



Submittal Review Response

Project Name: Hilo WWTP Rehabilitation and Replacement Project Phase 1
Submittal No.: 02621-001.0
Date: 4/25/2025

Client: County of Hawai'i Carollo Project No.: 203975
Contractor: Nan, Inc.
Submittal Name: Stabilization Fabric Mirafi 600X
Reviewed By: Bruce DiFranciso

SUBMITTAL REVIEW

Review is for general compliance with contract documents. No responsibility is assumed by Carollo for correctness of quantities, dimensions, and details. No deviation or variation is approved unless specifically addressed in these review comments. Refer to Section 01330 for additional requirements. The Contractor shall assume full responsibility for coordination with all other trades and deviations from contract requirements.

Approved	<input checked="" type="checkbox"/>	No Exceptions
	<input type="checkbox"/>	Make Corrections Noted - See Comments
	<input type="checkbox"/>	Make Corrections Noted - Confirm
Not Approved	<input type="checkbox"/>	Correct and Resubmit
	<input type="checkbox"/>	Rejected - See Remarks
Receipt Acknowledged	<input type="checkbox"/>	Filed for Record
	<input type="checkbox"/>	With Comments - Resubmit

Review Comments:

1. No additional comments

CONTRACTOR SUBMITTAL TRANSMITTAL FORM

Owner:	County of Hawaii	Date:	4/15/2025
Contractor:	Nan, Inc.	Project No.:	WW-4705R
Project Name:	WWTP	Submittal Number:	02621-001.0
Submittal Title:	Stabilization Fabric - Mirafi 600X		
To:	Engineer		
From:	Nan Inc.		

Specification No. and Subject of Submittal / Equipment Supplier			
Spec ##:	02621	Subject:	Stabilization Fabric - Mirafi 600X
Authorized By:	S. Kubo	Date Submitted:	4/15/2025

Submittal Certification	
Check Either (A) or (B):	
<input checked="" type="checkbox"/> (A)	We have verified that the equipment or material contained in this submittal meets all the requirements specified in the project manual or shown on the contract drawings with no exceptions.
<input type="checkbox"/> (B)	We have verified that the equipment or material contained in this submittal meets all the requirements specified in the project manual or shown on the contract drawings except for the deviations listed.
Certification Statement: By this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data, and I have checked and coordinated each item with other applicable approved shop drawings and all Contract requirements.	
General Contractor's Reviewer's Signature:	<i>Stan Kubo</i> for S. Kubo
Printed Name and Title:	Stan Kubo, CQC Manager
In the event, Contractor believes the Submittal response does or will cause a change to the requirements of the Contract, Contractor shall immediately give written notice stating that Contractor considers the response to be a Change Order.	
Firm:	Signature: Date Returned:

PM/CM Office Use
Date Received GC to PM/CM:
Date Received PM/CM to Reviewer:
Date Received Reviewer to PM/CM:
Date Sent PM/CM to GC:

Nan, Inc

PROJECT: HILO WWTP REHABILITATION
AND REPLACEMENT PROJECT - PHASE 1

JOB NO. WW-4705R

THIS SUBMITTAL HAS BEEN CHECKED BY
THIS CONTRACTOR. IT IS CERTIFIED
CORRECT, COMPLETE, AND IN
COMPLIANCE WITH CONTRACT
DRAWINGS AND SPECIFICATIONS. ALL
AFFECTED CONTRACTORS AND
SUPPLIERS ARE AWARE OF, AND WILL
INTEGRATE THIS SUBMITTAL (UPON
APPROVAL) INTO THEIR OWN WORK.

DATE RECEIVED 4/15/2025
SPECIFICATION SECTION # 02621
SPECIFICATION Stabilization Fabric
PARAGRAPH 1.04
DRAWING N/A
SUBCONTRACTOR N/A
SUPPLIER White Cap
MANUFACTURER Sol Max

CERTIFIED BY: S. Kubo

SECTION 02621
STABILIZATION FABRIC

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Woven stabilization fabric used for subgrade enhancement and containment of stabilization material in trench foundations.

