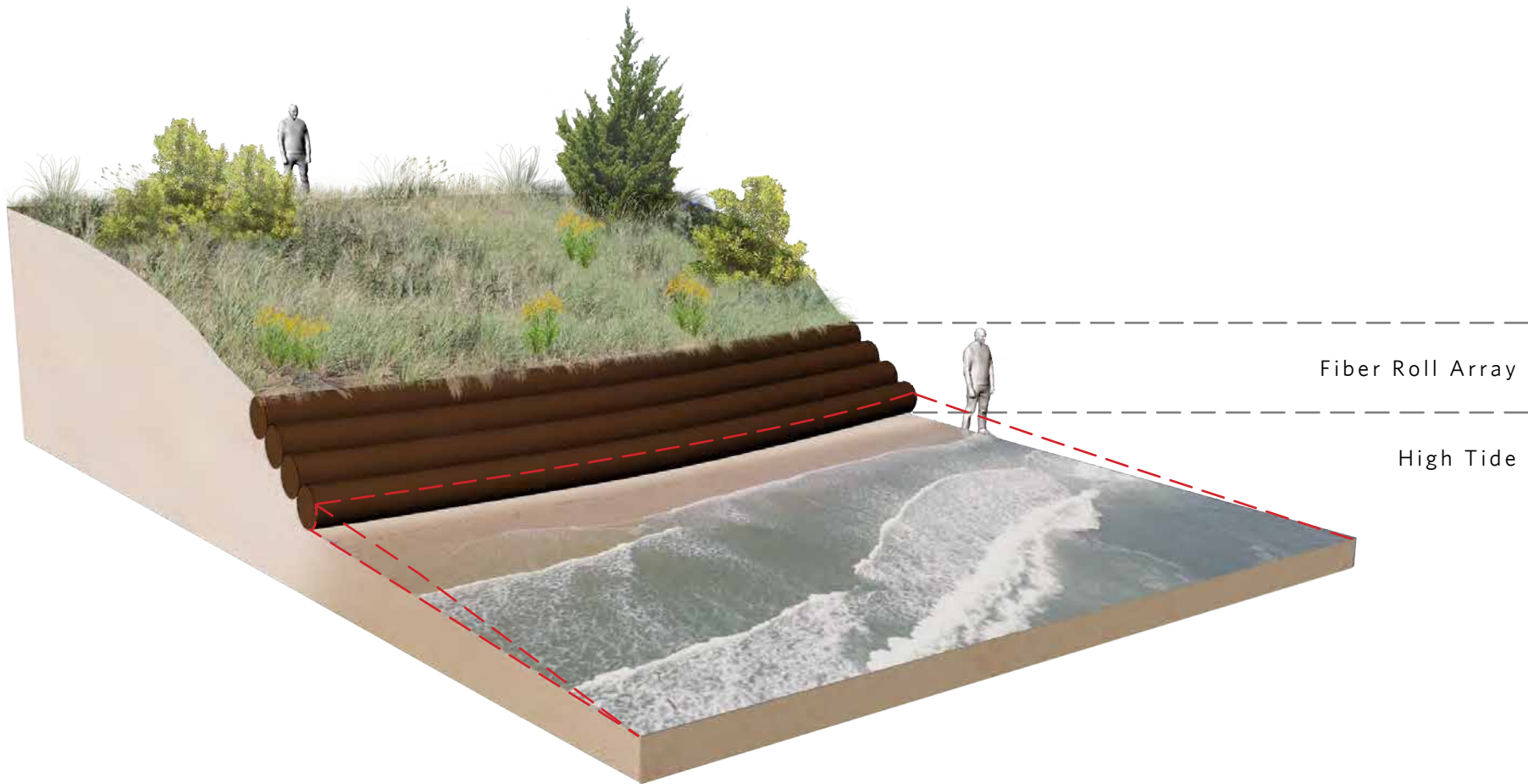


**BIOENGINEERING STRATEGIES**  
**Importance of Fringe Marshes**  
**in Coastal Stabilization**



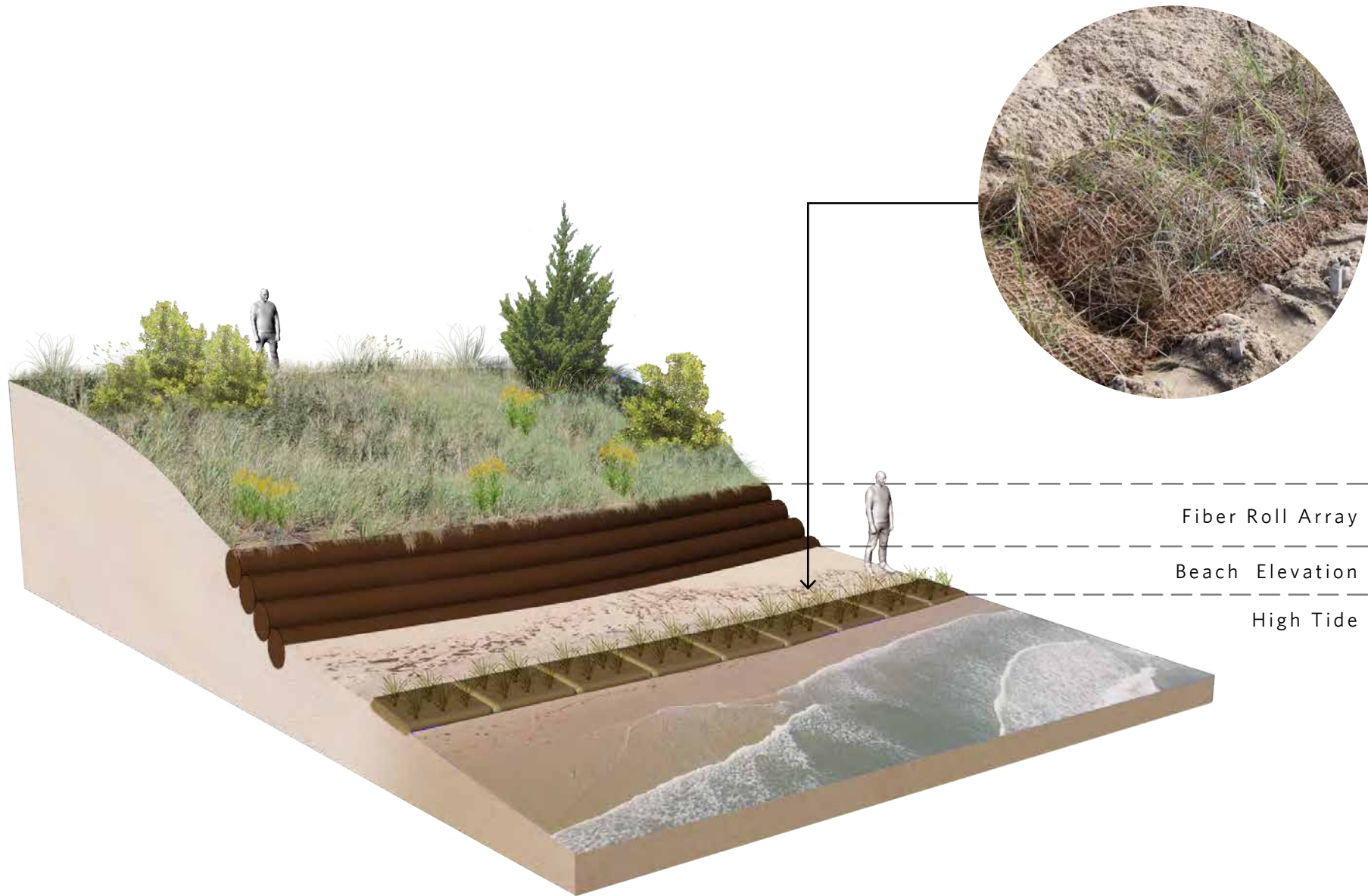


**BIOENGINEERING STRATEGIES**  
**Importance of Fringe Marshes**  
**in Coastal Stabilization**



# BIOENGINEERING STRATEGIES

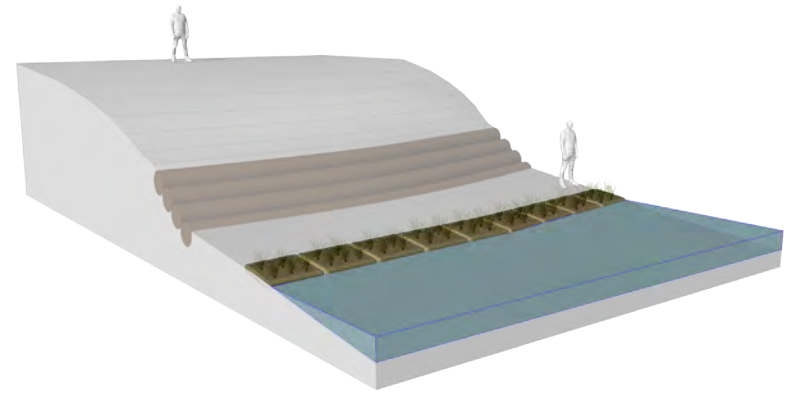
## Importance of Fringe Marshes in Coastal Stabilization





