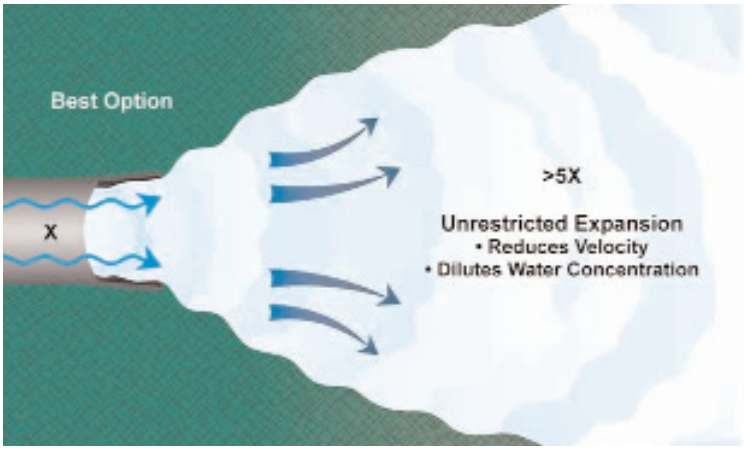
Installation Guide

At a Glance

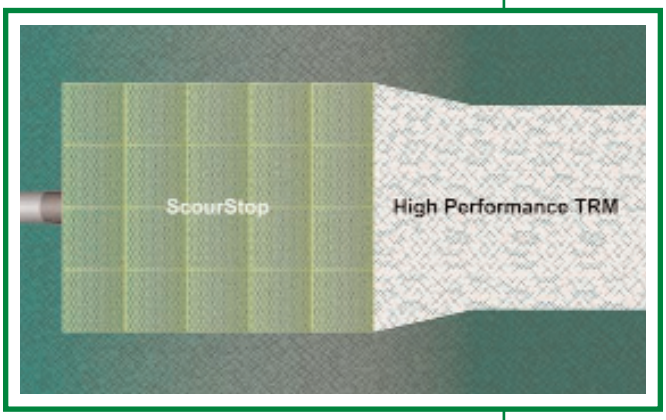
1. As with most BMPs, proper installation is critical to the effectiveness of the product.
2. Proper installation begins with preparing the area downstream of the outlet.
3. Create an area as wide and level as possible enabling runoff to dilute its concentration through the expansion process. The goal is a non-erosive water velocity and a stable conveyance system.

ScourStop™ transition mats combine with vegetation to mechanically protect the soil from erosion.

The first step in the installation process is determining what soil environment you have to start, and what you want to end up with. Is the location dry and manageable; wet on top, but stable underneath; saturated with no 'bottom' in sight; or hard, compacted clay? Whatever the conditions, and no matter how it was designed in CAD with the best of intentions, this long term structure must endure the test of time and water forces.

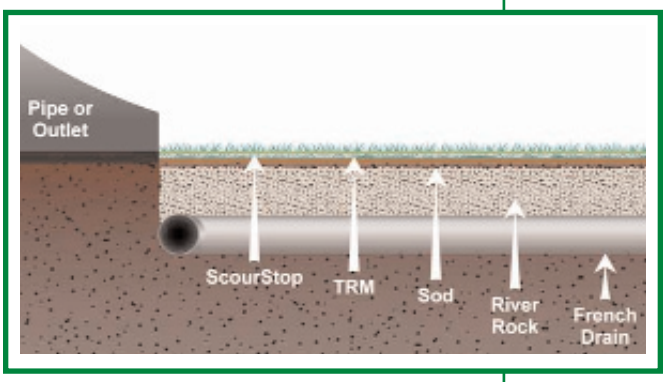


ScourStop™ is generally designed to be vegetated.
Create a soil base to support and nurture vegetation, and minimize conditions that restrict healthy vegetation.