1.02 REFERENCES

- A. ASTM International (ASTM):
1. D4355 - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus.
 2. D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
 3. D4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
 4. D4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
 5. D4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile.
 6. D6241 - Standard Test Method for the Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe.

1.03 DEFINITIONS

- A. Stabilization Fabric: Woven geotextile fabric manufactured from polypropylene yarns.

1.04 SUBMITTALS

- ✓ A. Product data.
- 1 B. Samples.
- ✓ C. Quality control submittals:
1. Certificates of Compliance.
 2. Manufacturer's Installation Instructions.

1. Deviation: Samples can be provided if requested. please call D. Herolaga 808-217-4301

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Storage and protection:
1. Furnish stabilization fabric in protective covers capable of protecting the fabric from ultraviolet rays, abrasion, and water.

1.06 PROJECT CONDITIONS

- A. Field measurements:
1. Take field measurements to determine the exact lengths and dimensions of the surfaces to receive the fabric.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. One of the following or equal:
1. Propex, Geotex 315ST.
 2. Ten Cate Geosynthetics, Mirafi 600X.

2.02 MATERIAL REQUIREMENTS

- A. Physical properties: Meet the following minimum requirements:

Property ⁽¹⁾	Test Method	Unit	Requirements ⁽¹⁾
Grab Tensile Strength	ASTM D4632	lbs	315
Grab Elongation	ASTM D4632	%	15
Trapezoid Tear Strength	ASTM D4533	lbs	120
CBR Puncture Resistance	ASTM D6241	lbs	900
UV Resistance (strength retained at 500 hrs)	ASTM D4355	%	70
Apparent Opening Size (AOS)	ASTM D4751	US sieve	40
Permittivity	ASTM D4491	sec ⁻¹	0.05
Flow Rate	ASTM D4491	gpm/ft ²	4
(1) Minimum average roll values.			

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of conditions: Verify that conditions are satisfactory for the installation of stabilization fabric.

3.02 PREPARATION

- A. Surface preparation: During grading operations, take care not to disturb the subgrade. This may require use of lightweight dozers for low strength soils such as saturated, cohesionless, or low cohesion soils.
- B. Prior to placement of fabric: Prepare surface to smooth condition free of debris, depressions, or obstructions that may damage the fabric.

3.03 INSTALLATION

- A. Follow manufacturer's installation instructions and as complimented in this Section.
- B. Place the stabilization fabric smoothly without folds or wrinkles.
- C. Use special care when placing the stabilization fabric in contact with the soil so that no void spaces occur between the stabilization fabric and the prepared surface.
- D. Overlap the parallel rolls and ends of rolls a minimum of 24 inches and not less than recommended by manufacturer.
- E. Do not drag stabilization fabric across subgrade.
- F. Make overlaps at ends of rolls in the direction of the aggregate placement with the previous roll on top.
- G. Use lightweight dozers, if necessary. Do not allow equipment directly on stabilization fabric.
- H. In pipe foundations, completely contain stabilization material (rock) in an envelope of stabilization fabric.

3.04 FIELD QUALITY CONTROL

- A. Inspection: Before covering, the condition of the fabric will be observed by the Engineer to determine that no holes or rips exist in the fabric. Repair all holes or rips by placing a new layer of fabric extending beyond the defect in all directions, a distance equal to the minimum overlap required for adjacent rolls.

END OF SECTION



MIRAFI 600X

MIRAFI® 600X is a woven geotextile composed of polypropylene fibers, which are woven into a stable network such that the fibers retain their relative position. MIRAFI 600X is inert to biological degradation and resists naturally encountered chemicals, alkalis, and acids. MIRAFI 600X meets AASHTO M288 Strength Classes 1, 2, & 3 for Elongation < 50%.

TenCate Geosynthetics Americas (A Solmax Company) is accredited by Geosynthetic Accreditation Institute – Laboratory Accreditation Program ([GAI-LAP](#)).