# INSTALLATION & CASE STUDIES

## Fringe Marshes



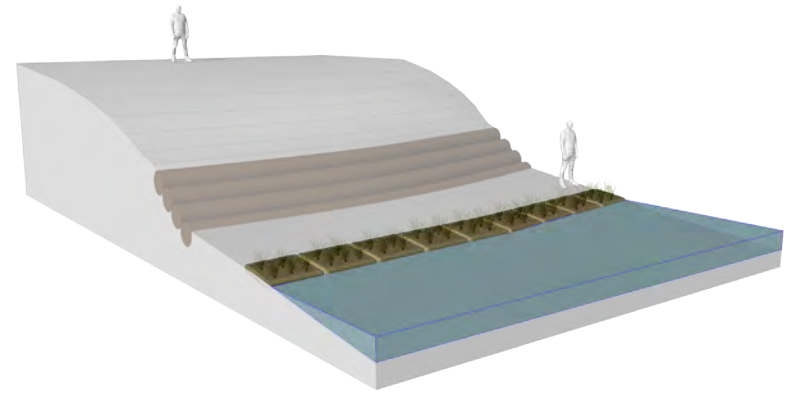
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# INSTALLATION & CASE STUDIES

## Fringe Marshes



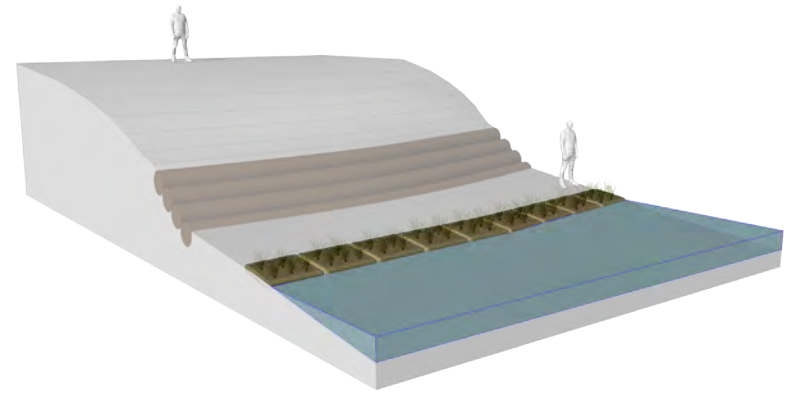
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# INSTALLATION & CASE STUDIES

## Fringe Marshes



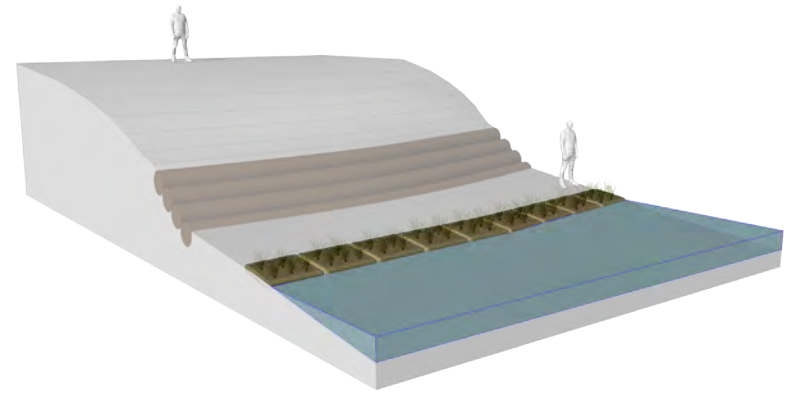
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# INSTALLATION & CASE STUDIES

## Fringe Marshes

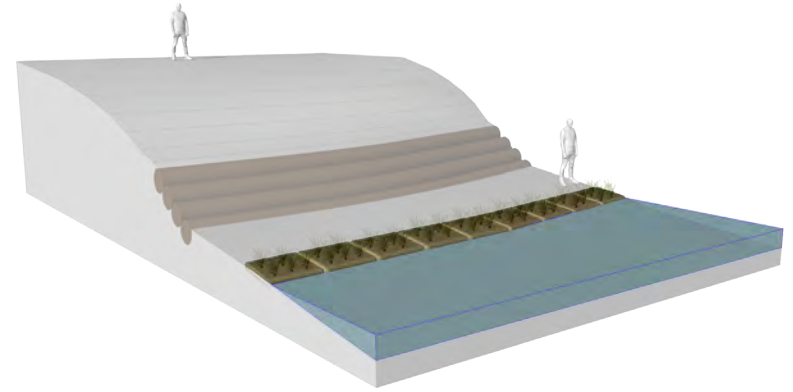


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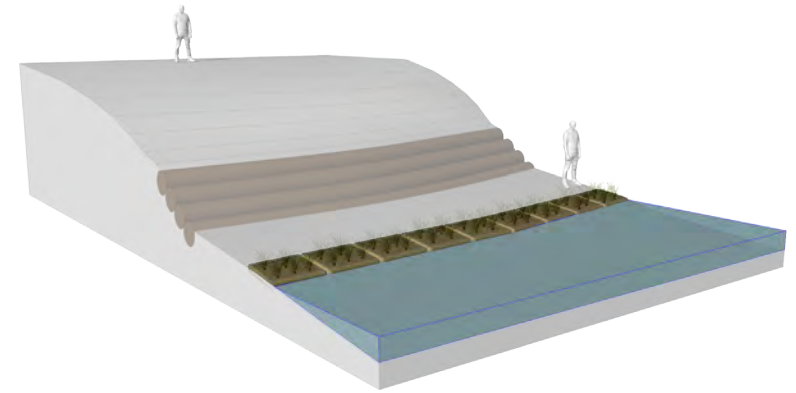
## Fringe Marshes



1



## Fringe Marshes

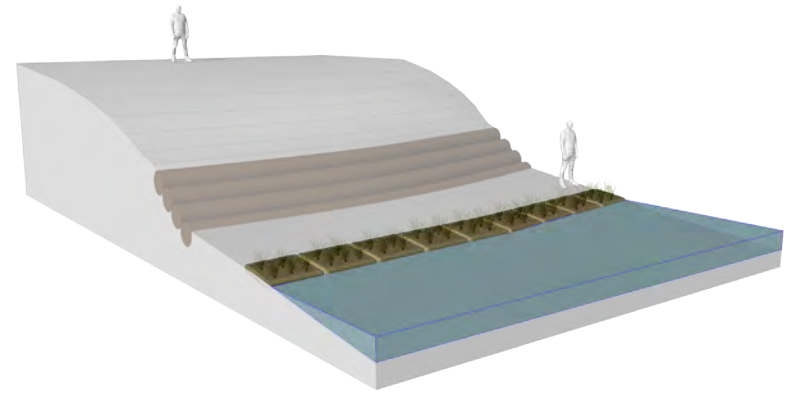


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## Fringe Marshes



1 2 3



BIOENGINEERING STRATEGIES  
**MATERIALS**





## BIOENGINEERING STRATEGIES MATERIALS



### **COIR FIBER ROLLS**

Adds stability and protection to the toe of a bank and provides a window of opportunity to establish vegetation.



