

DESIGN SPECIFICATION

1.6 Runoff Diversion - Compost Filter Sock

PURPOSE & DESCRIPTION

Filtrex SiltSoxx[®] (Soxx) is a three-dimensional tubular runoff and erosion control device used for **diversion or redirection of runoff** otherwise flowing to disturbed or highly erodible areas on and around construction activities. Runoff diversion can be used as temporary or permanent runoff diversion device used to prevent soil erosion during excavation, or prior to erosion control practice installation, vegetation establishment, or final stabilization.

APPLICATION

Runoff diversion is generally used upslope of areas undergoing excavation. Runoff diversion is effective at diverting sheet flow runoff coming from stabilized areas and otherwise flowing to unstable or bare soils while excavation and grading is in progress. Runoff diversion should direct runoff flows to stabilized channels, heavily vegetated areas, on to flat surfaces, infiltration zones, collection ponds, or storm inlets. Runoff diversion can also be used for temporary diversion on paved surfaces to protect disturbed soils adjacent to paved areas. Where hill slopes are greater than 5%, hydraulic shear stress is greater than 3 lbs/ft² (15 kg/m²), or runoff velocity is greater than 6 CFS (0.17 CMS) additional erosion control measures to help stabilize the area where flow is being directed and potentially concentrated or channeled should be utilized (KY TC, 2006). Filtrex channel protection (3.5) may be used to stabilize channels where runoff is conveyed or concentrated. Runoff diversion devices and practices should be utilized early in the soil disturbance and construction process. Appropriate applications for runoff diversion devices include (Fifield, 2001):

- diversion of runoff away from disturbed areas and to stabilized outlets or storm inlets,
- diversion of sediment-laden water to a sediment containment or storm water treatment system,
- diversion of runoff into a conveyance channel to improve site working conditions (but does not otherwise increase erosion),
- prevention of sediment-laden runoff or storm water from leaving site perimeter.

For temporary applications, runoff diversion does not need to be seeded; however, for permanent runoff diversion the device should be direct seeded at the time of application, as vegetation will prevent UV degradation of the device. Runoff diversion may also be used in sensitive environmental areas, where migration of wildlife may be impeded by the use of fences or trenching may damage plant roots.

It is possible to drive over runoff diversion during construction; however, these areas should be immediately repaired by manually moving back into place, if disturbed. Continued heavy construction traffic may destroy the fabric, reduce the dimensions, and reduce the effectiveness of the runoff diversion.

ADVANTAGES AND DISADVANTAGES

Advantages

- Runoff diversion can be used on hill slopes to divert storm water runoff and prevent soil erosion in unprotected or highly erodible soils.
- Tubular construction allows for heavier and denser barrier for added stability on slopes subject to storm water runoff flows.
- Greater surface area contact with soil than typical runoff control devices, reducing potential for runoff to create rills under the device.

- No trenching is required, therefore soil and plant roots are not disturbed upon installation.
- Runoff diversion can be installed year-round in difficult soil conditions such as frozen or wet ground, and dense and compacted soils, as long as stakes can be driven.
- Runoff diversion is easily implemented as a treatment in a greater treatment train approach to any erosion and sediment control plan.
- Runoff diversion can be easily installed on top of rolled erosion control blankets, bonded fiber matrices, soil stabilizers, slope protection, and channel protection; or adjacent to rip rap.
- Soxx (mesh netting containment system) allow runoff diversion to be placed in areas of high sheet flow and low concentrated flow, unlike conventional (loose) filter berms.
- Runoff diversion can be direct seeded at time of application to provide greater stability and anchoring once vegetation is established.
- Runoff diversion can be used as a temporary or permanent runoff and erosion control practice.
- GrowingMedia[™] is organic and can be left on site after permanent stabilization is complete, used in landscape design, and/or seeded and planted with permanent vegetation.
- GrowingMedia improves existing soil structure if spread out and used as a soil amendment after construction activity is complete.
- Biodegradable runoff diversion can be left on site after construction activity and may eliminate the need for removal and labor and disposal costs.
- Runoff diversion is less likely to obstruct wildlife movement and migration than planar/fence runoff control devices.
- Runoff diversion is available in 8 in (200mm), 12 in (300mm), 18 in (450mm), 24 in (600mm), and 32 in (800mm) diameters for customized applications and challenging situations.
- Runoff diversion is available in 200 ft (61 m) lengths to prevent weak sections and creation of concentrated flow situations typical to low points in runs of other runoff control devices. End points are sleeved together to create continuous unlimited lengths.
- Runoff diversion may assist in qualification for LEED[®] Green Building Rating and Certification credits under LEED Building Design & Construction (BD+C), New Construction v4. Awarded credits may be possible from the categories of Sustainable Sites, Water Efficiency, Materials & Resources, and Innovation. *Note: LEED is an independent program offered through the U.S. Green Building Council. LEED credits are determined on a per project basis by an independent auditing committee. Filtrex*