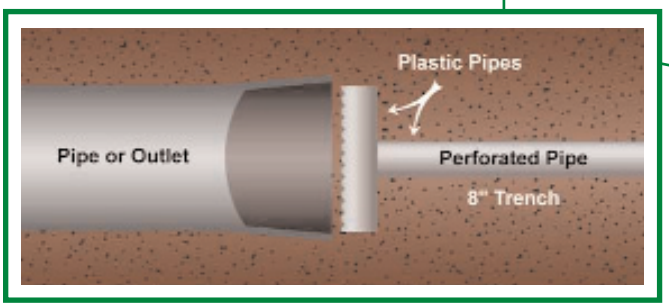


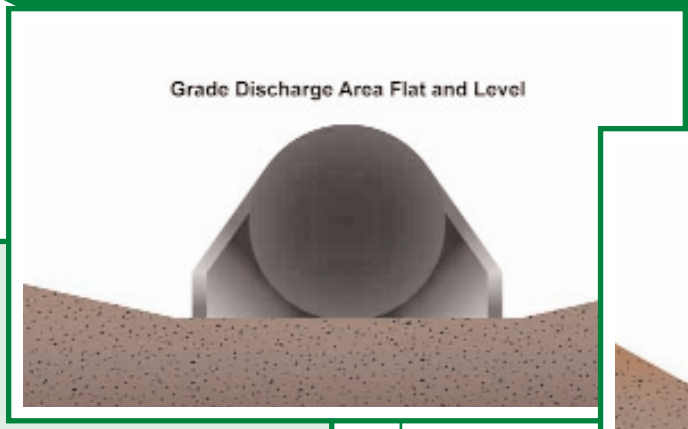
The other option is to plan and design for a non-vegetated state:

- generally either a constant wet condition, such as a stream bed condition – where larger particles of sediment materials will constantly be accumulating and moving around,
- or arid areas – where vegetation may take years to fill in, or may never quite fill in, and will also accumulate and change with sedimentation. In these conditions, utilize a combination high performance turf-reinforcement mat (TRM) and ScourStop™.



If the downstream water conveyance is relatively flat, you may need to determine that standing water is a possibility, whether or not that is situation is acceptable, and how to best deal with it. One popular option is installing a 'french drain' structure to take low flows off of the surface, allowing the vegetation and soil structure to 'firm up' and stabilize.





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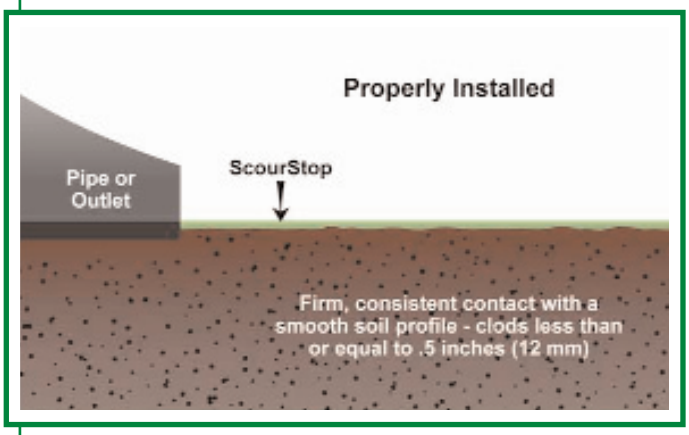
4. Remove saturated soils or hard clods of soil, and replace with fertile, workable soil.
5. Till the soil to create a consistent, manageable texture. Do not fill in low areas with dry, loose soil which is easily eroded. Compact the soil to a 'firm' status conducive to a proper seedbed.
6. Level the discharge area to a fairly smooth surface to minimize the potential for water concentrating in a single area.
7. Grade the soil height so that the final elevation height of all products to be used is level with the floor of the discharge outlet.

The soil surface should be relatively smooth and level across the width of the conveyance to inhibit storm water from concentrating and forming an erosive rill which would destroy the installation over time.

