

## 2.1 Compost Storm Water Blanket (CSWB™)

### PURPOSE & DESCRIPTION

**Filtrex® Compost Storm Water Blanket (CSWB™)** is a storm water runoff reduction and permanent vegetation establishment practice used on post-construction soil surfaces. CSWB are intended for application and use where:

- land disturbing activities have ceased,
- permanent vegetation is required,
- reduction of pollutant loading in storm runoff is required,
- runoff volume reduction from contributing watershed is necessary,
- reduction in the size of storm water collection or bio-retention ponds, and rain gardens is necessary.

CSWB are designed to act like a sponge for rain water and non-concentrated storm runoff. By holding large volumes of water at and across the land surface, CSWB increase the infiltration and evapotranspiration of water from rainfall and storm runoff. These processes aid the cycling of water by recharging ground water and atmospheric water vapor. By increasing the land surface roughness, CSWB slow the rate of sheet runoff, allowing it to more readily infiltrate the soil surface. CSWB are also specifically designed to allow for permanent and sustained vegetation growth.

### APPLICATION

CSWB are surface applied at a depth of 2 in (50mm). CSWB are used where reduction of storm water runoff and/or permanent vegetation is required or will improve the design and function of the landscape. CSWB are generally applied after land disturbing activities have ceased and where sheet runoff may exist under storm conditions. CSWB should NOT be used in areas of concentrated storm water flow. CSWB should not be used on slopes greater than 2:1 without the use of additional stabilizers or support practices (See Section 1.8 of Filtrex Design Manual). Filtrex Slope Interruption (See Section 1.5 of Filtrex Design Manual) may be seeded and used with CSWB to slow runoff velocity and the potential for soil erosion.

### ADVANTAGES AND DISADVANTAGES

#### Advantages

- CSWB can be used for reduction of storm water runoff and permanent vegetation establishment.
- CSWB can be easily designed and incorporated as part of a treatment train approach in storm water management and pollution prevention.
- CSWB are easily applied and can establish vegetation in difficult areas.
- CSWB have a high water holding capacity, therefore can absorb high volumes of rainfall and storm water sheet flows.
- CSWB can absorb rainfall and runoff water, thereby increasing infiltration and reducing runoff, erosion, and transport of pollutants.
- Holding water at soil-vegetation complex can increase ground water recharge, evapotranspiration, and plant available water.
- Reduction of storm runoff volume and transport of pollutants reduces pollutant loading to receiving surface waters and wetlands.
- CSWB can slow runoff velocity, thereby increasing infiltration and reducing the erosive energy of runoff and the potential for soil erosion and transport of pollutants.
- Humus colloids and organic matter in CSWBs provide good

- physical structure for seed and establishing seedlings.
- Humus colloids and organic matter in storm water blankets provide increased water holding capacity to aid in seed germination and the potential for reduced irrigation.
- CSWB act like a mulch which has been shown to reduce invasive weed establishment and cover.
- CSWB are a good option for arid and semiarid regions where germination, moisture management, and irrigation can be difficult.
- CSWB provide organic nutrients that are slow release for optimum uptake efficiency to establishing vegetation.
- CSWB provide organic nutrients that are less prone to transport in storm runoff and pollution of receiving surface waters, relative to mineral nutrients supplied by fertilizers.
- CSWB provide organic nutrients which have been correlated to lower growth of invasive weeds, relative to mineral nutrient fertilizers.
- CSWB have the ability to bind and adsorb phosphorus, metals, and hydrocarbons that may be in storm water runoff, thereby reducing their ability to migrate to and pollute receiving surface waters.
- Microorganisms in CSWB have the ability to degrade organic pollutants and cycle captured nutrients in storm water runoff.
- CSWB are manufactured from bio-based organic materials that can be incorporated into a permanent landscape design.
- CSWB may improve existing soil structure, soil aggregation, water permeability, aeration, and biological diversity for post-construction soils, thereby increasing the likelihood that vegetation will be sustainable.
- CSWB may increase soil carbon and organic matter which can increase water holding capacity and infiltration, and reduce runoff and erosion, which can be beneficial to storm water reduction and water quality well into the future.
- CSWB 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*

