5.3.6 Vegetated Filter Strips

Description

Vegetated filter strips are permanent areas of dense vegetation located between runoff pollutant sources (such as parking lots) and other BMPs or receiving water bodies. Vegetated filter strips may be constructed of turf, meadow grasses, or other vegetation such as landscape plantings (see Figure 5.3.6-1). Vegetated filter strips act to impede the velocity of stormwater runoff (thereby allowing sediment to settle out), reduce the impacts of temperature, and encourage infiltration. Vegetated filter strips are a water quality BMP to slow the rate of runoff and reduce peak flows. They do not provide SOV, although some infiltration will occur.

Figure 5.3.6-1. A meadow grass filter strip (long grass in the center of the image) provides a water quality buffer between a residential neighborhood and naturalized basin (far right).

BMP Functions Table

BMP	Applicability	Volume Reduction	Water Quality	Peak Rate Reduction	Recharge	Runoff Temperature Mitigation	Heat Island	Habitat Creation	Maintenance Burden	Cost
Vegetated Filter Strips	U/S/R	L	M	M	L	M	M	L	L	L

KEY: U = Urban; S = Suburban; R = Rural; H = High; M = Medium; L = Low

Key Design Features

- Runoff sheet flows across vegetation.
- It is important to provide uniform sheet flow conditions at the interface of the filter strip and the adjacent land cover.
- Pretreatment for other volume-reducing BMPs (such as infiltration bed).
- Are part of a "treatment train" approach for BMPs.
- Designed to decrease the velocity of runoff from small storms and improve water quality.
- For best performance, contributing capture areas should be small and localized.
- Maximum contributing drainage area slope is generally less than 5 percent, unless energy dissipation is provided.
- Minimum slope of 1 percent, maximum slope of 8 percent, target slope of 2 to 5 percent
- Filter strip length is influenced by the slope, soil type, and vegetation type (see Figures 5.3.6-2 and 5.3.6-3.a through 5.3.6-3.e).
- Minimum recommended length of filter strip is 25 feet (in the direction of flow); however, shorter lengths provide some water quality benefits as well, especially adjacent to BMPs such as rain gardens (small bioretention areas).
- Filter strip width should always consider the width of the contributing drainage area. It is important to avoid conditions that create concentrated flow.
- Concentrated flow should **not** be discharged directly onto a filter strip.
- Construction of filter strip shall entail as little disturbance to existing vegetation and soils at the site as possible.
- See Appendix E for list of acceptable filter strip vegetation.
- Filter strips should **never** be mowed to less than 4 inches in height.

Applications

- Better suited for less densely developed locations on a site due to surface area requirements
- Used in combination with other BMPs (especially when treating runoff from highly impervious areas)
- Pretreatment or overflow discharge point for other BMP (such as infiltration trench or bioretention area)
- To receive runoff from roof leaders or as divisions between individual lots (see Figure 5.3.6-4)
- Placement in underutilized areas of parks or other open space to receive runoff from compacted pervious areas
- Road and highway shoulders and medians
- Parking edges
- Riparian buffers

Advantages

- Integrates stormwater into landscape.
- Improves aesthetics.
- Flexible dimensions to fit conditions.
- Creates habitat for wildlife.
- Excellent retrofit capability.
- Cost-effective.

Disadvantages

- Volume reduction not quantifiable for SOV purposes.
- Maintenance must be clearly defined to avoid mowing. Signage is recommended, or a maintenance plan should be provided to maintenance personnel.
- Vegetation and soils must be protected from damage and compaction.
- Salt use may impact vegetation and soils.
- Vegetation must be firmly established and densely spaced, to avoid potential for erosion.