## BIOENGINEERING STRATEGIES MATERIALS



**COIR FIBER ROLLS**

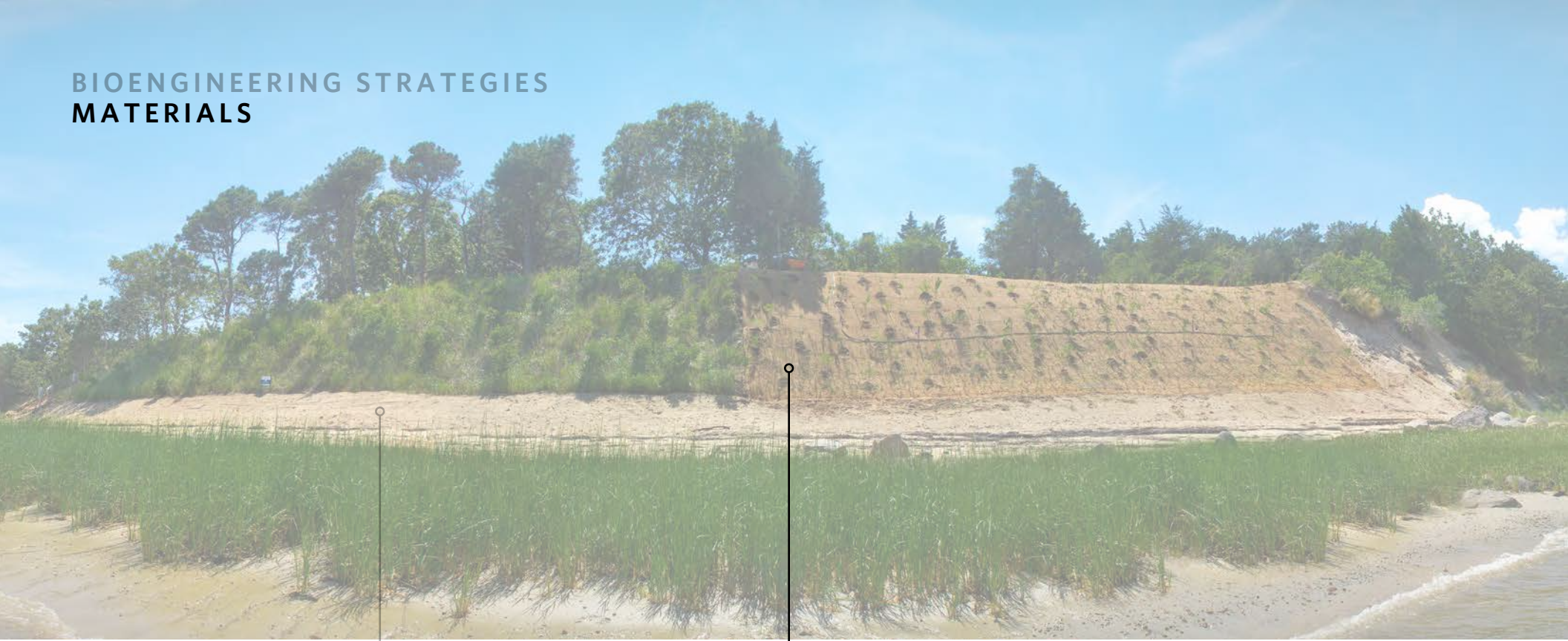
Adds stability and protection to the toe of a bank and provides a window of opportunity to establish vegetation.



**ROBUST ANCHORING SYSTEM**



# BIOENGINEERING STRATEGIES MATERIALS



## COIR FIBER ROLLS

Adds stability and protection to the toe of a bank and provides a window of opportunity to establish vegetation.



## ROBUST ANCHORING SYSTEM



## EROSION CONTROL BLANKETING

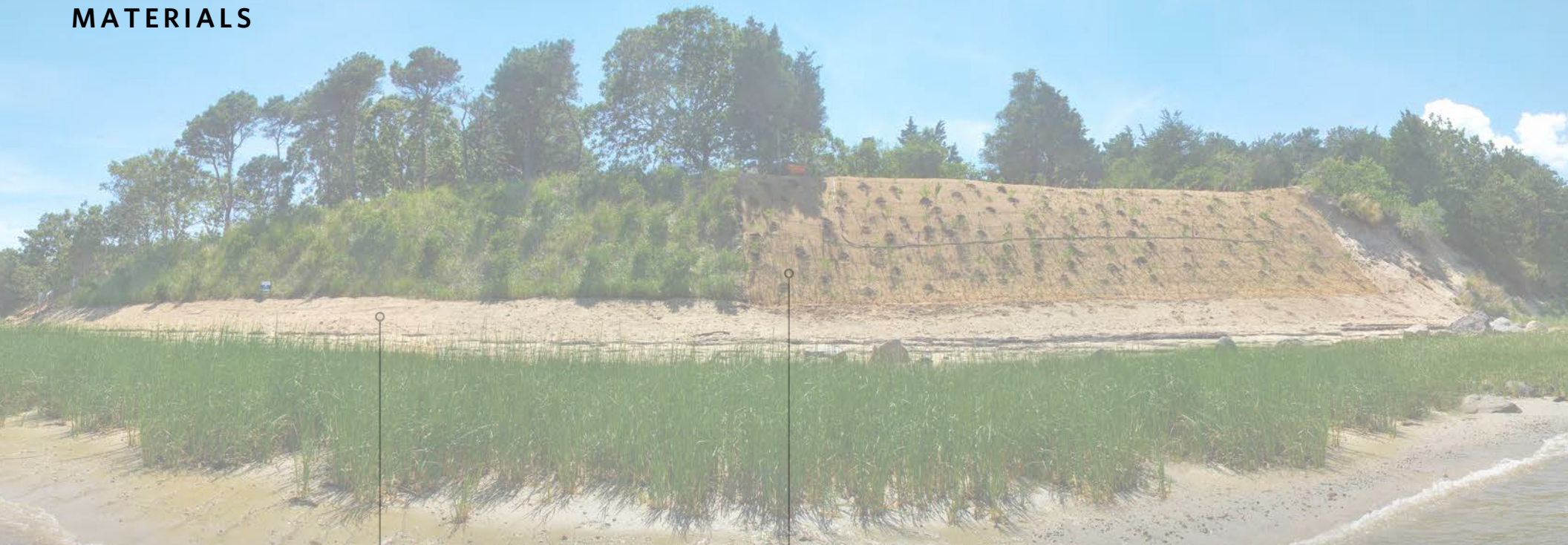
blanketing of natural fibers are used to stabilize soils allowing time for

NATIVE SALT TOLERANT  
PLANTS BECOME ESTABLISHED.



# BIOENGINEERING STRATEGIES

## MATERIALS



### COIR FIBER ROLLS

Adds stability and protection to the toe of a bank and provides a window of opportunity to establish vegetation.



### ROBUST ANCHORING SYSTEM



### EROSION CONTROL BLANKETING

blanketing of natural fibers are used to stabilize soils allowing time for  
NATIVE SALT TOLERATE  
PLANTS BECOME ESTABLISHED.

- Resists degradation from the marine environment.
- Absorbs some of the force of wave energy unlike many hard solutions that deflect the energy of wave action to surrounding areas.
- Materials life-expectancy to stabilize sediments matches the time required to **ESTABLISH NATIVE PLANTS.**



BIOENGINEERING STRATEGIES  
MATERIALS



NATIVE SHRUBS



NATIVE GRASSES



BIOENGINEERING STRATEGIES  
MATERIALS



PRE-VEGETATED  
FIBER ROLLS



NATIVE SHRUBS



NATIVE GRASSES



**BIOENGINEERING STRATEGIES**  
**MATERIALS**



**SALT MARSH**



**PRE-VEGETATED  
FIBER ROLLS**



**NATIVE SHRUBS**



**NATIVE GRASSES**



BIOENGINEERING STRATEGIES  
MATERIALS





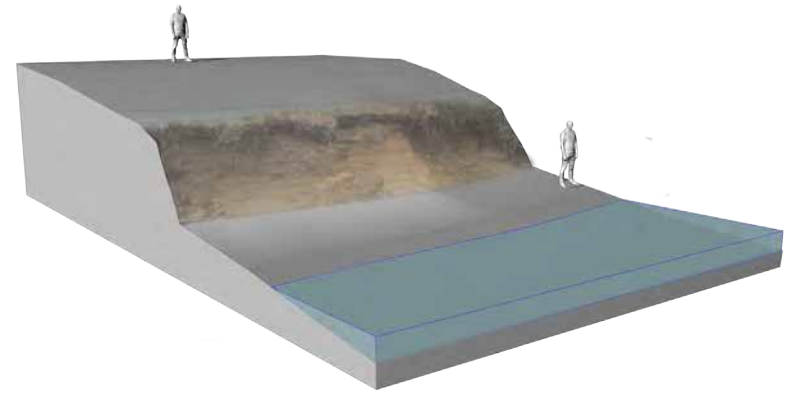
**BIOENGINEERING STRATEGIES  
INSTALLATION & CASE STUDIES**





# INSTALLATION & CASE STUDIES

## Typical Eroding Bank



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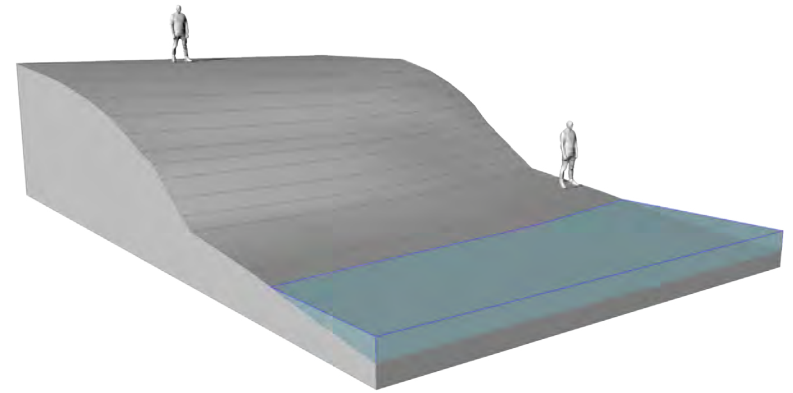