### ADVANTAGES

	LOW	MED	HIGH
<b>Installation Difficulty</b>	✓		
<b>Storm Water Volume Reduction</b>			✓
<b>Storm Water Runoff Rate Reduction</b>		✓	
<b>Pollutant Load Reduction</b>			✓
<b>Permanent Vegetation Establishment</b>			✓
<b>Soil Erosion Control</b>			✓

*Council. LEED credits are determined on a per project basis by an independent auditing committee. Filtrexx 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 CSWB do not use Filtrexx GrowingMedia or follow Filtrexx International specifications performance may be greatly diminished.
- If not installed correctly, maintained or used for a purpose or intention that does not meet specifications, performance may be diminished
- CSWB should never be used in areas of concentrated storm runoff flow, including channels and drainage ditches.
- CSWB should not be used without additional support practices on slopes greater than 2:1.
- CSWB may need to be reapplied if severe runoff occurs prior to vegetation establishment or where vegetation fails.

### GROWINGMEDIA™ CHARACTERISTICS

CSWB use only Filtrexx® GrowingMedia™ which is a composted material that is specifically designed to increase water holding capacity, reduce runoff volume, reduce pollutant loading to receiving waters, slow runoff velocity, increase infiltration, increase surface evapotranspiration, and provide rapid establishment and permanent sustainability of vegetation. GrowingMedia can be third party tested to meet minimum performance criteria defined by Filtrexx International. Performance parameters include: percent cover of vegetation, water holding capacity, pH, organic matter, nutrient and metals content, soluble salts, moisture content, biological stability, maturity bioassay, percent inert material, bulk density and particle size distribution. It should be noted that particle size distribution of GrowingMedia is one of the key components to the effective performance and design capacity of CSWB; therefore, Filtrexx International has conducted extensive research and development and review of state and federal specifications to create high performance and reliable CSWB. For information on the physical, chemical, and biological properties of GrowingMedia refer to Specifications in Section 5.2

### PERFORMANCE

QA/QC material testing of GrowingMedia, to ensure that specifications are met, is conducted by the Soil Control Lab, Inc. Performance testing and research of CSWB has been extensive in the last 5 years and is currently on-going. Filtrexx International will continue to conduct and support testing and research programs to better inform and assist design professionals in storm water management and storm water pollution prevention plan development. As new information becomes available it will be incorporated into our specifications and performance and design criteria; meaning this manual is a dynamic one and shall continually be updated. Filtrexx International relies on completed and published research or test results from reputable laboratories to generate the performance and design information provided herein. Filtrexx International gives preference to research published in peer-reviewed scientific journals, and secondarily to third party research conducted by universities and federal agencies. For a summary of performance testing, research results, and design criteria considerations see Table 1.1. Supporting summaries of technical reports and research papers have been included in the Appendices. *Note: the Contractor is responsible for establishing a working storm water management system and may, with approval of the Engineer,*

*work outside the minimum requirements as needed. Where the CSWB deteriorates or fails, it shall be repaired or replaced with an effective alternative.*

### DESIGN CRITERIA

CSWB are a storm water runoff reduction and permanent vegetation establishment practice to be used on around post-construction soil surfaces.

### Planning Considerations

CSWB should be used as one treatment in a designed treatment train approach to site storm water management and pollution prevention. Runoff control and runoff diversion practices may be designed to help prevent seed washing and erosion prior to vegetation establishment and to protect seedlings prior to maturity. Pre-application meetings should be conducted to educate site personnel about the devices/practices used and acceptable traffic patterns that avoid running over CSWB with vehicles and heavy equipment. Vehicular traffic and heavy equipment may reduce the effectiveness of CSWB and contribute to soil compaction, which may increase runoff and erosion and reduce vegetation establishment.