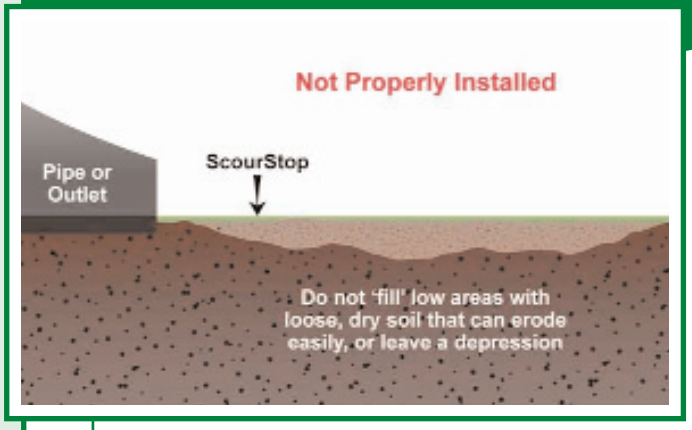


The mats are semi-rigid and should lay over the smooth surface of soil such that they have a fairly consistent contact with the soil or underlying materials, such as TRM or sod.

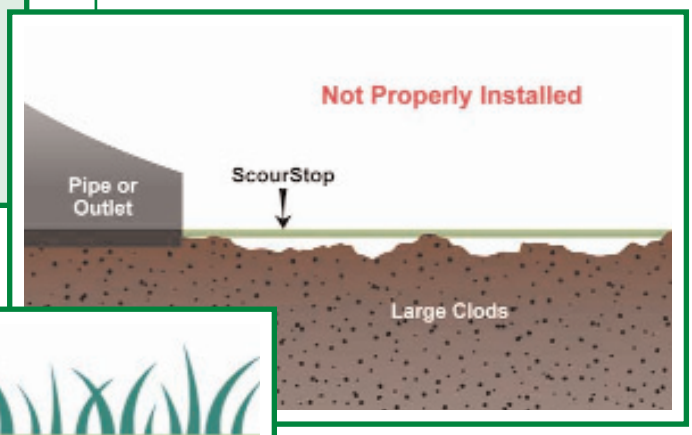
Excavate any 'high areas' and fill in shallow areas with workable soil that can be 'slightly compacted' to create a consistent soil bed.

At a Glance

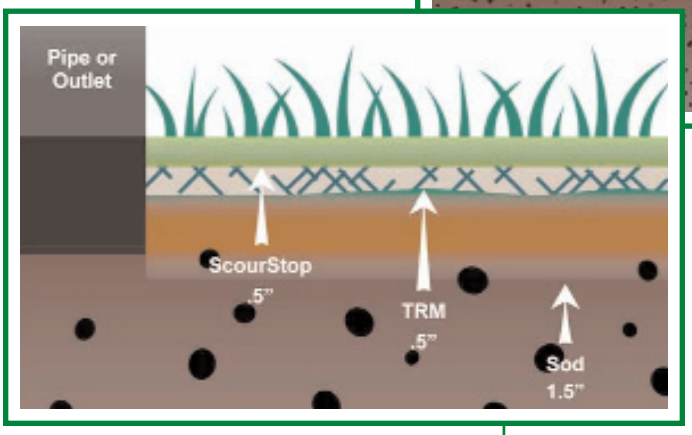
8. Grade the discharge channel as long, level, and wide as possible.
9. 'Softly' round the grade to the side slopes.
10. Avoid abrupt changes in water flow surfaces. Add a second layer of ScourStop™ mats at the scour area and additional mats at abrupt change in slope areas, if necessary.



Loose, dry soil will not compact and may 'shrink' when wet, causing a depression or potential area for erosion to start.