MECHANICAL PROPERTIES	TEST METHOD	UNIT	MINIMUM AVERAGE ROLL VALUE	
			MD	CD
Grab Tensile Strength	ASTM D4632	lbs (N)	315 (1402)	315 (1402)
Grab Tensile Elongation	ASTM D4632	%	15	15
Trapezoid Tear Strength	ASTM D4533	lbs (N)	120 (534)	120 (534)
CBR Puncture Strength	ASTM D6241	lbs (N)	900 (4005)	
MAXIMUM OPENING SIZE				
Apparent Opening Size (AOS)	ASTM D4751	U.S. Sieve (mm)	40 (0.425)	
MINIMUM ROLL VALUE				
Permittivity	ASTM D4491	sec ⁻¹	0.05	
Flow Rate	ASTM D4491	gal/min/ft² (l/min/m²)	4 (163)	
MINIMUM TEST VALUE				
UV Resistance (at 500 hours)	ASTM D4355	% strength retained	70	
PHYSICAL PROPERTIES	UNIT		ROLL SIZE	
Roll Dimensions (width x length)	ft (m)		12.5 x 360 (3.8 x 110)	
			15 x 300 (4.6 x 91)	
			17.5 x 254 (5.3 x 78.7)	
Roll Area	yd² (m²)		500 (418)	
Roll Weight	lbs (kg)		208 (94)	

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FGS000393 ETQR42



INSTALLATION GUIDELINE

Geotextiles used in filtration and drainage applications



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1. INTRODUCTION

This document is prepared to help ensure that a subsurface drainage geotextile, once installed, will perform its intended design function. To do so, the geotextile must be identified, handled, stored, and installed in such a way that its physical property values are not affected and that the design conditions are ultimately met as intended. This document contains information consistent with generally accepted methods of identifying, handling, storing and installing geotextile materials. Failure to follow these guidelines may result in the unnecessary failure of the geotextile in a properly designed application.

2. MATERIAL IDENTIFICATION, STORAGE AND HANDLING

The geotextile shall be rolled on cores having strength sufficient to avoid collapse or other damage from normal use. Each roll shall be wrapped with a plastic covering to protect the geotextile from damage during shipping and handling, and shall be identified with a durable gummed label or the equivalent, clearly readable on the outside of the wrapping for the roll. The label shall show the manufacturer's name, the style number, and the roll number. Roll identification corresponding to the proposed location of the roll as shown on the construction drawings and as approved by the engineer, owner and contractor can be provided.

While unloading or transferring the geotextile from one location to another, prevent damage to the wrapping, core, label, or to the geotextile itself. If the geotextile is to be stored for an extended period of time, the geotextile shall be located and placed in a manner that ensures the integrity of the wrapping, core, and label as well as the physical properties of geotextile. This can be accomplished by elevating the geotextile off the ground on dunnage and ensuring that it is adequately covered and protected from ultraviolet radiation including sunlight, chemicals that are strong acids or strong bases, fire or flames including welding sparks, temperatures in excess of 60C (140F), and human or animal destruction.

Before unrolling the geotextile, verify the roll identification, length, and installation location with the contract drawings. While unrolling the geotextile, inspect it for damage or defects. Repair any damage that occurs during storage, handling or installation as directed by the engineer. Normally light traffic will not damage the exposed geotextile. However, as a safety precaution, it is recommended that traffic not run on exposed geotextile.

3. FRENCH AND TRENCH DRAINS

A. Site preparation

Excavate the drainage trench to the design dimensions (minimum 8 in/20 cm wide), placing excavated material well away from the sides of the trench. If unstable soil conditions exist, it may be necessary to excavate a trench with sloping sides to ensure wall integrity during the rest of the project. Trim any large roots to be flush with the trench sides to prevent puncturing or tearing the geotextile. Refill any voids with fill dirt so that the excavation sides are smooth.