## INSTALLATION & CASE STUDIES

### Importance of Establishing a Stable Slope

- Utilizing a portion of the upper bank can create a more stable slope angle.
- Adds increased stability and storm damage prevention to the bank.
- Without this step, an investment in bioengineering can be lost due to bank collapses.

(Storm Smart Properties Fact Sheet 4)



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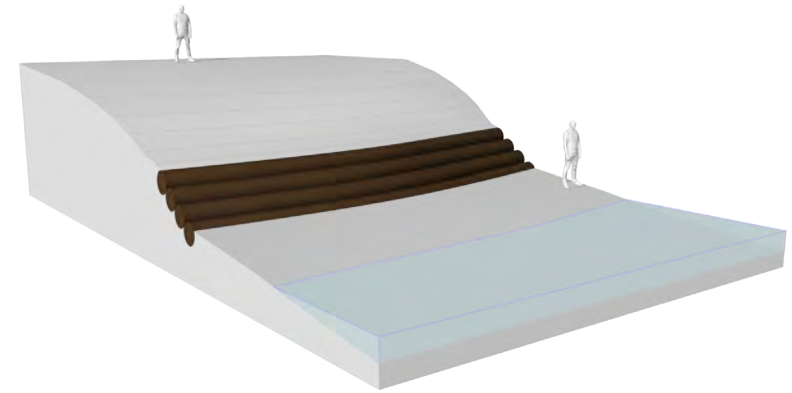




## INSTALLATION & CASE STUDIES

### Stabilizing toe of bank - Fiber rolls

- Installation begins at the base of the array and proceeds up bank.
- Proper anchoring strategy to hold toe protection in place.
- Synthetic filter fabrics DO NOT ENHANCE success of a bioengineering project.



1 2 3

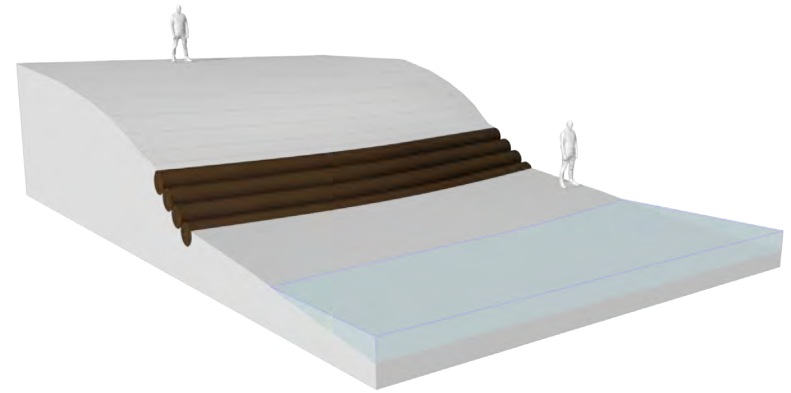




## INSTALLATION & CASE STUDIES

### Stabilizing toe of bank - Pre-vegetated fiber rolls

- Use of pre-vegetated fiber rolls along top of array.
- Added vegetation to the root matrix.
- Full season of plant growth prior to installation.



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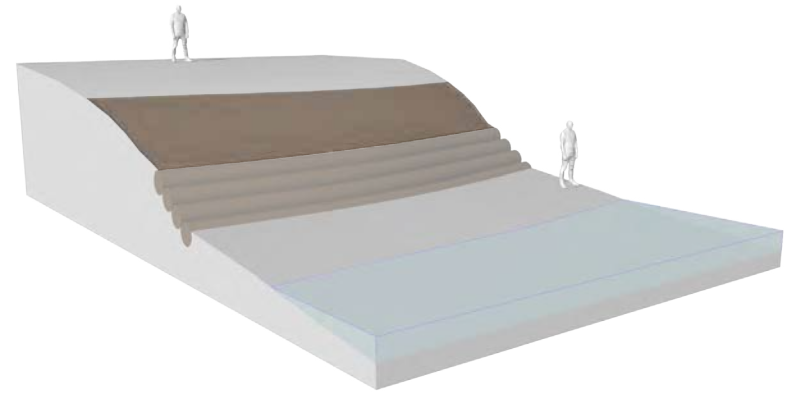




## INSTALLATION & CASE STUDIES

### Stabilizing soils above toe protection

- Native salt tolerant grasses are seeded into the bank prior to installation of erosion control blankets.
- Protect soils from erosion and helps to retain moisture to promote seed germination.

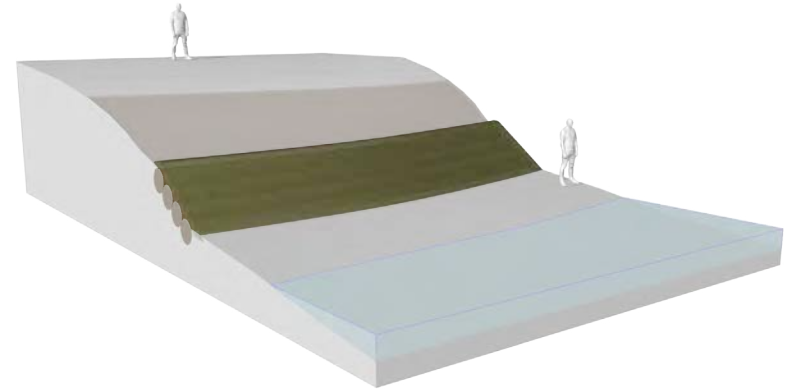




## INSTALLATION & CASE STUDIES

### Sand cover for fiber rolls

- Sand nourishment protects coir fiber rolls from photo-degradation “Sun Block”.
- Nourishment functions as sediment source to the adjacent coastal resource areas.



1 2 3 4 5

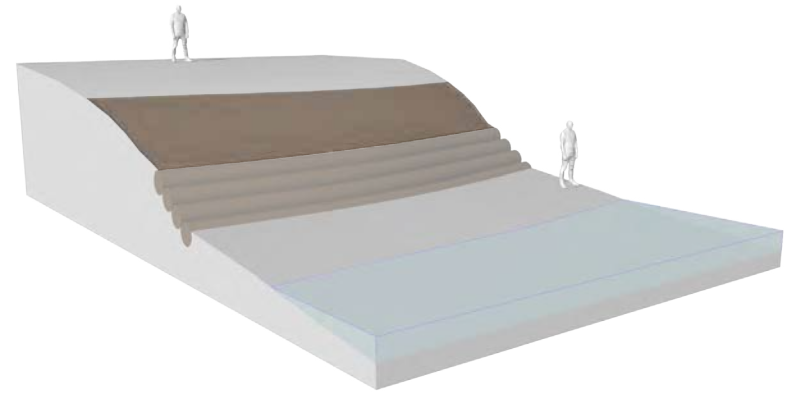




## INSTALLATION & CASE STUDIES

### Native shrub species

- Native beach plum and bayberry planted through erosion control blanketing.
- Temporary above ground irrigation for plant establishment.