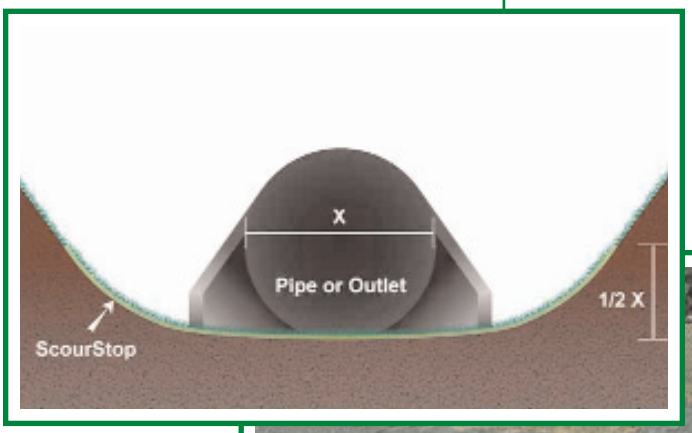


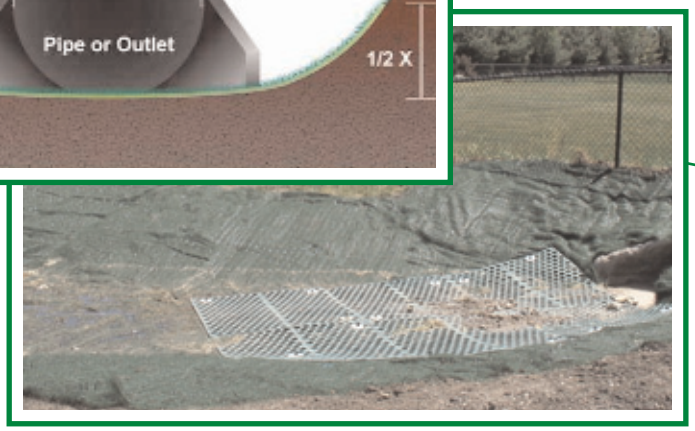
Remove saturated soils, hard clods, and areas of poor soil. Replace with soil that is fertile for vegetation growth and workable for creating the structure and shape required.



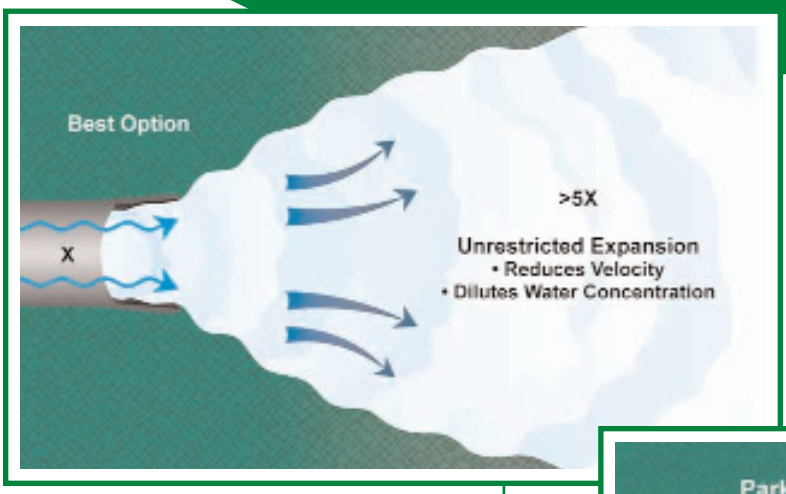
The top of the SS mats should be level or slightly lower than the top of the discharge surface. Therefore the height of the grade should be calculated by subtracting for all of the materials to be utilized. For instance, subtract 2 inches for sod, 1/2 inch for most TRMs, and 1/2 inch for the SS mat, which all add up to 3 inches below the top of the discharge surface (edge). Sod and SS alone would require a 2.5 inch excavation for final grade.

Where the channel sides are formed, grade as flat and rounded as possible. Again, SS mats are semi-rigid and abrupt changes in grade should be avoided in order to maintain a consistent contact with the surface.