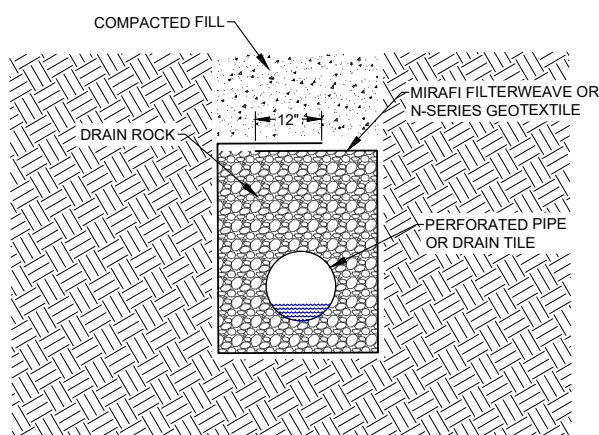


Figure 1a: Typical French drain/underdrain overlap

B. Geotextile placement

Cut geotextile to proper width prior to placement. Width should be enough to conform to the trench perimeter with at least a 12 in (30 cm) top overlap or the trench width (whichever is less), as shown in Figure 1a. Place the geotextile roll over the trench and unroll enough geotextile that the geotextile can be placed down into the trench. Anchor the edges of the geotextile with heavy objects to prevent the geotextile from falling into the trench. Where overlaps are necessary between rolls, allow for 3 ft (7 cm) overlap from the upstream to the downstream roll.

C. Aggregate placement and compaction

If drainage pipes are to be used, place a 3 in (7 cm) to 6 in (15 cm) layer of drainage aggregate on top of the geotextile, then install the drainage pipe.

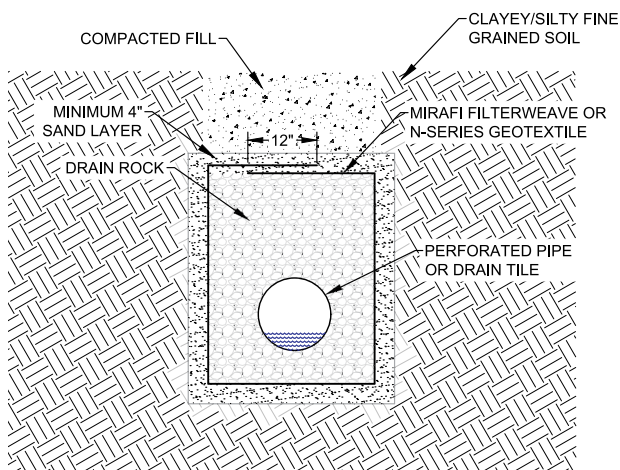


Figure 1b: French drain/underdrain for problematic soils

Fill the trench with the specified aggregate and compact using plate compactors. Ensure that no foreign material is included within the aggregate. Compact aggregate to ensure the geotextile conforms to the excavation sides. Allow for a maximum loose lift thickness of 12 in (30 cm). Fold leftover geotextile over aggregate to form a longitudinal lap. Backfill the trench to the recommended specifications.

Problematic soil conditions (high fines content, dispersive silts and clays, gap graded silts, etc.) that may clog, blind or pipe through the geotextile, should be installed with a minimum 3 in (7 cm) layer of sand encapsulating the geotextile within the trench (Figure 1b). For French drains adjacent to footing structures, a sand layer is not required between the geotextile and the concrete footing /wall, as shown in Figure 1c. The sand retains problematic soils, while the geotextile retains the sand creating a stable filter system.