Successful planning for any permanent vegetation establishment project should consider climate, prevailing weather, temperature, sun exposure, available moisture/irrigation requirements, topography, soil type, soil pH, soil amendments, nutrient requirements, drought tolerance, site preparation/coordination with construction phases, time to vegetation establishment/coordination with construction phases, protection from erosion and sedimentation, and seed mix/plant selection. Perennial grasses are typically specified and if possible native grasses should be utilized (Fifield, 2001).

Local Landscape Architects, NRCS, or university/cooperative extension should be consulted and used as resources for seed and plant material selection in your region. Many state storm water design manuals have specifications for seed and plant selection and application rates.

### Preparation and Application

Where possible, slopes should be vertically tracked to increase soil roughness. This will increase the CSWB's contact with the soil, reduce runoff velocity, and increase vegetation establishment success. Reducing runoff velocity can reduce seed wash prior to and during germination and reduce stress on young plants during the establishment phase. CSWB shall be applied to and cover 100% of the exposed soil area where storm runoff reduction or vegetation is required. CSWB shall be applied at a depth of 2 in (50mm) or a rate of 270 cubic yards/ac (513 cubic m/ha). Thicker CSWB may further reduce runoff volume during large storm events; however, this should be at the discretion of the Engineer. See Installation guidelines in the following section for further details on application specifications of CSWB. Field application depths up to 6 in (150mm), or a rate of 810 cubic yards/ac (249 cubic m/ha), have been used successfully to reduce stormwater volume and pollutant loads, however this has not been tested in a controlled environment. The Filtrexx® Rain Garden/Bioretenion System (Section 2.7) Specification should be consulted for deeper media applications, where stormwater containment will be utilized, or where containment and infiltration is the primary objective.

### Establishing & Sustaining Vegetation

Although CSWB increase water holding capacity and may reduce

evaporation, irrigation should be utilized to ensure successful vegetation establishment. Runoff diversion devices may be utilized to prevent storm runoff from washing seed prior to germination and establishment and reduce erosion prior to permanent stabilization.

CSWB can supply humus, organic matter, beneficial microbes, and slow release organic nutrients that can contribute to better soil quality and plant health. In arid and semi-arid regions, or hot and dry weather, regular irrigation may be required.

### Runoff Conditions

CSWB should not be used in areas where concentrated flow exists or where runoff velocities will damage or undermine vegetation. For most grasses a maximum velocity of 4 ft/sec (1.2 m/sec) or a maximum hydraulic shear stress of 2 lbs/ft<sup>2</sup> (10 kg/m<sup>2</sup>) is recommended (Maryland Storm Water Design Manual, 2000).

### High Wind Conditions:

In regions or seasons prone to high velocity wind conditions (such as arid regions, mountainous regions, and regions with distinct hurricane seasons) it is recommended that LockDowntm Netting is installed on top of the CSWB to prevent wind erosion and movement of the CSWB. For more information on LockDowntm Netting see Section 5.4.

### Mulch Function

CSWB cover 100% of the soil surface, and therefore provide the beneficial affects characteristic to mulches, including: reduced raindrop impact and splash erosion, reduced runoff energy and sheet erosion, buffered soil temperature for plants, decreased moisture evaporation, increased moisture holding capacity at the soil surface, reduced runoff volume and velocity, and increased infiltration. Decreasing runoff volume can decrease pollutant transport and loading to receiving waters. Increasing water holding capacity at the soil surface can increase infiltration, which can help to recharge ground water, and increase available water to plants.

### Soil Amendment Function

CSWB also amend the soil which can provide the following functional benefits: increased soil structure, increased soil aggregates, increased soil aeration, increased infiltration and percolation, increased moisture holding capacity, increased activity of beneficial microbes, increased availability of nutrients, increased cation exchange capacity, decreased runoff volume and velocity, decreased erosion, and increased plant health and long-term sustainability.

### Organic vs. Fertilizer Nutrients

Although most specification and design manuals include fertilizer recommendations or requirements for permanent vegetation establishment, mineral nutrients from fertilizers may not be preferable where vegetation sustainability and water quality are a concern. CSWB provide organic nutrients, which: are slow release, provide plant micronutrients, and are less likely to be transported in storm runoff to receiving waters – which can reduce pollution and eutrophication of waterways (Faucette et al, 2005).