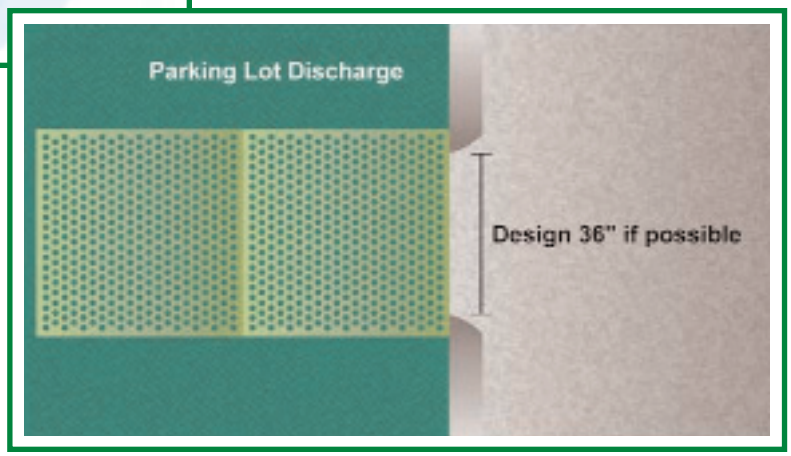


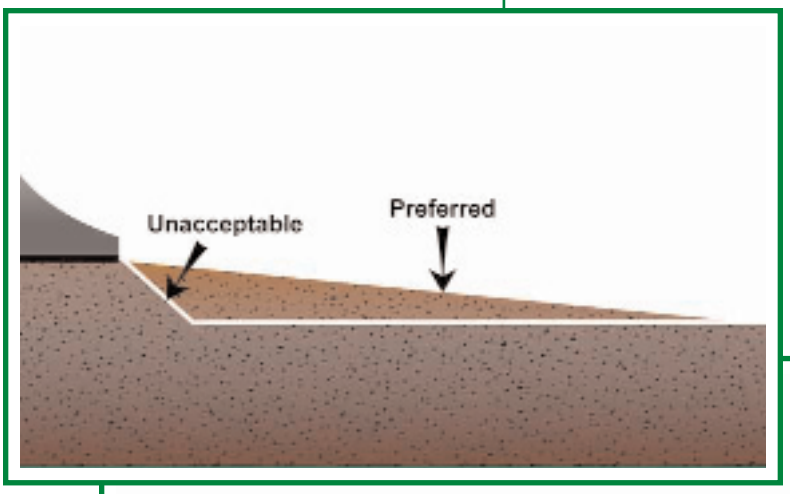


the green solution to rip rap
scourstop™

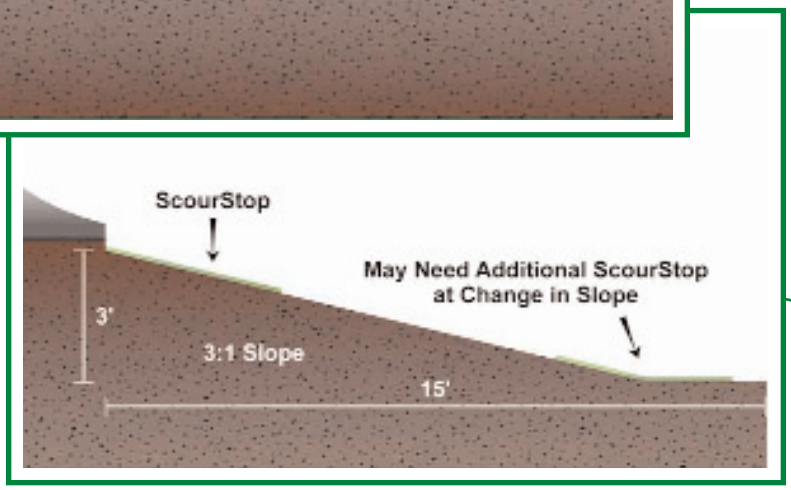


The bottom width of the formed channel should always be at least as wide as the outlet. In a pipe situation, 5 times the diameter is recommended, with a minimum of 3 times the diameter. In a parking lot outlet situation, double the width would be recommended.