ADVANTAGES

	LOW	MED	HIGH
Installation Difficulty	✓		
Durability			✓
Runoff Control		✓	
Erosion Control		✓	
Sediment Control		✓	

neither guarantees nor assures LEED credits from the use of its products. LEED is a trademark of the U.S. Green Building Council.

Disadvantages

- If filler material of runoff diversion is not Filtrexx® CertifiedSM GrowingMediaTM, runoff diversion and/or vegetation growth may be diminished.
- If not installed correctly, maintained or used for a purpose or intention that does not meet specifications, performance may be diminished.
- If land surface is extremely bumpy, rocky, or changes elevation abruptly ground surface contact to runoff diversion may be diminished, thereby adversely effecting performance.
- Runoff diversion should not be the only form of site erosion control.
- Runoff diversion should not be used for filtration of storm water runoff.
- Runoff diversion is not used for perimeter control of sediment.
- Runoff diversion should only be used on hill slopes and never in intermittent, ephemeral, or perennial streams.
- Runoff diversion which concentrate runoff flow may require additional erosion control or soil stabilization practices such as erosion control blankets, turf reinforcement mats, Filtrexx channel protection, or rip rap.

MATERIAL SPECIFICATIONS

Runoff diversion uses only photodegradable or biodegradable netting materials available from Filtrexx International and are the only mesh materials accepted in creating runoff diversion for any purpose. For Soxx Material Specifications see Table 6.1.

GROWINGMEDIA™ CHARACTERISTICS

Runoff diversion typically use only Filtrexx GrowingMedia which is a fine composted material that is specifically designed for diversion of storm water runoff, and establishment and sustainability of plant vegetation. At the discretion of the Engineer, soil or sand may be added to the GrowingMedia to add weight and ballast to the runoff diversion. Performance parameters include: hydraulic flow-through rate, percent cover of vegetation, water holding capacity, pH, organic matter, soluble salts, moisture content, biological stability, percent inert material, bulk density and particle size distribution. For information on the physical, chemical, and biological properties of Filtrexx GrowingMedia refer to Filtrexx Design Manual, section 5.2.

PERFORMANCE

Testing conducted at the Soil Control Lab, Inc. under simulated runoff conditions of sediment-laden water found that hydraulic flow-through rates for GrowingMedia used in runoff diversion is less than 1 gpm/linear ft (1 L/min/m). Adding soil to the GrowingMedia may further reduce hydraulic flow-through rates. Field testing conducted by Filtrexx International has shown that vegetation establishment can be near 100%. Figure 6.2 depicts a vegetated runoff diversion.

For a summary of design specifications and performance testing results see Table 6.1 and Table 6.2 Note: the Contractor is responsible for establishing a working erosion and sediment control system and may, with approval of the Engineer, work outside the minimum construction requirements as needed. Where the Runoff diversion deteriorates or fails, it shall be repaired or replaced with an effective alternative.

DESIGN CRITERIA

Runoff diversion is physical barriers designed to redirect or divert sheet flow runoff away from soil surfaces that have not been stabilized or are prone to water erosion. Runoff diversion should be used to intercept and convey runoff flows to non-erodable surfaces, drainage channels, or sediment ponds. This practice will prevent runoff from entering highly erodable areas and will reduce rill and gully erosion. For stabilized channel and drainage system specifications and design see Filtrexx Channel Protection (3.5). Ultimately, runoff conveyance and drainage should lead to infiltration zones, heavily vegetated areas, or sediment/storm water treatment ponds.

To increase the weight of the runoff diversion blending GrowingMedia with native soil and/or sand is acceptable. Blends should displace no more than 50% (by volume) of the GrowingMedia typically used within the runoff diversion. Blends should consider the potential affects on vegetation if runoff diversion will be seeded or used to support live stakes.