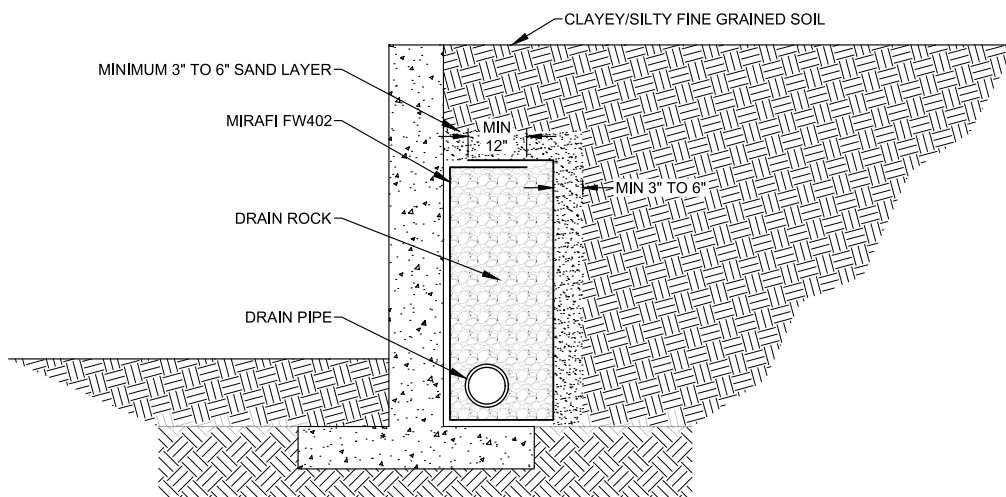


Figure 1c: French drain/underdrain for problematic soils over footing

4. BLANKET DRAINS

A. Site preparation

Grade the soil surface smooth, removing roots, vegetation, and sharp objects that could puncture or tear the geotextile. Fill in any existing surface voids.

B. Initial geotextile layer placement

Place geotextile smoothly and wrinkle-free over the ground surface. Allow enough geotextile to conform to the ground surface, while maintaining the required raft dimensions and completely covering any edge drains/French drains below the blanket drain (Figure 2). If possible, place a single continuous piece of geotextile to line the bottom, sides and top of the blanket drain with a single 1 in (3 cm) overlap over the top of the blanket drain aggregate (Figure 2). If geotextile overlaps at the base of the blanket are necessary (in either direction), use 1 in overlaps for firm soils (CBR ≥ 3) and up to 3 in (7 cm) for softer soils (CBR < 3). Secure with pins if necessary (not required).

C. Drainage aggregate placement

Place aggregate in lifts, avoiding direct equipment operation on the geotextile. Smooth aggregate to the designed thickness. Follow French drain installation procedures (above) to provide drainage below the blanket (if required).

D. Cover geotextile layer placement

Lap the remaining geotextile over the aggregate raft following the same overlap dimension requirements stated above. Smooth wrinkles in the geotextile and secure with pins, sandbags, or heavy objects until cover material is applied.

E. Cover material placement

Place cover material in lifts, avoiding direct equipment operation on the geotextile. Start at the downstream end (if possible) and apply enough material to protect the geotextile from UV degradation.

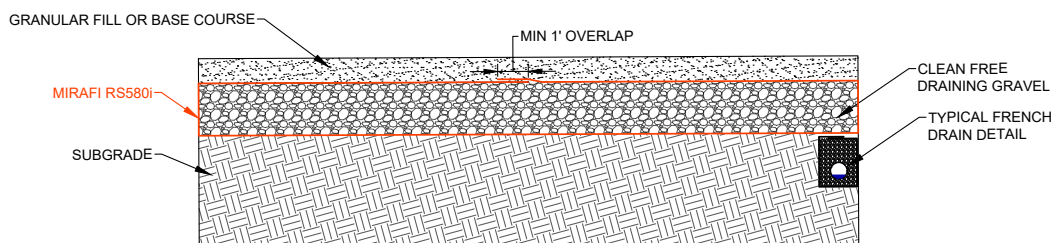


Figure 2: Blanket drain

5. BANK STABILIZATION / ROCK (ARMOR STONE) UNDERLAYMENT

A. Site preparation

Clear the site of large stones, roots, or other debris that could damage the geotextile. Excavate and shape the site to the lines and grades as directed by the engineer. Fill depressions or holes to ensure intimate contact between the geotextile and the prepared surface.