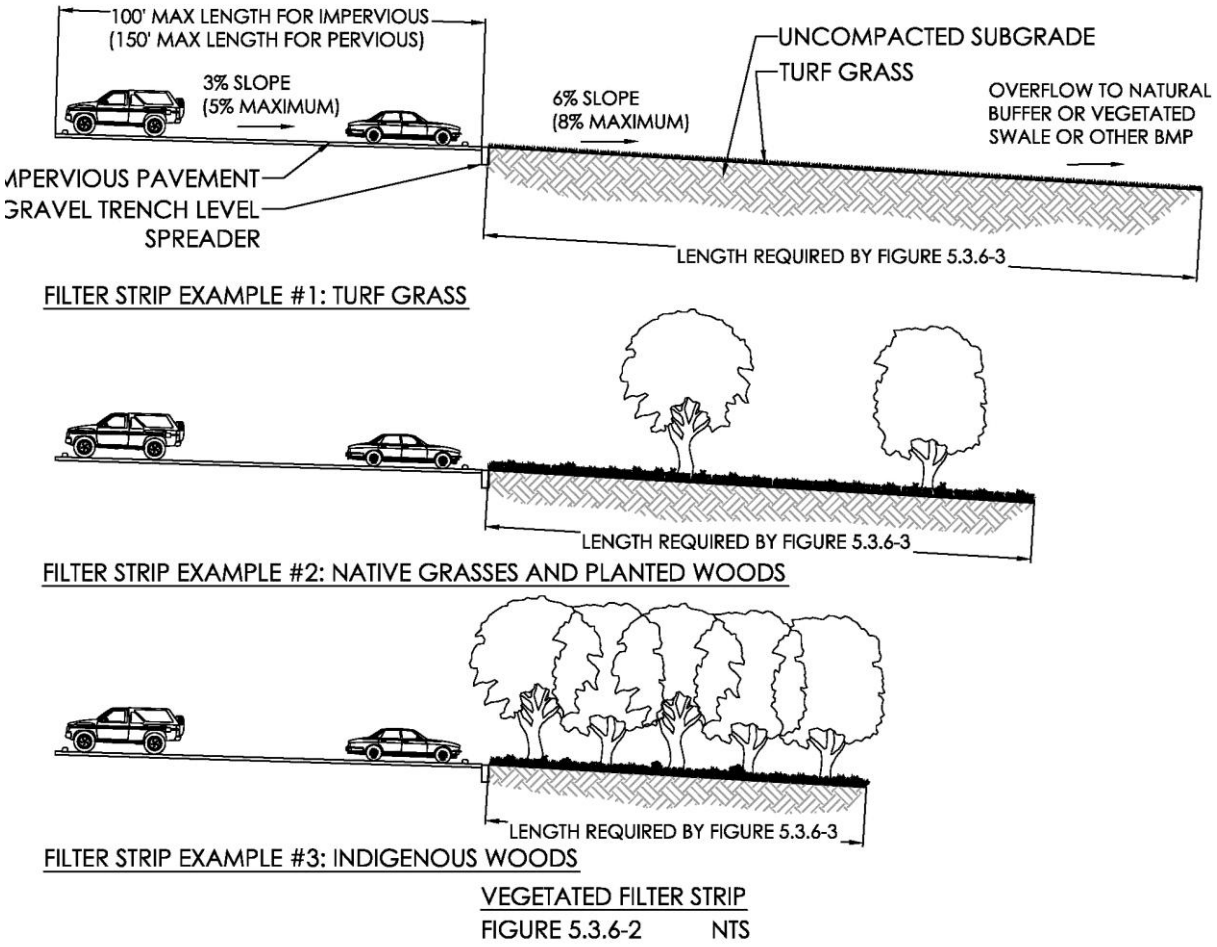

Figure 5.3.6-2. The width of a vegetative filter strip is determined by the slope, soil type, and vegetation type. For example, more densely vegetated strips are shorter in length than grass strips.