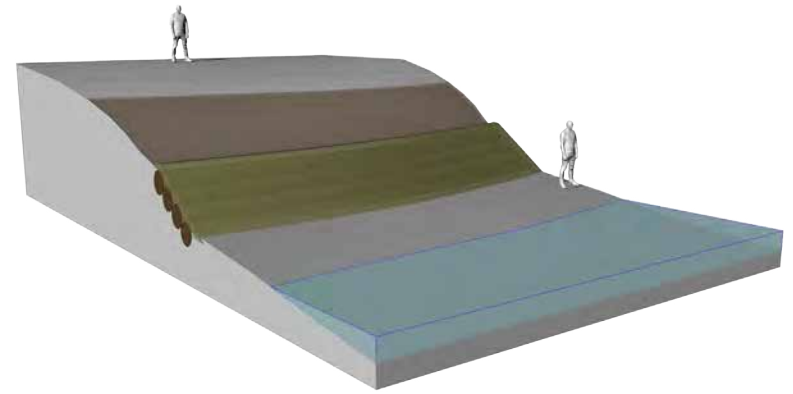
1 2 3 4 5 6





## INSTALLATION & CASE STUDIES

- Establishment of native vegetation after two seasons of growth.



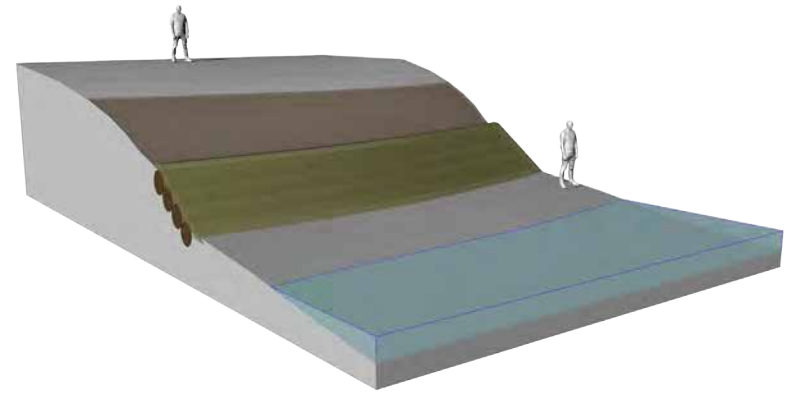
1 2 3 4 5 6 7





## INSTALLATION & CASE STUDIES

Condition of fiber roll array following  
Hurricane Sandy  
11/2012



1 2 3 4 5 6 7 8

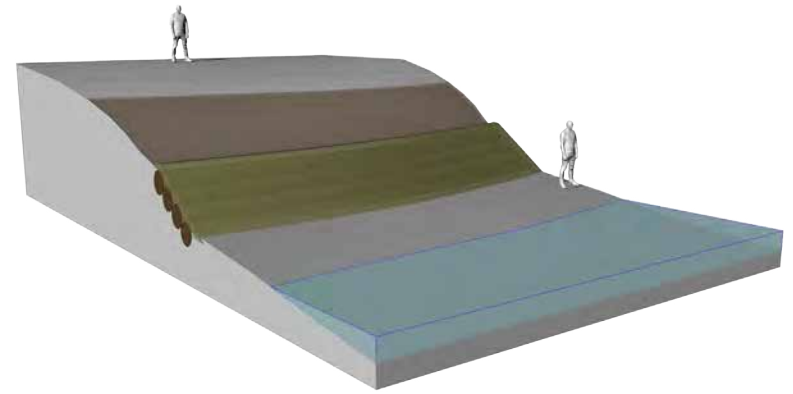


Waves reached  
above fiber roll  
array with no  
damage.



## INSTALLATION & CASE STUDIES

Condition of fiber roll array following  
named storm Nemo  
2/2013



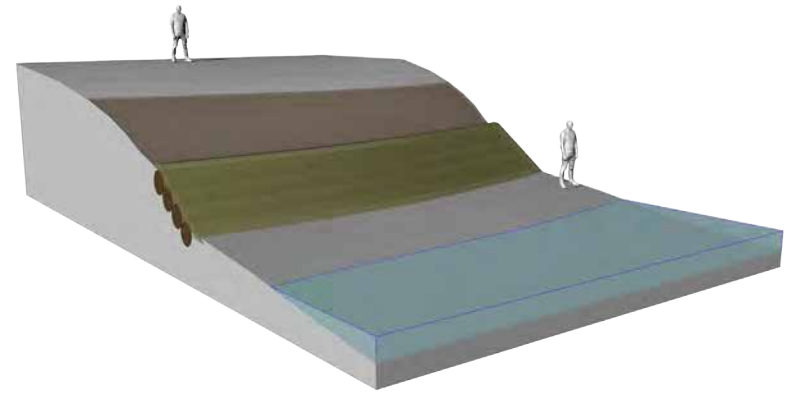
1 2 3 4 5 6 7 8 9





## INSTALLATION & CASE STUDIES

Condition of fiber roll array following  
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1 2 3 4 5 6 7 8 9



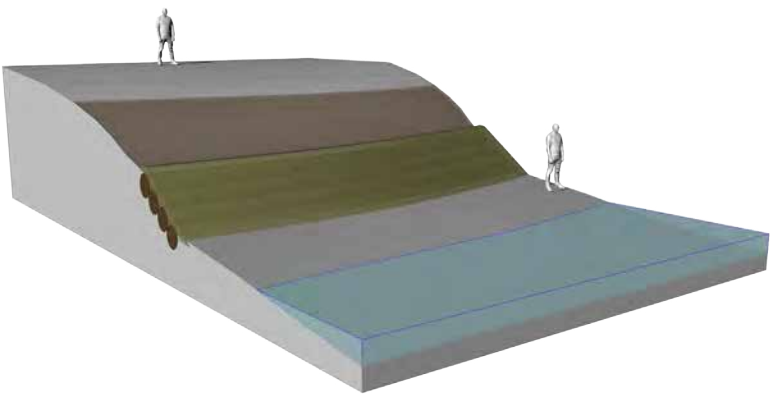
Waves  
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INSTALLATION & CASE STUDIES

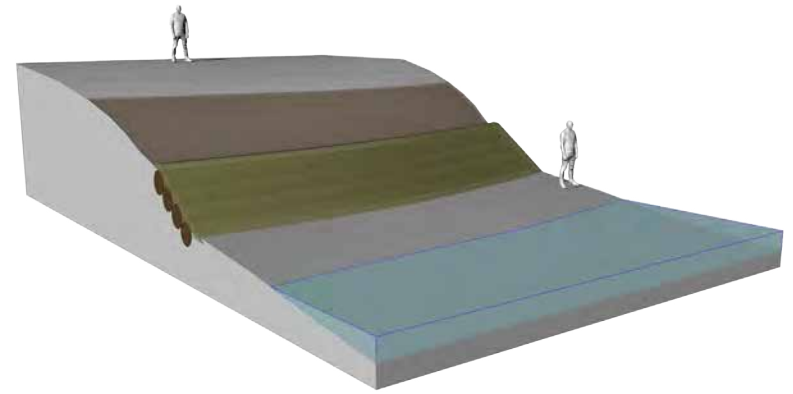
Fiber roll array increased in length by 90'