### Weed Establishment

The effects of mulching are known to suppress weed establishment. In addition, invasive weed growth has been more closely associated with mineral fertilizers than organic fertility practices (Faucette et al, 2004).

### Runoff Volume Reduction

CSWB are designed to absorb water. For every 1% of organic matter, the CSWB will hold approximately 5,500 gal (21 cubic m) of water per acre inch (103 cubic m) (Breedlove, 2006). CSWB are typically 25% organic matter by wet weight and 50% organic matter by dry weight. Alternatively, CSWB typically hold approximately 1.6 oz (45 g) of water per 3.6 oz (100 g) of CSWB (dry weight); 1 gal (0.004 cubic m) of water per 20 lbs (9 kg) of CSWB (dry wt) or per 30 lbs (14 kg) of CSWB (wet wt). This equates to approximately 40 gal (0.15 cubic m) of water per cubic yard (0.76 cubic m) of CSWB and 5,400 gal (722 cubic ft, 20 cubic m) of water per acre inch (0.01 ha meter, 103 cubic m) of CSWB, and 10,800 gal (1444 cubic ft, 41 cubic m) of water for a 2 in (50mm) CSWB; An acre inch (0.01 ha meter) of CSWB requires approximately 135 cubic yards (103 cubic meters) of material.

### INSTALLATION

1. CSWB used for storm runoff reduction and permanent vegetation establishment shall meet Filtrexx Compost Storm Water Blanket and Filtrexx Certified GrowingMedia Specifications.
2. Call Filtrexx at 877-542-7699 or visit [www.filtrexx.com](http://www.filtrexx.com) for a current list of installers and distributors of Filtrexx products.
3. CSWB will be placed at locations indicated on plans as directed by the Engineer.
4. Land or soil surface shall be roughened prior to application of CSWB.
5. CSWB shall be applied to 100% of the land surface area where storm water reduction and permanent vegetation is required. No native soil shall be visible in or through the CSWB.
6. CSWB shall be applied at a minimum depth of 2 in (50mm) or at a rate of 270 cubic yards/ac (513 cubic m/ha).
7. Seed shall be thoroughly mixed with the GrowingMedia prior to application or surface applied to GrowingMedia at time of application.
8. CSWB shall not be installed in areas of concentrated storm runoff flow, including channels and ditches.
9. CSWB shall be installed at least 10 ft (3m) over and beyond the shoulder of a slope and/or into existing vegetation to ensure runoff does not undercut the blanket.
10. CSWB installed on slopes: greater than or equal to 4:1 shall be tracked; greater than 2:1 shall be tracked and use other support practices (See Section 1.8 of Filtrexx Design Manual).

### INSPECTION

Routine inspection should be conducted within 24 hrs of a runoff event or as designated by the regulating authority. If rilling occurs or vegetation does not establish, the area of application should be reapplied with a CSWB. If failure continues, the use of runoff diversion devices, slope interruption devices, erosion control support practices, soil stabilizers, turf reinforcement mats, or hard armoring practices should be considered. CSWB should be inspected until permanent vegetation is established. Permanent vegetation practices should always be inspected for noxious or invasive weeds.

### MAINTENANCE

1. The Contractor shall maintain the stormwater blanket in a functional condition and it shall be routinely inspected until vegetation is established.
2. CSWB shall be maintained until a minimum of 70% uniform cover of the applied area has been vegetated or as required by the jurisdictional agency.

3. CSWB may require regular irrigation during hot and dry weather, or arid and semi-arid climates to ensure permanent vegetation establishment.
4. Where a CSWB fails, rilling occurs, or vegetation does not establish the Contractor will repair or provide an approved and functioning alternative.
5. If gullies form in CSWB, the area shall be re-graded prior to reinstallation of CSWB or approved alternative.
6. If a CSWB is damaged by stormwater runoff, installation of slope interruption devices across the slope, or runoff diversion devices above the CSWB may be required.