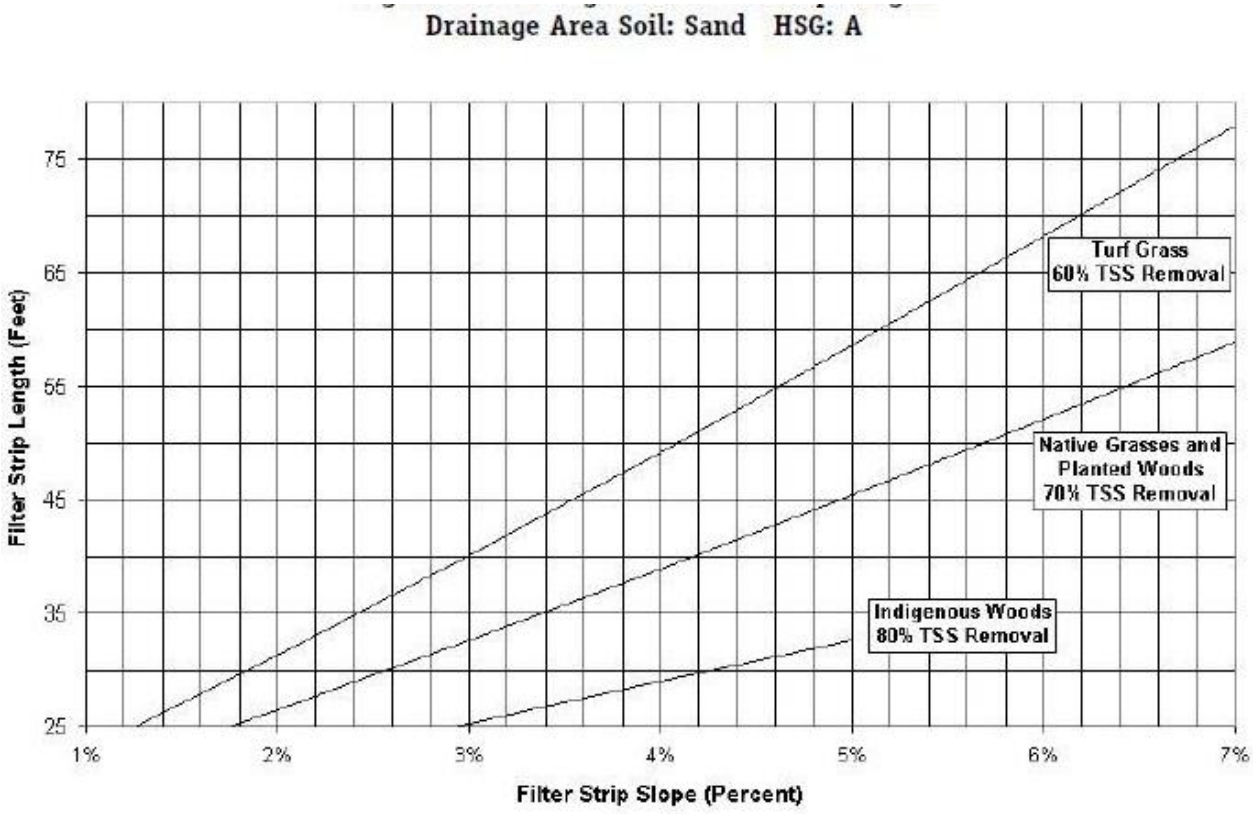

Figure 5.3.6-3.a. Graph may be used to estimate filter strip width based on soils, slope, and vegetation. Adapted from New Jersey Stormwater Management Practices Manual, Chapter 9, 2004.