Design Height

A 4 in (100mm) minimum vertical distance from the waterline to the top of the runoff diversion (freeboard) is recommended. For most standard runoff diversion applications, an 18 in (450mm) diameter runoff diversion is recommended (see Figure 6.1); however, where runoff flow may concentrate or sheet flow may be extreme a 24 in (600mm) or 32 in (800mm) diameter runoff diversion may be used.

Three or more runoff diversion Soxx may be stacked in a pyramid configuration to achieve a greater height or greater lateral stability, if desired (see Figure 6.1). Vegetation may be direct seeded at the time of installation resulting in enhanced performance and stability (see Figure 6.2 for an example). For a summary of specifications for product/practice use, performance and design see Table 6.1 and Table 6.2.

Slope Degree and Runoff Flow

Runoff diversion must be placed on slopes of at least 1% to effectively divert and convey runoff without ponding. If runoff diversion is to be used on hill slopes greater than 5% soil stabilization or armoring practices may be necessary to prevent erosion from concentrated flows and/or conveyance channels. Concentrated runoff flows with hydraulic shear stress greater than 3 lbs/ft² (15 kg/m²) or velocity greater than 6 ft/sec (2 m/sec) should also use stabilization or armoring devices to prevent erosion. Runoff diversion should not be used on slopes steeper than 2:1. Runoff from undisturbed lands should be directed and discharged to an outlet that has been protected by approved practices such as channel protection, rip rap or turf reinforcement mats. Sediment-laden runoff should be directed to a designed sediment containment or treatment system. Installation and utilization of runoff diversion devices should be done early in the construction process (Fifield, 2001). Correct installation and maintenance is especially important for proper function and performance.

Land Placement:

Runoff diversion should be placed on smooth ground and even surfaces to prevent undercutting or excessive ponding and overtopping by runoff. Placing runoff diversion on undisturbed soil will reduce the potential for undercutting.

Directing Flow:

In order to prevent water flowing around the ends of runoff diversion, 5 ft (1.5m) of the end at highest elevation should be constructed pointing slightly upslope and into any existing vegetation. This will ensure runoff will flow along the down gradient of runoff diversion. The trailing edge of the device should point down slope to direct runoff flow to appropriate outlet, containment, or treatment systems already described.

Permanent Application: (Vegetated Filter Strip)

For permanent runoff control, runoff diversion can be direct-seeded to allow vegetation to establish directly in the device, and seeding may be expanded to 5 ft (1.5m) upslope and downslope from the device, to increase performance. Vegetation on and around the runoff diversion will assist in slowing runoff velocity, and increase the structural stability and anchoring of the device for long term use. Additionally, runoff control by the device may increase the stability and sustainability of plant establishment and growth where runoff is prone to destabilize vegetation. The option of adding vegetation will be at the discretion of the Engineer. No additional soil amendments or fertilizer are required for vegetation establishment in the Runoff diversion. See Figure 6.2 for an example of a vegetated Runoff diversion.

INSTALLATION

1. Runoff diversion used for runoff and erosion control shall meet Filtrex Soxx Mesh Material and Filtrex Certified FilterMedia specifications.
2. Call Filtrex at 877-542-7699 or visit www.filtrex.com for a current list of installers and distributors of Filtrex products.
3. Runoff diversion will be placed at locations indicated on plans as directed by the Engineer.
4. Runoff diversion shall be installed above and adjacent to areas of unprotected soil or areas prone to soil erosion.
5. Runoff diversion shall be installed where 5 ft (1.5m) of the end at highest elevation shall be constructed pointing slightly upslope and into any existing vegetation.
6. Runoff diversion shall be installed so trailing end of the device points down slope to prevent ponding of runoff.
7. Runoff diversion shall lead sheet and shallow concentrated runoff from vegetated/stabilized soil areas to stabilized channels, vegetated areas, level areas, high infiltration zones, or collection ponds.
8. Runoff diversion shall be placed on slopes 1% or greater to allow effective runoff conveyance and to prevent ponding.
9. Runoff diversion installed on slopes greater than 5% may require erosion control/soil stabilization practices where runoff flow is concentrated or conveyed.
10. Runoff diversion should not be used on slopes greater than 2:1.
11. Stakes shall be installed through the middle of the runoff diversion on 10 ft (3m) centers, using 2 in (50mm) by 2 in (50mm) by 3 ft (1m) wooden stakes.
12. Staking depth for sand and silt loam soils shall be 12 in (300mm), and 8 in (200mm) for clay soils.
13. If the runoff diversion is to be a permanent runoff diversion device or part of the natural landscape, it may be seeded at time of installation for establishment of permanent vegetation. The Engineer will specify seed requirements.
14. Loose GrowingMedia used for backfilling and extension of filter strip may also be seeded. The Engineer will specify seed requirements.