7. No additional fertilizer or lime is required for vegetation establishment and maintenance.

#### METHOD OF MEASUREMENT

Bid items shall show measurement as 'Filtrexx® Compost Storm Water Blanket (CSWB), per square ft, per square yd, per square meter, per hectare, or per acre installed.

Engineer shall notify Filtrexx 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



#### 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](http://filtrexx.com)

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Call for complete list of international installers and distributors.

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**REFERENCES CITED & ADDITIONAL RESOURCES**

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**Table 1.1.** Compost Storm Water Blanket Performance<sup>1</sup> and Design Specifications.

Rainfall Total/Duration	4.4 in(112mm) /2.4 hr	1.8 in(45mm) /35 min	3.2 in(80mm) /1 hr	4.0 in(100mm) /1 hr	8.0 in(200mm) /2 hr
Design & Performance					
Depth of Application	3.0 in (75mm)	2.0 in (50mm)	1.5 in (35mm)	1.5 in (35mm)	2.0 in (50mm)
Slope	2:1	3:1	10:1	10:1	3:1
Soil Texture	Silty sand	Clay	Sandy clay loam	Sandy clay loam	Loamy sand
Hydrologic Soil Class			B	B	
Runoff Volume Reduction (Vr)	76% <sup>2</sup>	35%	49% <sup>3</sup>	60%	90 <sup>4</sup>
Peak Runoff Flow Rate Reduction (Q)	ND	ND	36%	34-51%	79%
Hydrologic Abstraction (Initial) Reduction (Ia)	ND	ND	68%	72%	94% <sup>4</sup>
Runoff Curve Number (CN)	ND	ND	49	42	ND
Runoff Coefficient (C)	ND	ND	0.28 - 0.32	0.21	ND
Unit Hydrograph vs. bare sandy clay loam				See Figure 1.2	
Water Holding Capacity <sup>5</sup>	2,166 ft <sup>3</sup> /ac (153 m <sup>3</sup> /ha)	1,444 ft <sup>3</sup> /ac (102 m <sup>3</sup> /ha)	1,083 ft <sup>3</sup> /ac (77 m <sup>3</sup> /ha)	1,083 ft <sup>3</sup> /ac (77 m <sup>3</sup> /ha)	1,444 ft <sup>3</sup> /ac (102 m <sup>3</sup> /ha)
Total N Load Reduction	ND	88%	58% <sup>6</sup>	92% <sup>7</sup>	99%
Nitrate-N Load Reduction	ND	45%	88% <sup>6</sup>	ND	ND
Total P Load Reduction	ND	87%	83% <sup>6</sup>	ND	99%
Bio-available P Load Reduction	ND	87%	83% <sup>6</sup>	97% <sup>7</sup>	99%
Soil Loss Reduction	98%	99.2%	99%	93.5%	96.1% <sup>8</sup>
Test/Research Facility	University of Connecticut	Texas A&M	University of Georgia	University of Georgia	Iowa State University
Reference/Publication	New England Transportation Consortium & Federal Highway Administration – NETCR 20	ASAE International Meeting	Journal of Soil and Water Conservation	USDA SBIR	Transactions of ASAE
Authors	Demars et al, 2000	Mukhtar et al, 2004	Faucette et al, 2005	Faucette et al 2006	Persyn et al 2004; Glanville et al 2004; Glanville et al 2001.

ND: no data reported

<sup>1</sup>Blankets in studies that met Filtrexx Specifications.

<sup>2</sup>Averaged over 10 runoff events.

<sup>3</sup>Cumulative over 3 runoff events.