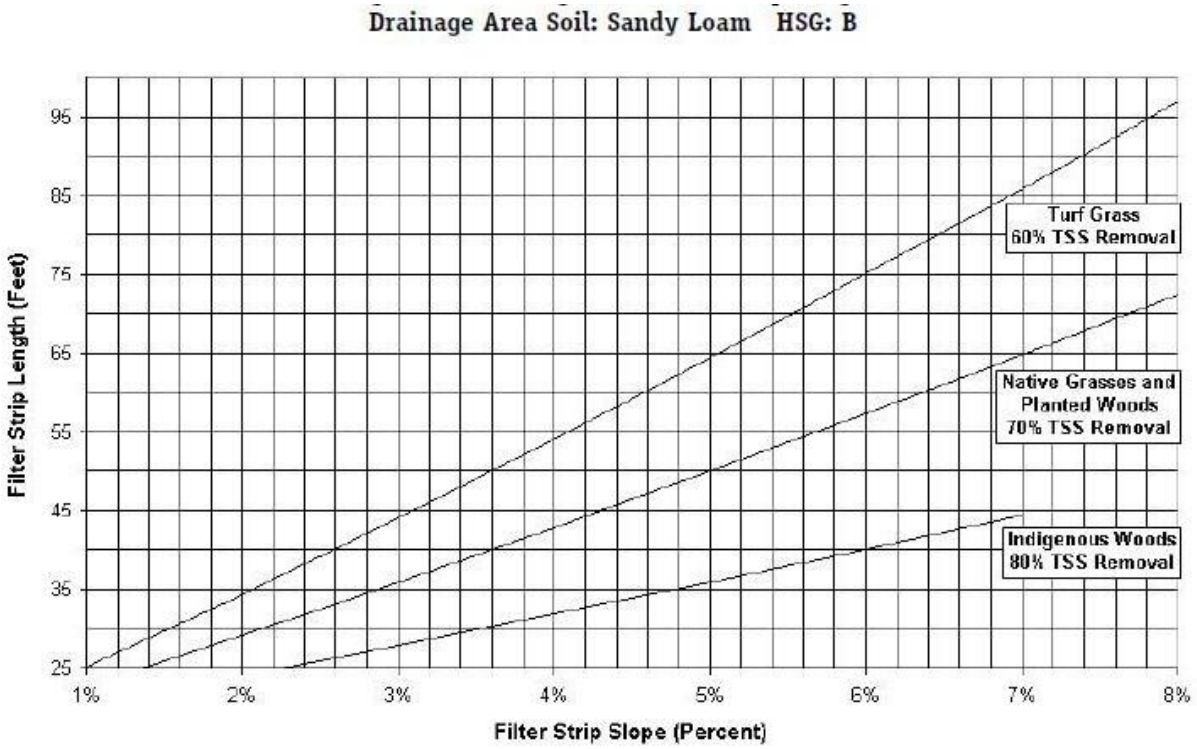

Figure 5.3.6-3.b. Graph may be used to estimate filter strip width based on soils, slope, and vegetation. Adapted from New Jersey Stormwater Management Practices Manual, Chapter 9, 2004.