6/2013





## INSTALLATION & CASE STUDIES

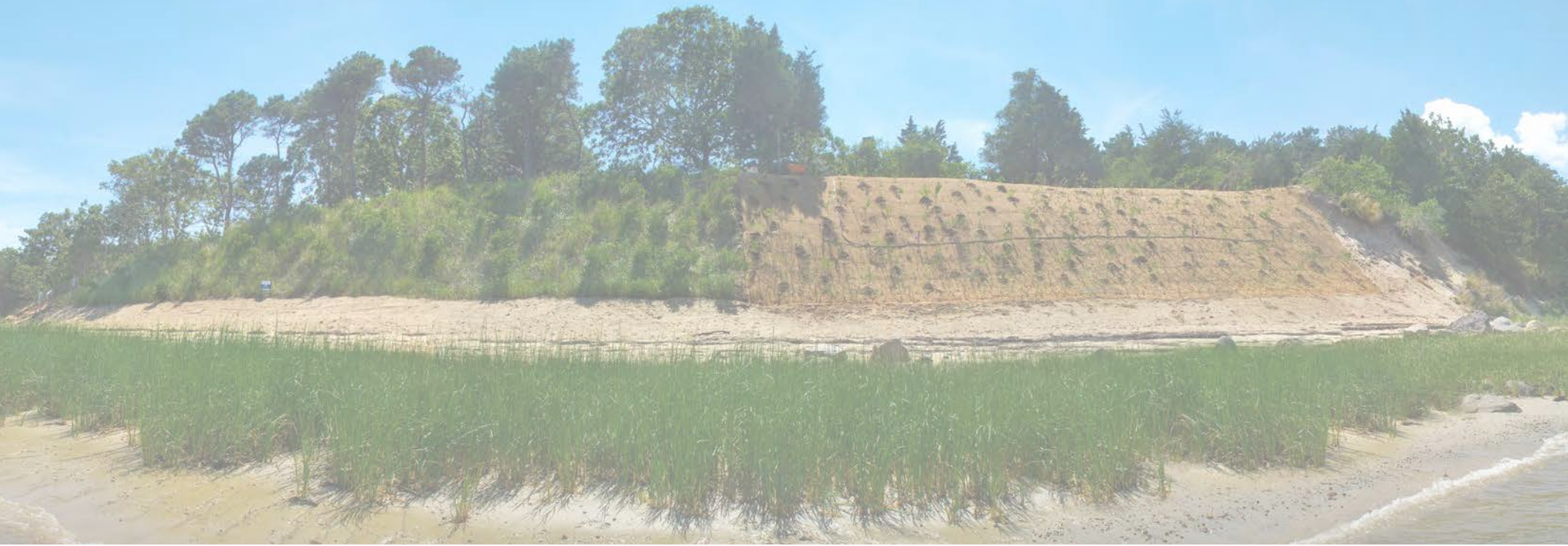


1 2 3 4 5 6 7 8 9 10 11



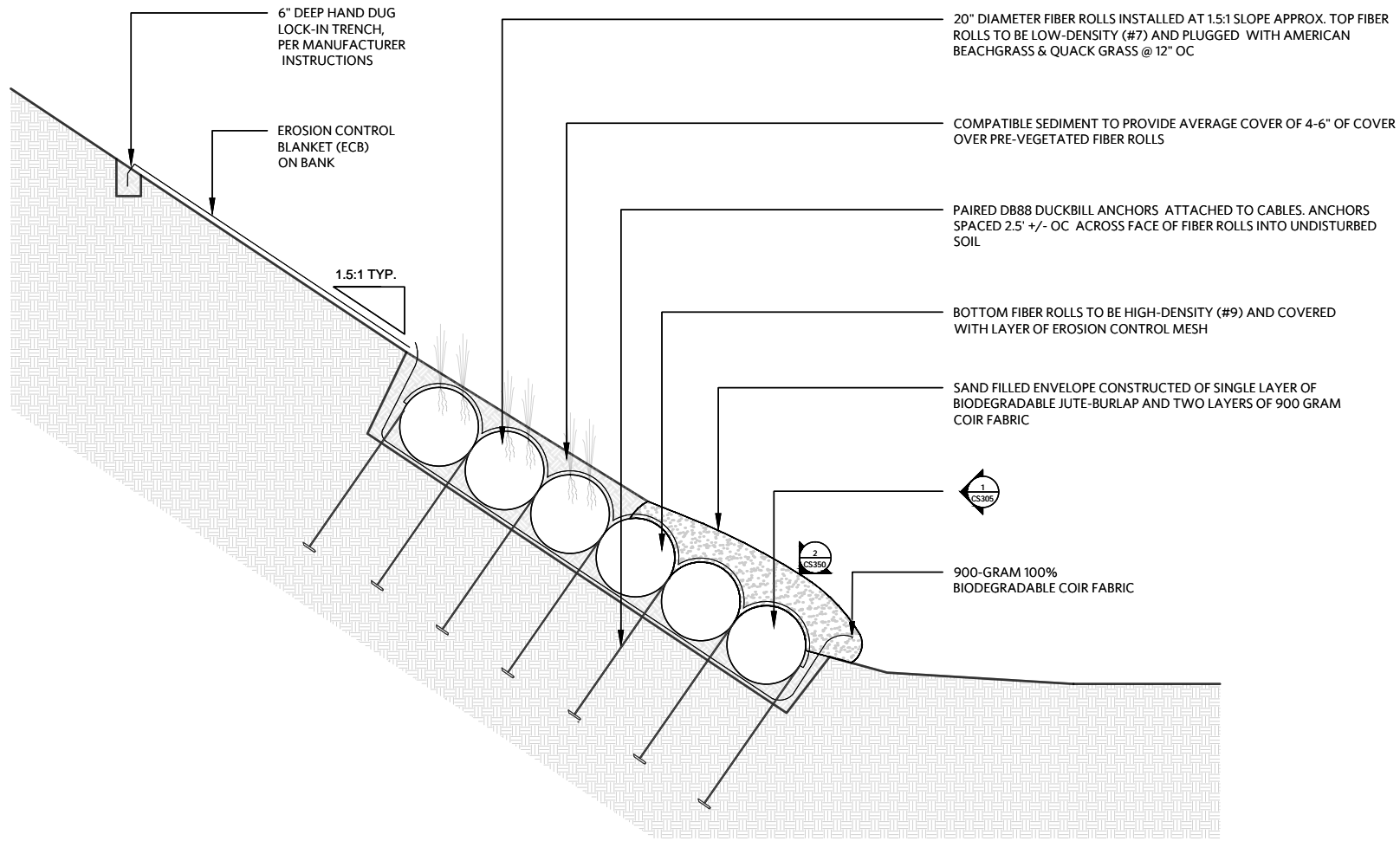


## EVOLUTION OF BIOENGINEERING





EVOLUTION OF BIOENGINEERING  
Sand Envelopes



1

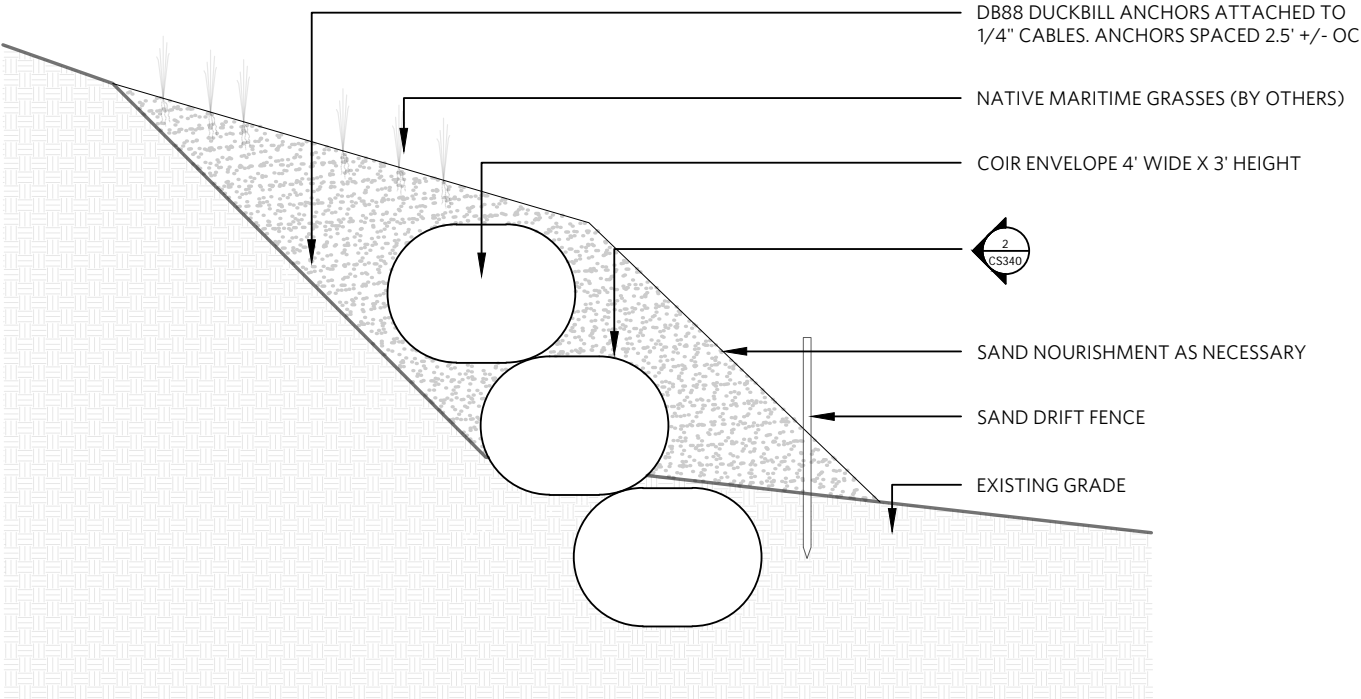
FIBER ROLL SECTION, TYPICAL

DETAIL PROVIDED BY WILKINSON ECOLOGICAL DESIGN, SPECIALISTS IN COASTAL STABILIZATION CONSTRUCTION

Scale: 3/8" = 1'



EVOLUTION OF BIOENGINEERING  
Sand Envelopes



1

COIR ENVELOPE SECTION TYP.