<sup>4</sup>Calculated from mean rainfall intensity/duration and runoff rate values

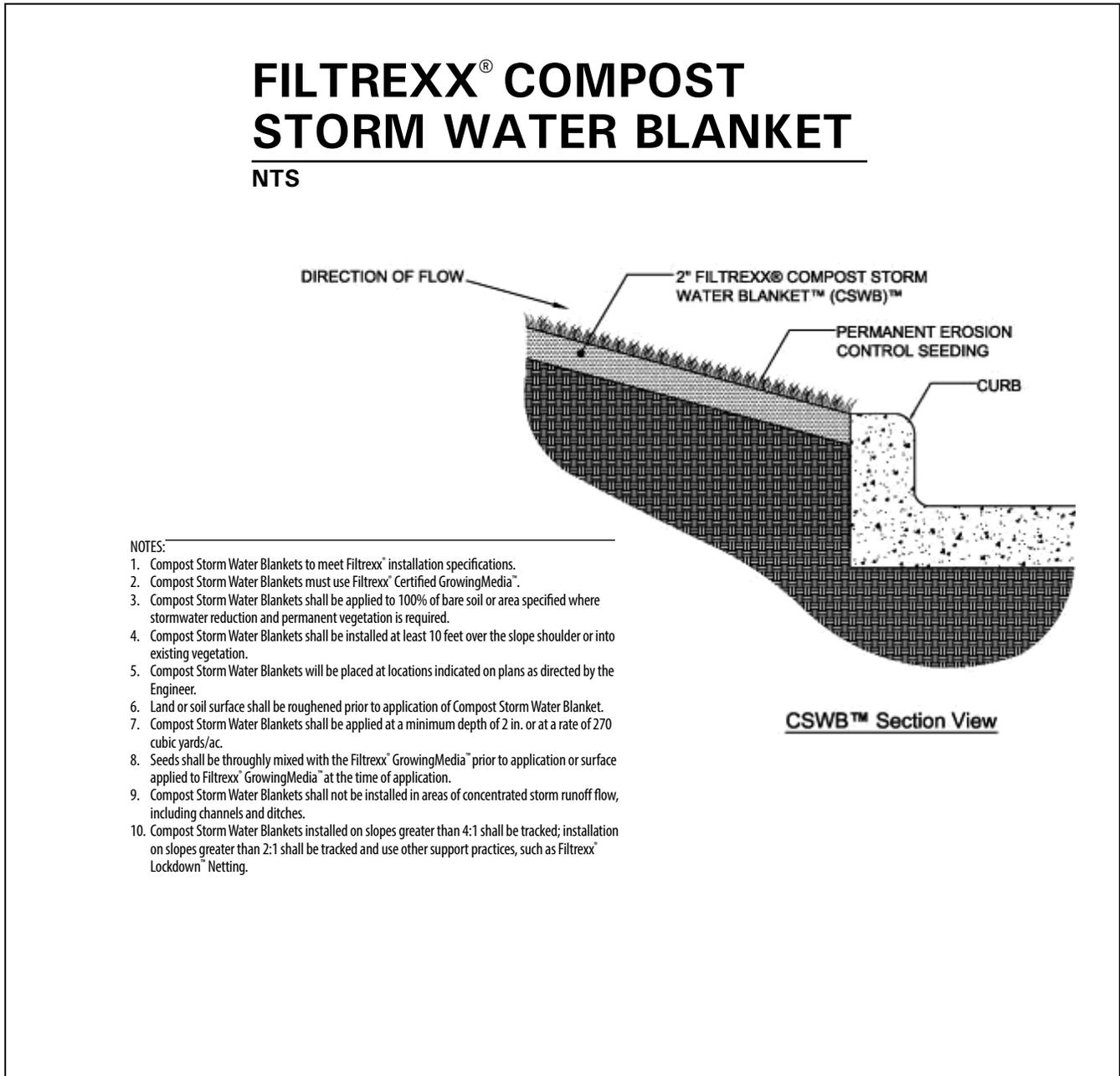
<sup>5</sup>Based on database provided by independent lab, Soil Control Lab, Inc.

<sup>6</sup>Relative to vegetation establishment by hydroseed

<sup>7</sup>Relative to vegetation establishment that followed GDOT specifications.

<sup>8</sup>Determined from interrill erosion rate.

Figure 2.1. Engineer Design Details for Compost Storm Water Blanket.



**Figure 2.2.** Unit Hydrograph of a Compost Storm Water Blanket Relative to a Bare Study Clay Loam for a 4in/hr 1 hr Storm Event.