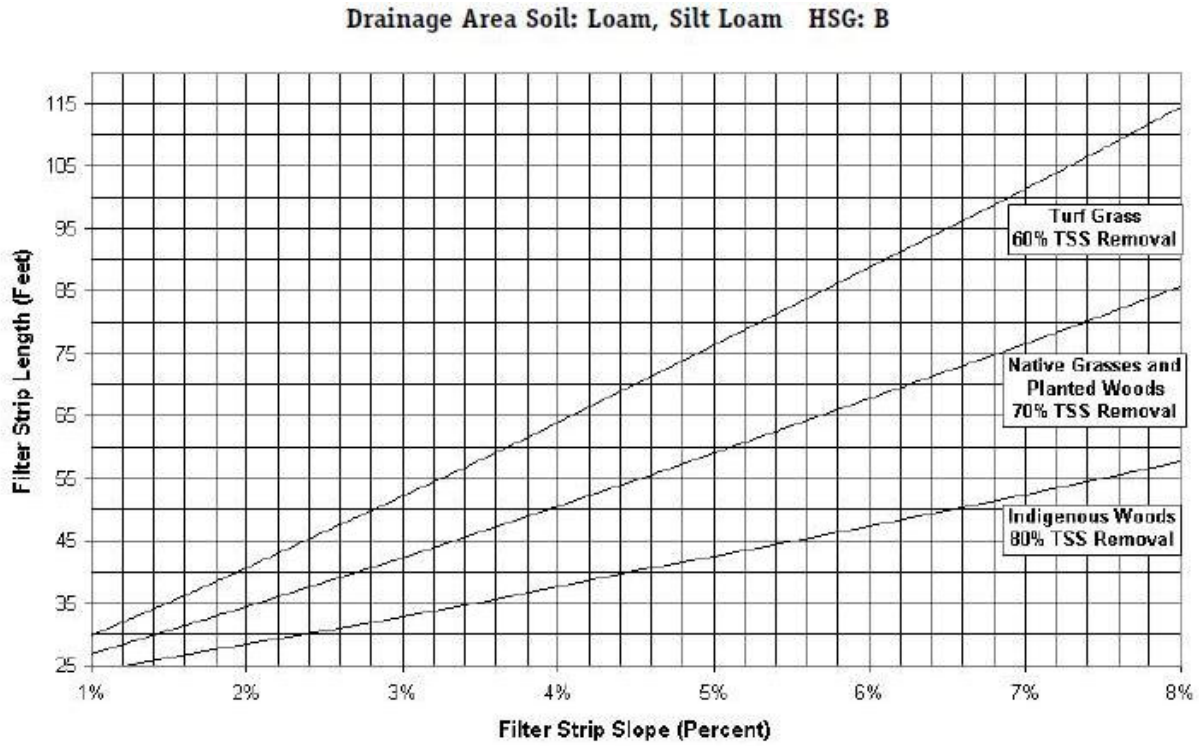

Figure 5.3.6-3.c. Graph may be used to estimate filter strip width based on soils, slope, and vegetation. Adapted from New Jersey Stormwater Management Practices Manual, Chapter 9, 2004.

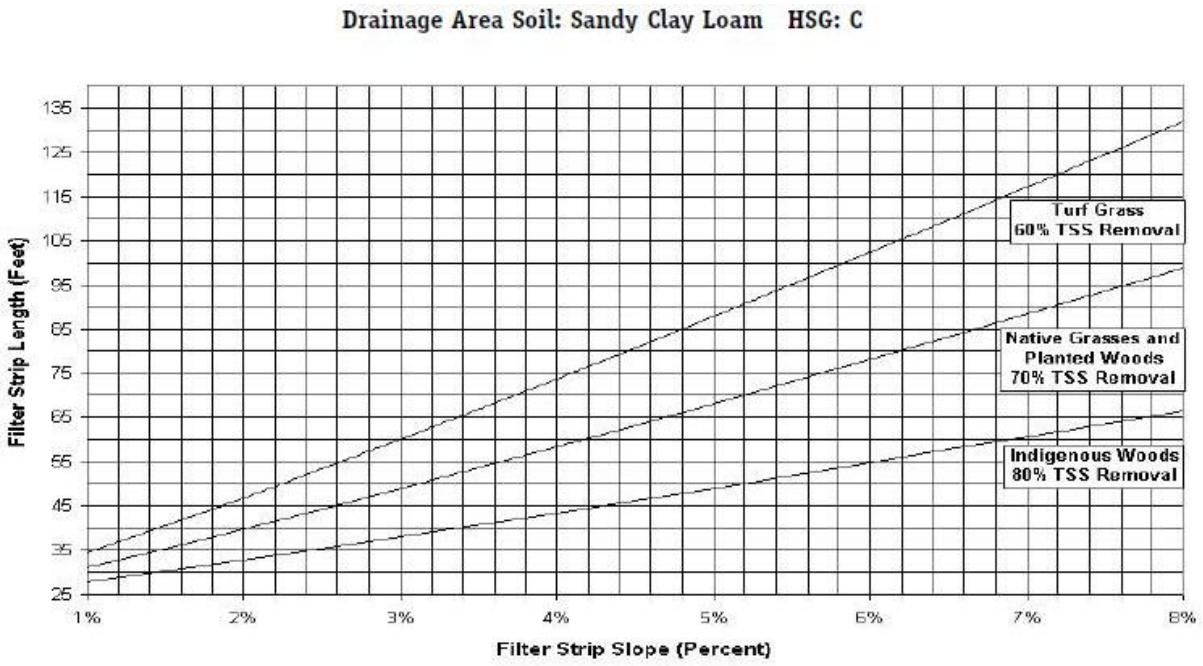

Figure 5.3.6-3.d. Graph may be used to estimate filter strip width based on soils, slope, and vegetation. Adapted from New Jersey Stormwater Management Practices Manual, Chapter 9, 2004.