DETAIL PROVIDED BY WILKINSON ECOLOGICAL DESIGN, SPECIALISTS IN  
COASTAL STABILIZATION CONSTRUCTION

Scale: 1/4" = 1'



## EVOLUTION OF BIOENGINEERING Sand Envelopes



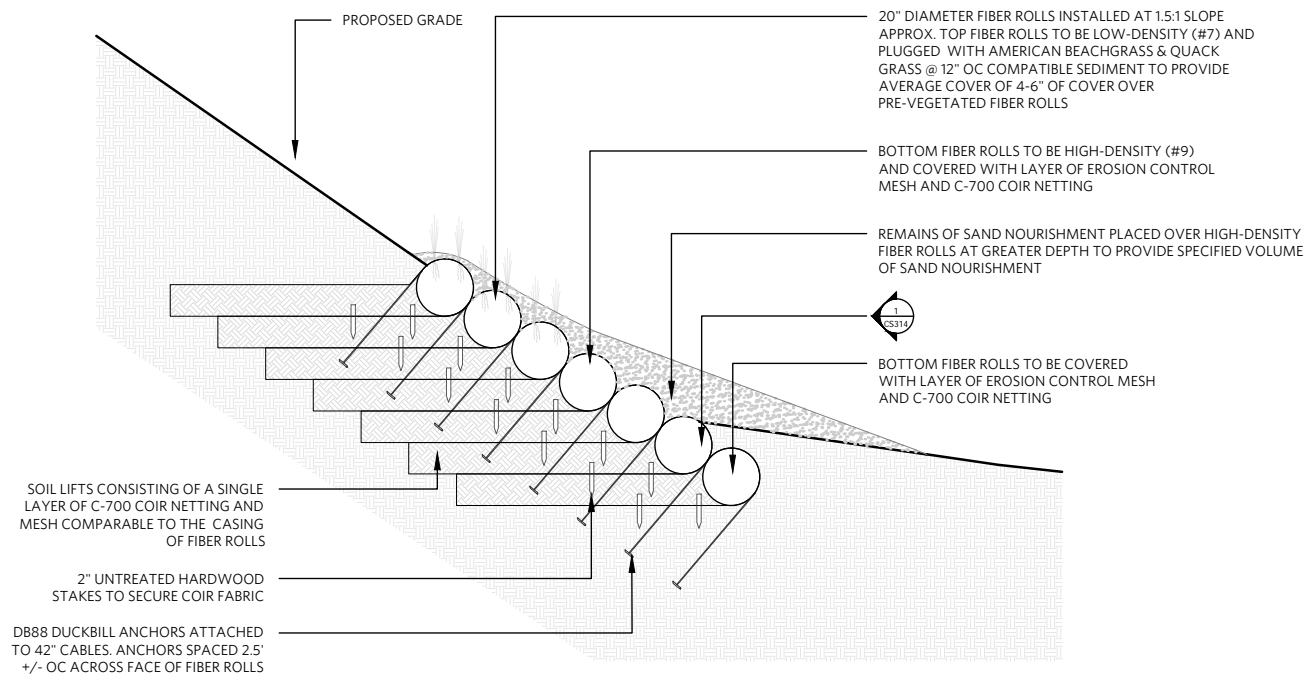


## EVOLUTION OF BIOENGINEERING WILKINSON HYBRID LIFT





EVOLUTION OF BIOENGINEERING  
WILKINSON HYBRID LIFT  
*Patent Pending*

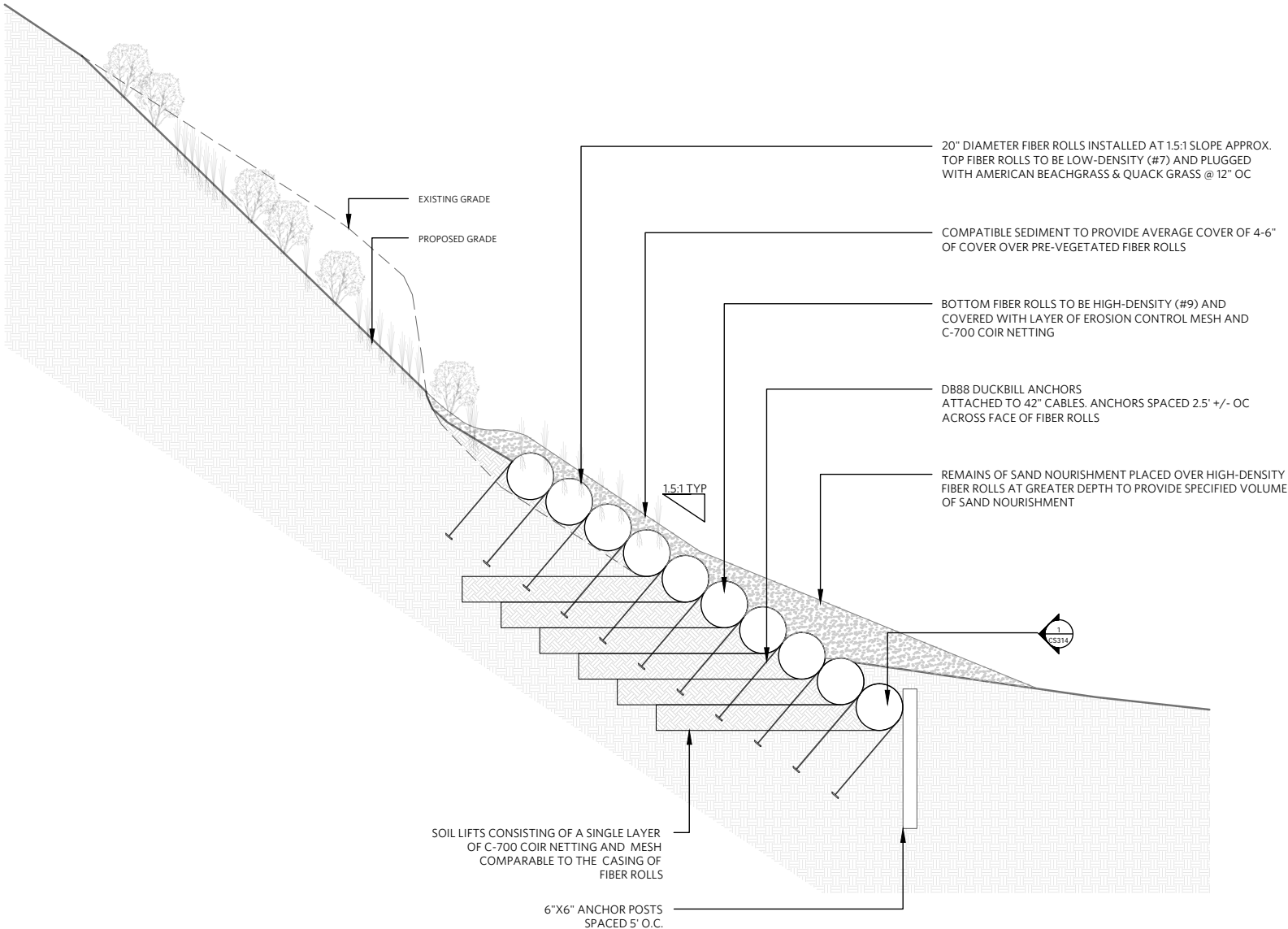


1 FIBER ROLL REINFORCED LIFT SECTION ,TYPICAL  
DETAIL PROVIDED BY WILKINSON ECOLOGICAL DESIGN, SPECIALISTS IN COASTAL STABILIZATION CONSTRUCTION  
PATENT PENDING

Scale: 1/4" = 1'