See design drawing details for correct runoff diversion installation (Figure 6.1).

INSPECTION

Routine inspection should be conducted within 24 hrs of a runoff event or as designated by the regulating authority. Runoff diversion should be regularly inspected to make sure they maintain their shape and are adequately diverting storm runoff. If ponding becomes excessive, additional runoff diversion may be required, sediment or debris removal may be necessary, or the device may need to be adjusted to allow gravitational flow of water down slope. A freeboard height of 4 in (100mm) below the top edge of the device must be maintained at all times.

Runoff diversion shall be inspected until the entire area has been permanently stabilized and construction activity has ceased.

MAINTENANCE

1. The Contractor shall maintain the runoff diversion in a functional condition at all times and it shall be routinely inspected.
2. If the runoff diversion has been damaged, it shall be repaired, or replaced if beyond repair.
3. The Contractor shall remove sediment and debris at the base of the upslope side of the runoff diversion when accumulation has reached 1/2 of the effective height of the Soxx or as directed by the Engineer.
4. A freeboard height of 4 in (100mm) below the top edge of the device must be maintained throughout the life of the device.
5. Runoff diversion shall be maintained until the hill slope has been permanently stabilized and construction activity has ceased.
6. The GrowingMedia will be dispersed on site once disturbed area has been permanently stabilized, construction activity has ceased, or as determined by the Engineer.

For runoff diversion and erosion control exceeding 1 year, runoff diversion can be seeded at the time of installation to create a permanent runoff and erosion control system. Vegetation will add stability to the device and will reduce UV degradation of the system. The appropriate seed mix shall be determined by the Engineer.

DISPOSAL/RECYCLING

GrowingMedia is an organic, composted product manufactured from locally generated organic, natural, and biologically based materials. Once all soil has been stabilized and construction activity has been completed, the GrowingMedia may be dispersed with a loader, rake, bulldozer or similar device and may be incorporated into the soil as an amendment or left on the soil surface to aid in permanent seeding or landscaping. Leaving the GrowingMedia on site reduces removal and disposal costs compared to other temporary runoff diversion devices. The mesh netting material will be extracted from the GrowingMedia and disposed of properly by the Contractor. The photodegradable mesh netting material (Soxx) may degrade if left on site. Biodegradable mesh netting material is available and may eliminate the need and cost of removal and disposal. As an alternative, vegetated Runoff diversion can be left on-site as permanent runoff diversion and erosion control devices used to redirect storm runoff and reduce stress from sheet flow on permanent vegetation.

METHOD OF MEASUREMENT

Bid items shall show measurement as 'X inch (X mm) diameter Filtrex® Runoff Diversion/SiltSoxx per linear ft (linear meter), installed.

Engineer shall notify Filtrex of location, description, and details

of project prior to the bidding process so that Filtrexx can provide design aid and technical support.

FIELD APPLICATION PHOTO REFERENCES



Pyramid stacked installation



24 in Runoff Diversion for High Storm Flow



Pyramid stacked installation



Runoff diversion

ADDITIONAL INFORMATION

For other references on this topic, including additional research reports and trade magazine and press coverage, visit the Filtrexx website at filtrexx.com

Filtrexx International, Technical Support
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Call for complete list of international installers and distributors.

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Table 6.1. Filtrex SiltSoxx® Mesh Material Specifications.