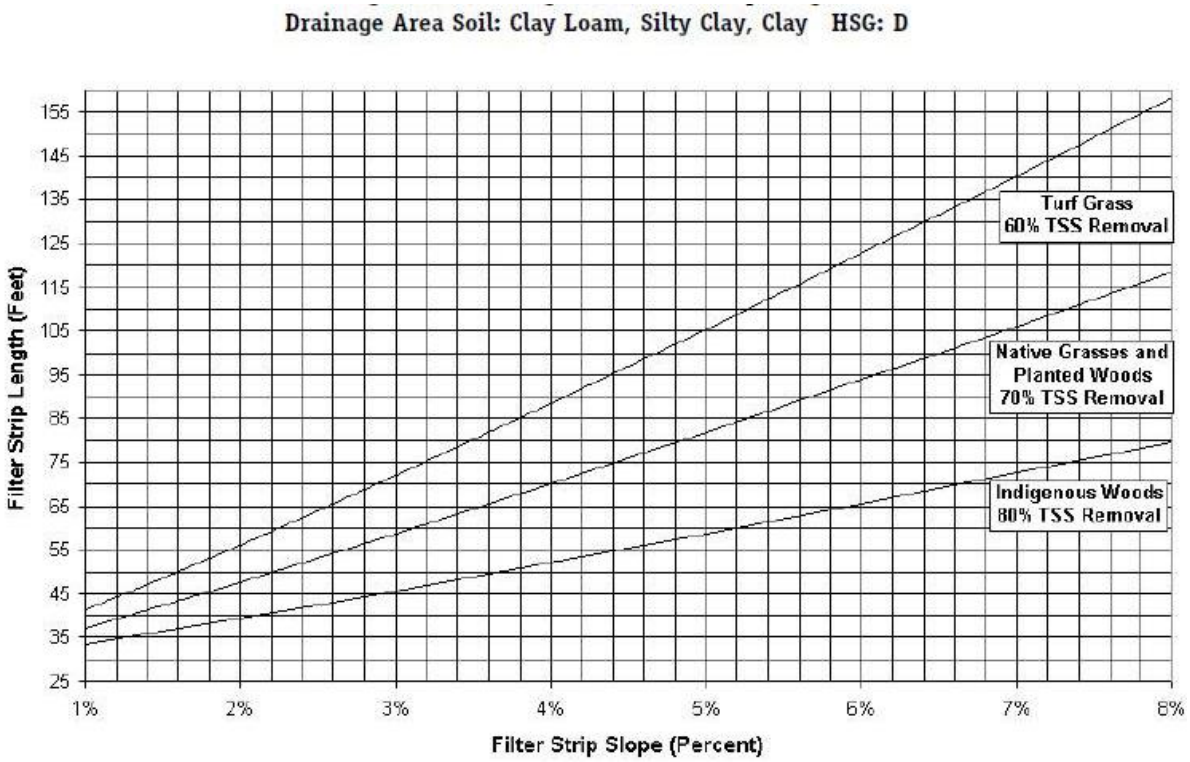

Figure 5.3.6-3.e. Graph may be used to estimate filter strip width based on soils, slope, and vegetation. Adapted from New Jersey Stormwater Management Practices Manual, Chapter 9, 2004.

Figure 5.3.6-4. Roof leaders convey runoff to a vegetated filter strip in a residential neighborhood.

Applicable Protocols and Specifications

The following Protocols and Specifications (see Appendices A through F) are applicable to vegetated filter strips and must be addressed:

- Protocol 5 Planting and Mulching Guidelines

Design Considerations for Vegetated Filter Strips

1. Location and Capture Area

Human activity influences the location of vegetated filter strips, as well as slopes and soil type. The following site-specific conditions should be considered:

- Select location to prevent vegetation damage and soil compaction from pedestrian traffic or unintended vehicle compaction. Optimum filter strip locations are often located to the side or downhill of high-volume vehicle or pedestrian traffic areas. Consider locating vegetated filter strips in places that are generally "not used" such as road/highway shoulders and medians; between parked cars in parking lots; along edges of public playgrounds, school yards, plazas, and courtyards; and in place of traditional landscape planting areas around buildings and structures (see Figure 5.3.6-5).