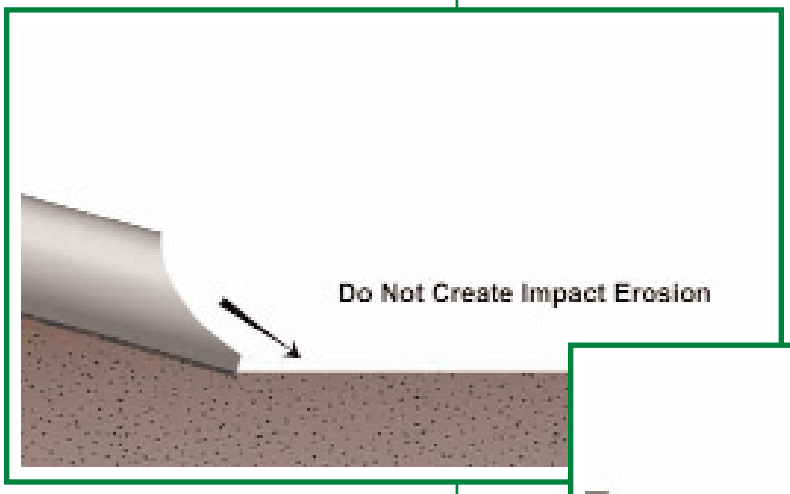




Grade the slope away from the outlet as flat as possible, and grade for the largest width reasonable. Scouring and erosion is possible wherever a flow encounters a change in slope. The more extreme the change in slope, the more erosion potential of the channel.



Headcutting - the process of soil erosion downstream working itself upstream as a rill or gully - is usually caused by a significant change in elevation and inadequate soil protection for the length of the slope.



Avoid both impact and waterfall impact erosion.

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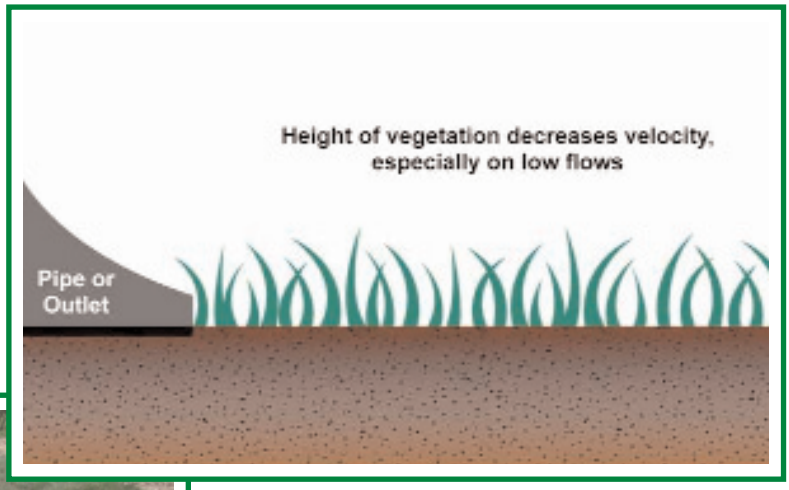
11. Install the sod pieces perpendicular to the flow, and fit the pieces snuggly together. Install sod up the sides of the channel to half the height of the outlet, and at least twice the distance of the transition mat installation.
12. If installing a TRM over the sod, mow or trim the sod grass stems to less than 2 inches, remove the trimmings.
13. If installing a TRM perpendicular to the flow, shingle the lagging edge over the next leading edge in a stair step fashion. Or if the turf reinforcement mats are to be parallel to the flow, lay a mat down the center of the channel, and then install the adjacent mat under the side edge of the center mat.

ScourStop™ MUST BE USED with other 'soil cover' BMPs.