Material Type	NATURAL ORIGINAL (Cotton Fiber)	NATURAL PLUS (Wood Fiber)	BASIC (5 mil High Density Polyethylene HDPE)	BASIC PLUS (Multi-Filament Polypropylene MFPP)	DURABLE (Multi-Filament Polypropylene MFPP)	ORIGINAL / DURABLE PLUS / DURASOXX HD (Multi-Filament Polypropylene MFPP)	EXTREME (Multi-Filament Polypropylene MFPP)
Material Characteristic	Biodegradable	Biodegradable	Photodegradable	Photodegradable	Photodegradable	Photodegradable	Photodegradable
Design Diameters	5 in (125mm), 8 in (200mm), 12 in (300mm)	5 in (125mm), 8 in (200mm), 12 in (300mm)	8 in (200mm), 12 in (300mm), 18 in (400mm)	8 in (200mm), 12 in (300mm), 18 in (400mm), 24 in (600mm), 32 in (800mm)	5 in (125mm), 8 in (200mm), 12 in (300mm), 18 in (400mm), 24 in (600mm), 32 in (800mm)	5 in (125mm), 8 in (200mm), 12 in (300mm), 18 in (400mm), 24 in (600mm)	8 in (200mm), 12 in (300mm)
Mesh Opening	1/8 in (3mm)	1/8 in (3mm)	3/8 in (10mm)	3/8 in (10mm)	1/8 in (3mm)	1/8 in (3mm)	1/16 in (1.5mm)
Tensile Strength (ATSM D4595) ¹	MD: 193 lbs TD: 158 lbs	MD: 210 lbs TD: 289 lbs	MD: 211 lbs TD: 79 lbs	MD: 236 lbs TD: 223 lbs	MD: 545 lbs TD: 226 lbs	MD: 670 lbs TD: 423 lbs	MD: 1062 lbs TD: 797 lbs
% Original Strength from Ultraviolet Exposure (ASTM G-155)	ND	ND	23% at 1000 hr	100% at 1000 hr	100% at 1000 hr	100% at 1000 hr	100% at 1000 hr
Functional Longevity/ Project Duration ²	up to 12 months ³	up to 18 months ⁴	up to 4 yr	up to 4 yr	up to 5 yr	up to 5 yr	up to 5 yr

¹ Tensile Strength is based on 12" diameter using ATSM D4595. See Filtrex TechLink #3342 for full tensile strength testing.

² Functional longevity ranges are estimates only. Site specific environmental conditions may result in significantly shorter or longer time periods.

³ Data based on Caltrans research and specifications

⁴ See TechLink #3339 for research & testing

Table 6.2. Filtrex® Runoff Diversion Performance and Design Specifications Summary.

Design Diameter	8 in (200mm)	12 in (300mm)	18 in (450mm)	24 in (600mm)	32 in (800mm)	Testing Lab/ Reference	Publication(s)
Effective Height	6.5 in (160mm)	9.5 in (240mm)	14.5 in (360mm)	19 in (480mm)	26 in (650mm)	The Ohio State University, Ohio Agricultural Research and Development Center	Transactions of the American Society of Agricultural & Biological Engineers, 2006
Effective Circumference	25 in (630mm)	38 in (960mm)	57 in (1450mm)	75 in (1900mm)	100 in (2500mm)		
Density	20 lbs/ft (30 kg/m)	48 lbs/ft (73 kg/m)	110 lbs/ft (167 kg/m)	200 lbs/ft (300 kg/m)	200 lbs/ft (300 kg/m)	Filtrex International Field Lab	
Air Space	Testing in Progress	Testing in Progress	Testing in Progress	Testing in Progress	Testing in Progress	Soil Control Lab, Inc	
Maximum continuous length	unlimited	unlimited	unlimited	unlimited	unlimited		
Staking Requirement	10 ft (3m)	10 ft (3m)	10 ft (3m)	10 ft (3m)	10 ft (3m)		
Maintenance Requirement (sediment accumulation removal at X height)	3.25 in (80mm)	4.75 in (120mm)	7.25 in (180mm)	9.5 in (240mm)	13 in (325mm)		
Functional Longevity*	6 mo – 5 yr	6 mo – 5 yr	6 mo – 5 yr	6 mo – 5 yr	6 mo – 5 yr		
Percent Vegetated Cover	Testing in Progress	Testing in Progress	Testing in Progress	Testing in Progress	Testing in Progress	Filtrex International Field Lab	
Hydraulic Flow Through Rate	< 1 gpm /linear ft (<1 L/min/m)	< 1 gpm / linear ft (<1L/min/m)	< 1 gpm /linear ft (<1L/ min/m)	< 1 gpm /linear ft (<1L/min/m)	< 1 gpm / linear ft (<1L/min/m)	Soil Control Lab, Inc	
Max Runoff Flow Height	3 in (75mm)	6 in (150mm)	11 in (275mm)	15 in (375mm)	22 in (550mm)	The Ohio State University, Ohio Agricultural Research and Development Center	Transactions of the American Society of Agricultural & Biological Engineers, 2006

* Functional Longevity is dependent on mesh material type, UV exposure, freeze/thaw frequency, region of US/Canada, runoff-sediment frequency/durion/loading, and adherence to specified maintenance requirement. Functional longevity ranges are estimates only. Site specific environmental conditions may result in significantly shorter or longer time periods.