Figure 5.3.6-5. The parking lots at this truck stop discharge to filter strips before being conveyed to bioretention and infiltration areas.

- Select locations where existing maintenance is difficult. Although locating filter strips on slopes will reduce the ability for infiltration, converting traditional lawn to a denser vegetative cover still provides significant stormwater benefits.
- Avoid placing filter strips in locations that will disturb existing forest or meadows. Such areas should be addressed by protective BMPs.
- Locate filter strips to prevent future conflicts for space, and provide public access if necessary.

- Vegetated filter strips are generally most effective when used to manage a small capture area, or in conjunction with other BMPs.

2. Entrance/Flow Conditions

It is important for entrance conditions or distributed flow into a filter strip to be as sheet flow. Concentrated flows of runoff should always be avoided to prevent erosion, gully formation, and preferential flow paths through a filter strip. When runoff travels across a surface for long distances, flows can begin to concentrate. For pervious contributing areas, flow path lengths greater than 150 feet should be avoided. For impervious contributing areas, flow path lengths greater than 100 feet should be avoided.

- The upstream edge of a filter strip should be level and directly abut the contributing drainage area. A gravel trench level spreader (see Figure 5.3.6-6) can be used for this purpose.

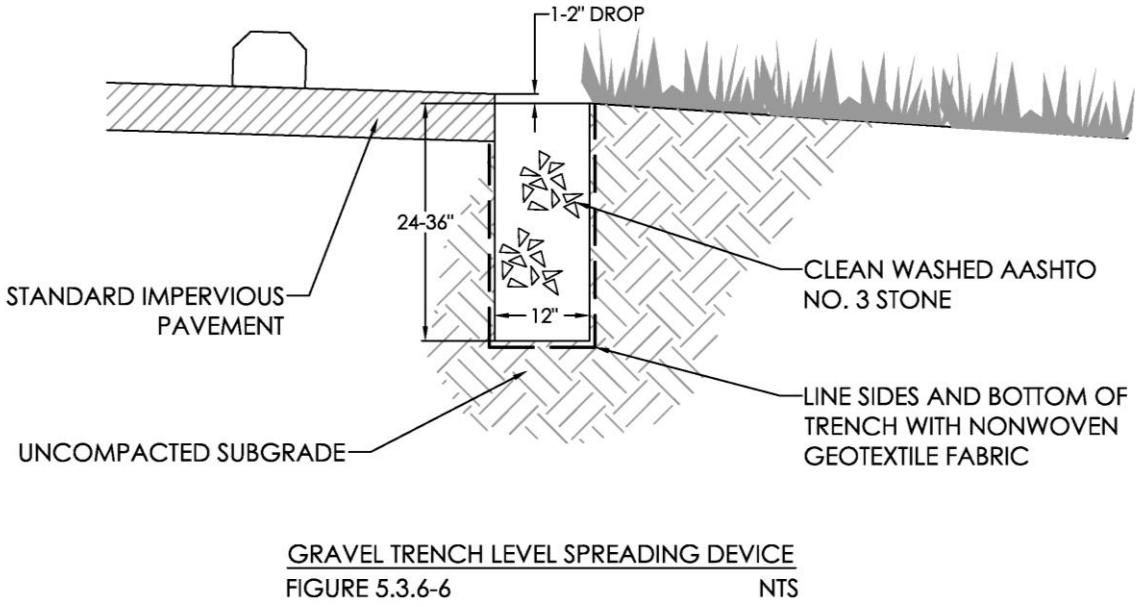

Figure 5.3.6-6. A gravel trench filter strip can be used as a level spreader to disperse flow and prevent the creation of rills and gullies.