EVOLUTION OF BIOENGINEERING  
WILKINSON HYBRID LIFT  
*Patent Pending*

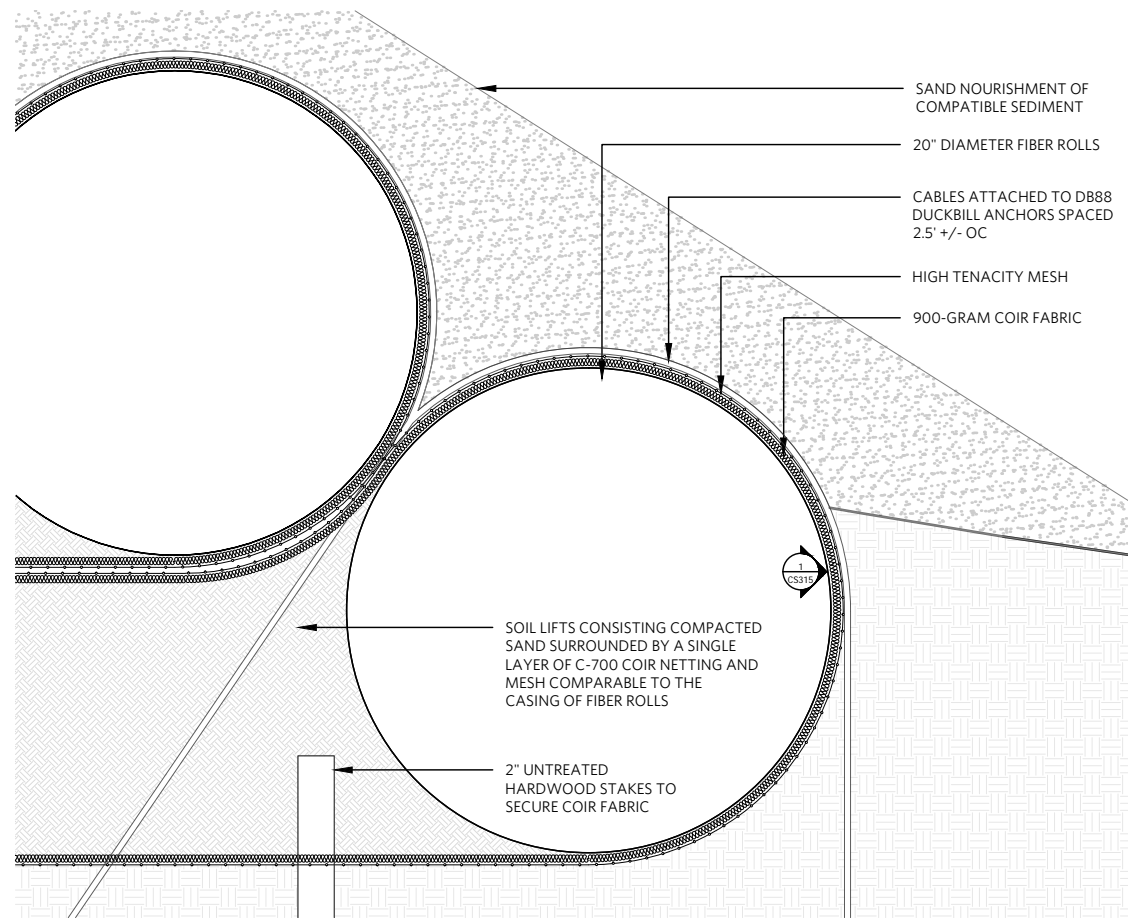


1 FIBER ROLL REINFORCED LIFT SECTION ,TYPICAL

DETAIL PROVIDED BY WILKINSON ECOLOGICAL DESIGN, SPECIALISTS IN COASTAL STABILIZATION CONSTRUCTION  
PATENT PENDING

Scale: 1/4" = 1'

EVOLUTION OF BIOENGINEERING  
WILKINSON HYBRID LIFT  
*Patent Pending*



1 FIBER ROLL REINFORCED LIFT SECTION ,TYPICAL

DETAIL PROVIDED BY WILKINSON ECOLOGICAL DESIGN, SPECIALISTS IN COASTAL STABILIZATION CONSTRUCTION  
PATENT PENDING

Scale: 2" = 1'



# EVOLUTION OF BIOENGINEERING WILKINSON HYBRID LIFT

*Patent Pending*

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# EVOLUTION OF BIOENGINEERING WILKINSON HYBRID LIFT

*Patent Pending*

1 2





# EVOLUTION OF BIOENGINEERING WILKINSON HYBRID LIFT

*Patent Pending*

1 2 3





# EVOLUTION OF BIOENGINEERING WILKINSON HYBRID LIFT

*Patent Pending*

1 2 3 4





# EVOLUTION OF BIOENGINEERING WILKINSON HYBRID LIFT

*Patent Pending*

1 2 3 4 5





# EVOLUTION OF BIOENGINEERING WILKINSON HYBRID LIFT

*Patent Pending*

1 2 3 4 5 6





# EVOLUTION OF BIOENGINEERING WILKINSON HYBRID LIFT

*Patent Pending*

1 2 3 4 5 6 7





# EVOLUTION OF BIOENGINEERING WILKINSON HYBRID LIFT

*Patent Pending*

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*Patent Pending*

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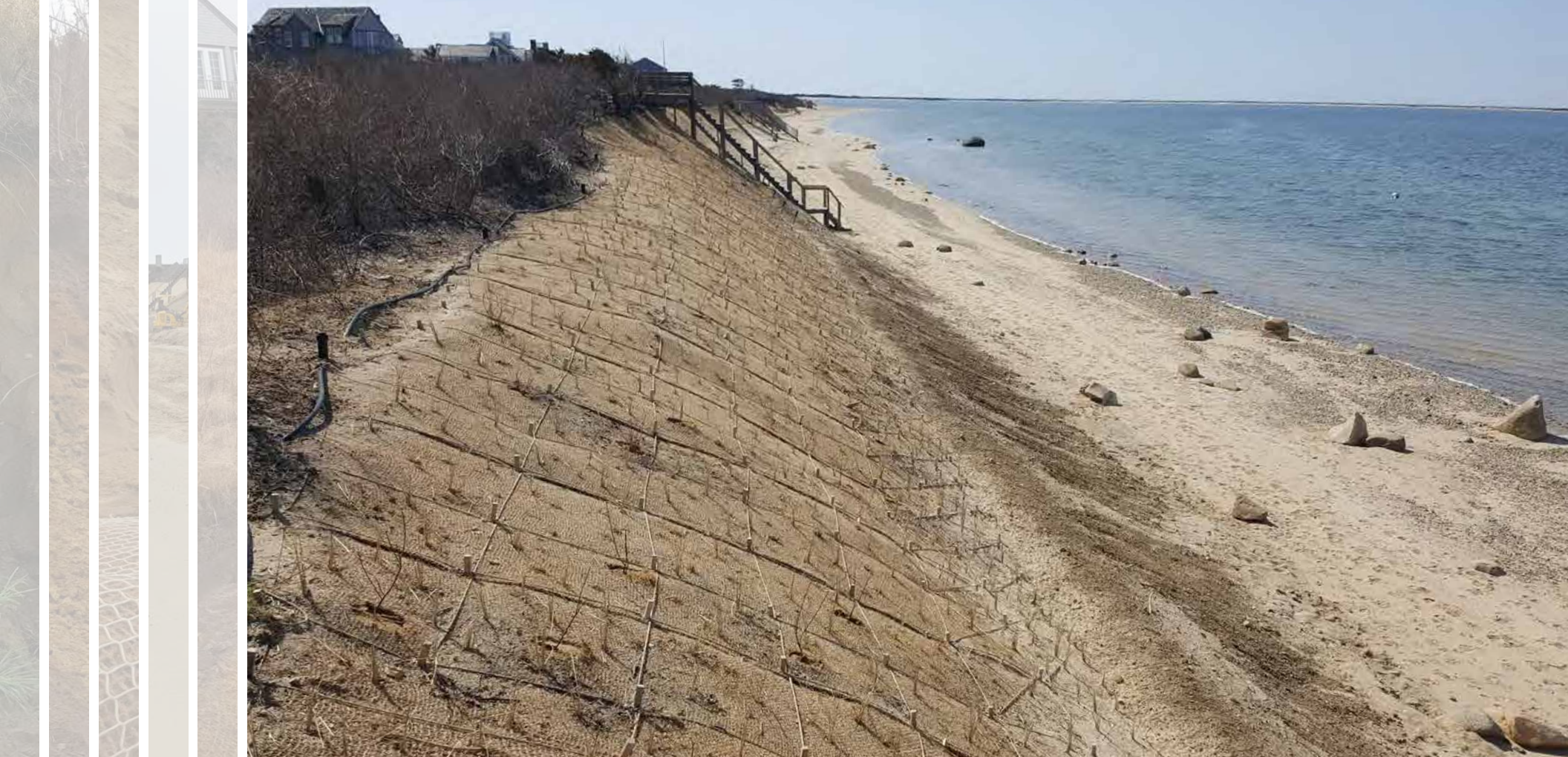




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*Patent Pending*

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