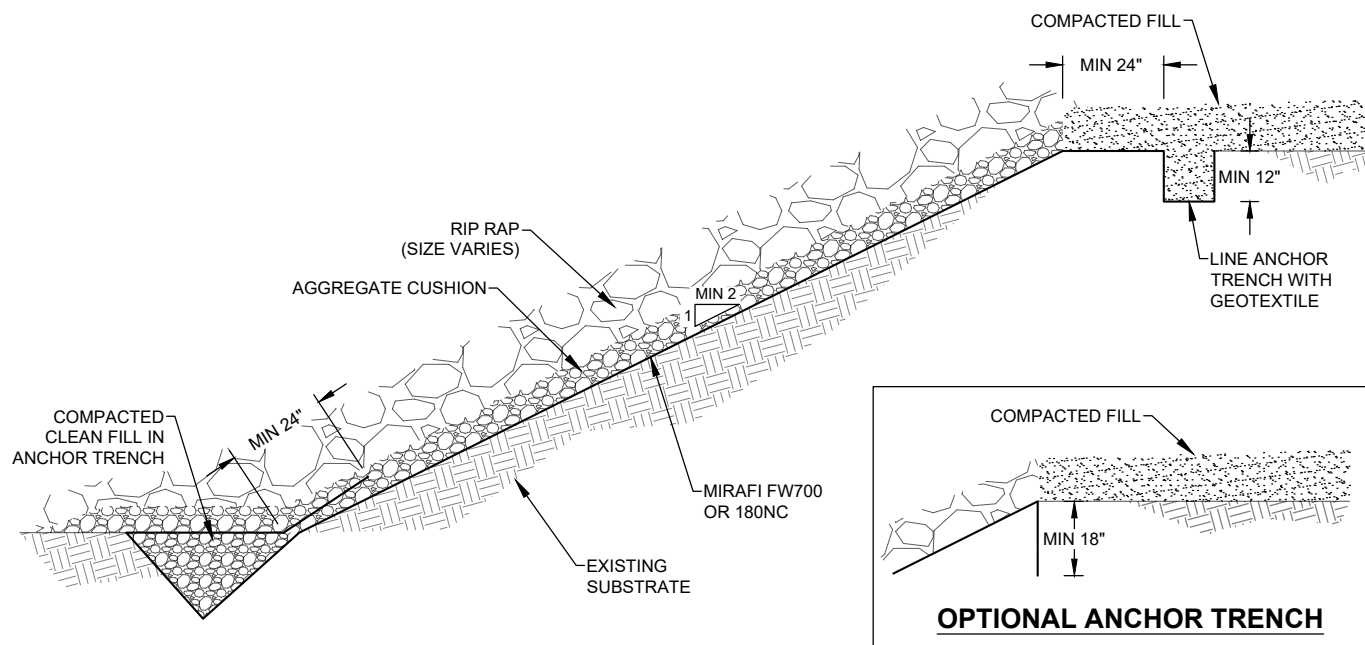


Figure 3: Permanent erosion control using Armor stone

Place the geotextile in close contact with the soil, eliminating folds or excessive wrinkles both longitudinally and transversely (Figure 3). Tension is not required on the geotextile prior to placement of armor stone or other materials. Use care in placing the geotextile to avoid possible damage. The geotextile shall be placed with the machine direction parallel to the direction of water flow, which is normally parallel to the slope for erosion control runoff and wave action (Figure 3), and parallel to the stream or channel in the case of streambank and channel protection.