3. Access and Protection

- If necessary, provide for pedestrian passage or maintenance access.
- Use structures, barriers, and plantings to limit access and prevent damage to soils and vegetation. Low fences, curbs, and woody vegetation are examples.

- Identify large filter strips on maintenance plans and with signage. This is especially important since vegetated filter strips can easily be overlooked or forgotten over time. As a result, maintenance personnel may inadvertently mow or remove vegetation.

Construction Considerations

For best success, vegetated filter strip areas should be protected during construction and should not be installed until site construction is complete and site stabilization has occurred.

Construction Sequence Example

Step 1 Excavate Strip

a. Existing subgrade in vegetated filter strips shall **not** be compacted or subject to excessive construction equipment traffic. Protect areas from vehicle traffic during construction with construction fence, silt fence, or compost sock.
b. Clear and grub site as needed. Disturb as little existing vegetation as possible and avoid compaction.

Step 2 Install Vegetated Filter Strip

a. Rough grade the filter strip area, including the berm at the toe of the slope, if included (see Section 5.3.7). Use the lightest, least disruptive equipment possible to avoid excessive compaction and/or land disturbance.
b. Construct level spreader device at the upgradient edge of the strip. For level spreaders and other gravel trenches, do not compact subgrade (follow construction sequence for infiltration trench; see Section 5.3.3).
c. Fine grade vegetated filter strip area to line, grade, and elevations indicated. Accurate grading is essential for filter strips. Even the smallest nonconformities may compromise flow conditions.
d. If testing indicates that the soil infiltration rate has been compromised (by excessive compaction), rototill the area prior to establishment of vegetation. Note: tilling will benefit only the top 12 to 18 inches of topsoil.
e. Seed and vegetate according to plans, and stabilize topsoil. Plant the strip at a time of the year when successful establishment without irrigation is most likely. Temporary irrigation may be needed in periods of little rain or drought. Vegetation should be established as soon as possible to prevent erosion and scour.
f. Concurrently with step “e,” stabilize seeded filter strips with appropriate temporary or permanent soil stabilization methods, such as erosion control matting or blankets. Erosion control for seeded filter strips shall be required for at least the first 75 days following the first storm event of the season. If

runoff velocities are high, consider sodding the filter strip or diverting runoff until vegetation is fully established.

g. Protect vegetated filter strip from sediment at all times during construction. Hay bales, diversion berms, and/or other appropriate measures shall be used at the toe of slopes that are adjacent to vegetated filter strips to prevent sediment from washing into these areas during site development.
h. When the site is fully vegetated and the soil mantle stabilized, the engineer shall be notified and shall inspect the filter strip drainage area at his/her discretion before the area is brought online and sediment control devices removed.

Operations and Maintenance

A properly designed and installed vegetated filter strip requires relatively little maintenance, much of which may overlap with standard landscaping requirements.

- While vegetation is being established, pruning and weeding may be required.
- Detritus may need to be removed approximately twice per year. Perennial grasses can also be cut down or mowed at the end of the growing season.
- Inspect vegetated filter strips annually for sediment buildup, erosion, vegetative conditions, etc.
- Inspect for pools of standing water; dewater and discharge to an approved location. Regrading may also be required. If a filter strip exhibits signs of poor drainage and/or vegetative cover, periodic soil aeration may be required. In addition, depending on soil characteristics, the strip may require periodic liming.
- Mow and trim vegetation to a minimum height of 4 to 6 inches.
- Mowing and maintenance must occur to ensure safety, aesthetics, and proper filter strip operation, or to suppress weeds and invasive species; dispose of cuttings in a local composting facility; mow only when filter strip is dry to avoid rutting. Fall mowing should be kept to a grass height of 6 inches to provide adequate winter habitat for wildlife.
- Inspect filter strip inlet (gravel trench level spreader, curb cuts, etc.) and outlet for signs of erosion or blockage, and correct as needed.
- Inspection should confirm that vegetation has been maintained as designed and not removed or replaced.