Figure 6.1. Engineering Design Drawing for Runoff Diversion

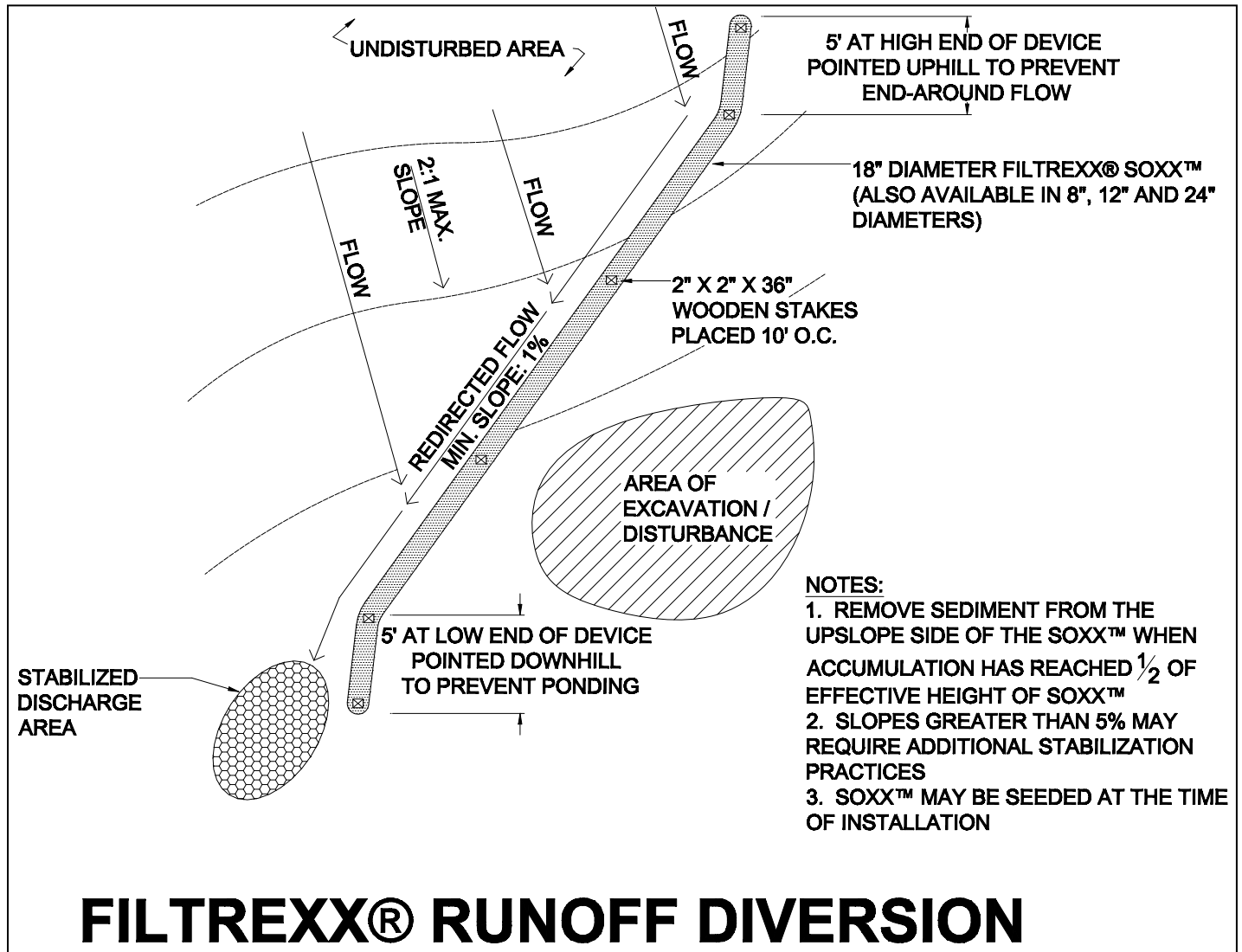


Figure 6.2. Engineering Design Drawing for Runoff Diversion - Sectional View