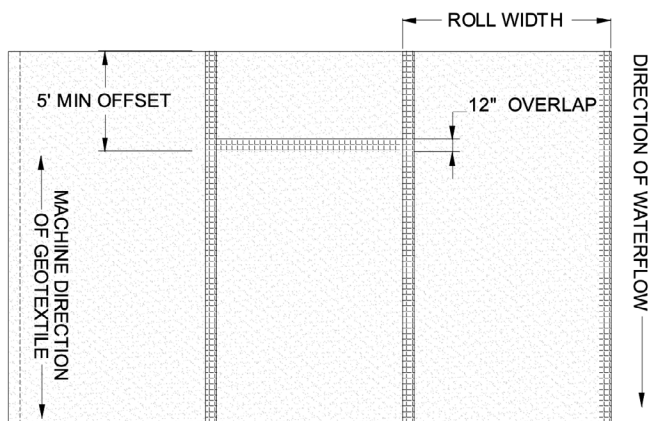


Figure 4: Geotextile overlap and offset below Armor

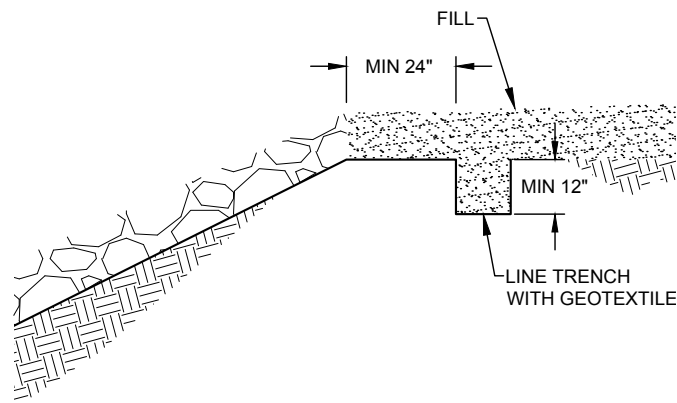


Figure 5a: Typical Armor stone anchor trench

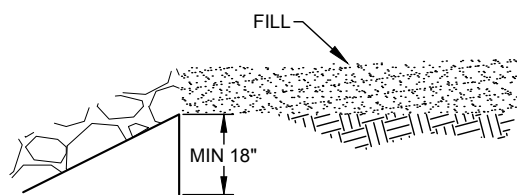


Figure 5b: Armor stone anchor trench (ow runoff)

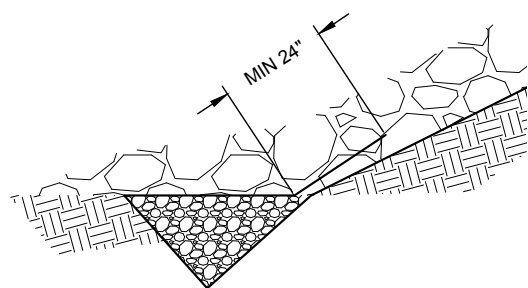


Figure 5c: Armor stone toe anchor

slopes without anticipated wave action or lower water flow from runoff, the geotextile may be placed along one edge of a 0.46 m (18 in) trench, as shown in Figure 5b. To ensure good anchorage in the trench compact soil thoroughly.

When placing geotextile along a stream or other places where water movements are expected, anchor the toe of the geotextile with a minimum 2 ft (0.6 m) upslope overlap, as shown in Figure 5c, to prevent scouring beneath it.

B. Rock (Armor) placement

Stone or armor block may be placed directly (without a cushion layer) on **MIRAFI** products shown in Table 1, below or as directed by the project engineer. Use of lighter nonwoven geotextiles, such as **MIRAFI 180N**, that only meet minimum AASHTO Class I specifications, may require the placement of an aggregate cushion before placement of armor stone (Figure 6). The cushion layer should be a minimum 6 in (15 cm) thick aggregate bedding layer designed to be compatible with the armor layer being placed directly above it. Armor stone and heavy rock cover shall not be dropped onto the geotextile from a height of more than 1 ft (0.3 m). Slope protection and smaller sizes of rock cover shall not be dropped onto the geotextile from a height exceeding 3 ft (1 m). Any geotextile damaged during placement shall be replaced as directed by the project engineer (typically a patch that extends 3 ft (1 m) beyond the edge of damage). Following placement of the armor stone, grading of the slope shall not be permitted if the grading results in movement of the stone directly above the geotextile.

Geotextiles can be joined by overlapping or sewing. The minimum overlap distance in the transverse or longitudinal direction is 12 in (30 cm), as shown in Figure 4, except in underwater installations where the minimum overlap is 3 ft (1 m). Sewn seams are allowed if the overlap in the transverse or longitudinal direction is at least 6 in (15 cm). In cases where wave action or multidirectional flow is anticipated, all seams perpendicular to the direction of flow shall be sewn.

To expedite construction on steeper slope conditions, 0.45 m (18 in) anchoring pins placed on 2–6 ft (0.6–1.8 m) centers (depending on the slope soils of the covered area) may be used.

Anchor the geotextile firmly at the top of the slope using an anchor trench. For maximum effectiveness, the trench should be at least 2 ft (0.6 m) from the crest of the slope and at least 1 ft (0.3 m) deep, as shown in Figure 5a. For

Recommended MIRAfi geotextiles for stone armor sizes (D50) without a cushion layer		
D50 of 6-16 in (30-220 lbs)	D50 of 14-18 in (180-550 lbs)	D50 > = 20 in (800-2000 lbs)
MIRAfi FW700, MIRAfi FW404 (granular soils only) MIRAfi 180N	MIRAfi FW700, MIRAfi 180NC, MIRAfi RS580i (for granular soils only)	MIRAfi 1100NC (< 800 lbs) MIRAfi S1600 (2000 lbs) MIRAfi RS580i (for granular soils only)

Note: Weight of armor stone based on typical stone specific gravity of 155 pcf.

Table 1

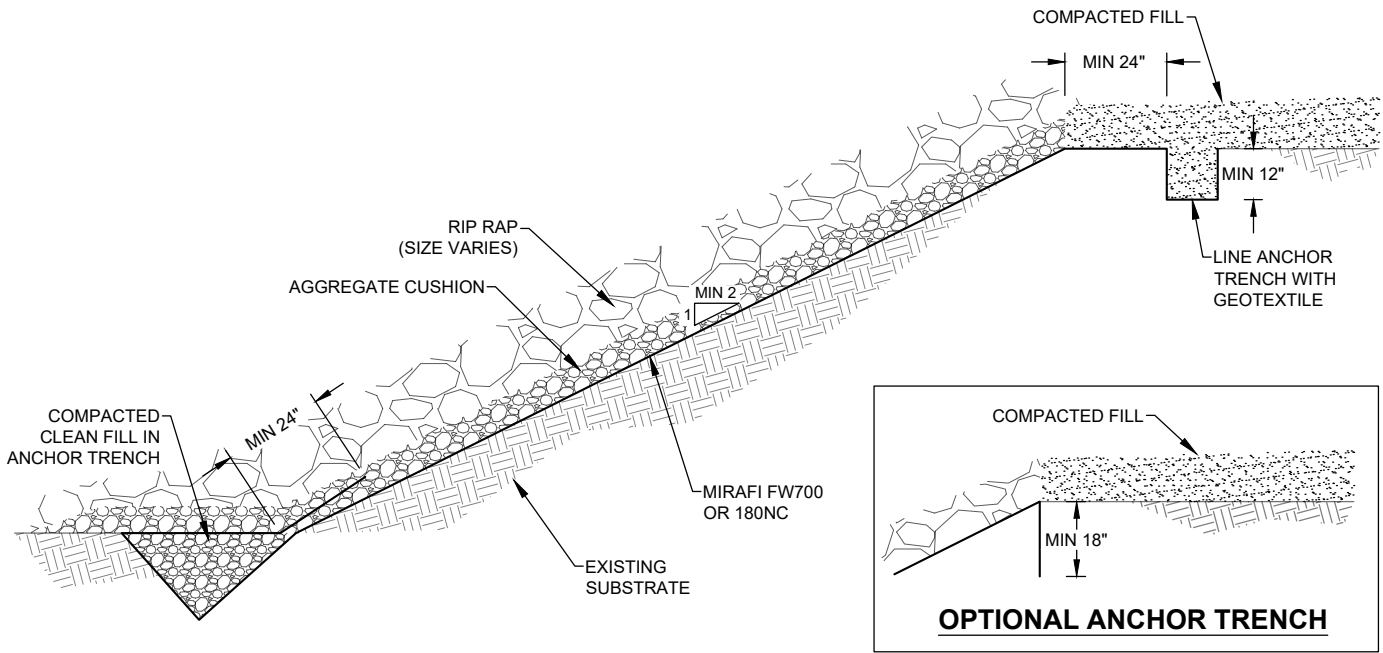


Figure 6: Permanent erosion control with cushion layer