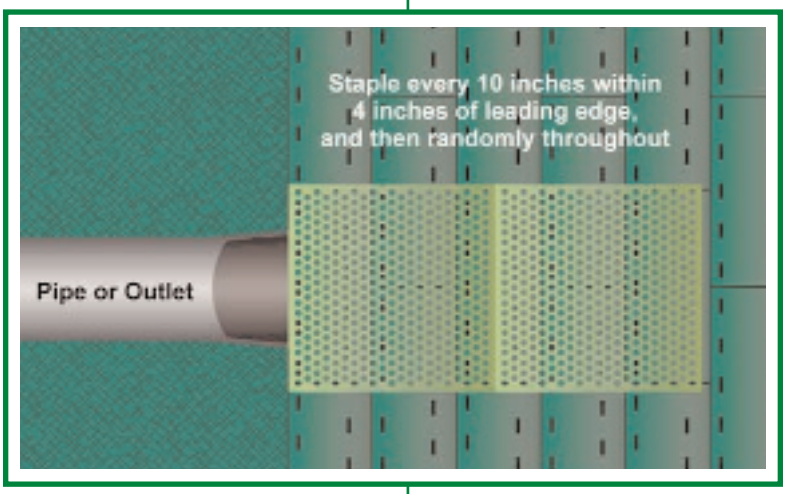
ScourStop™ must be used with another BMP 'cover' to protect soil particles from the erosive forces of moving water. Some BMP 'covers' include: sod, turf reinforcement mats (TRMs), composite TRMs, possibly erosion control blankets (ECBs) in limited applications, and combinations thereof.

Sod eliminates the risks of seed washing away prior to germination, poorly germinating, or thinly vegetating the area. Sod is the fastest means for vegetative cover because it is ready-made with near surface root mat and good surface cover foliage. Sod often needs irrigation maintenance during the rooting down stage, and should not be allowed to go dormant during the first season. Sod will carry a significant velocity without added support of turf reinforcement mats, so it can be used downstream of the SS mats after the shear has dissipated.

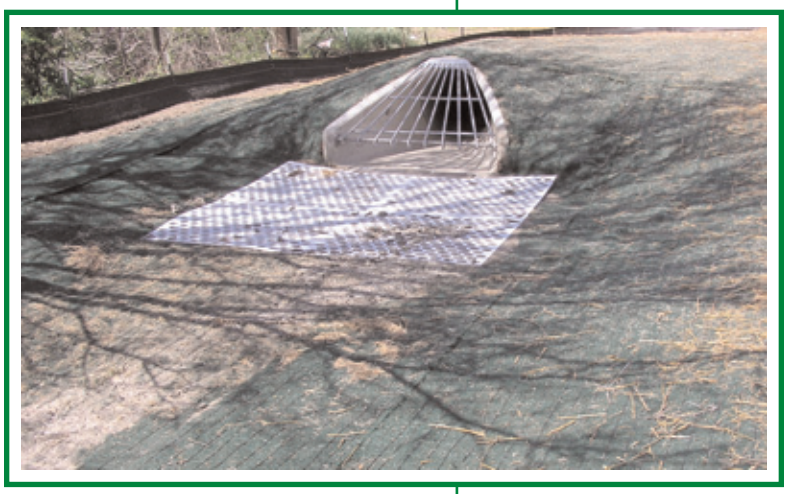


StayTurf is a reinforced-sod product as a great option. It has been tested at 12 pounds per sq. ft. shear strength and many of the benefits of TRM reinforced applications.

Install sod up the sides of the channel at least half the height of the outlet, and at least twice the distance downstream of the ScourStop™ installation. All leading edges of uncovered sod should be stapled about 4 inches downstream of the edge, laterally 8-12 inches apart, and randomly throughout the sod piece.



If sod is utilized under ScourStop™, stapling the sod under the ScourStop™ is not necessary, and staples used for TRMs may replace some sod stapling requirements. If sod is utilized under ScourStop™, stapling the sod under the ScourStop™ is not necessary, and staples used for TRMs may replace some sod stapling requirements.



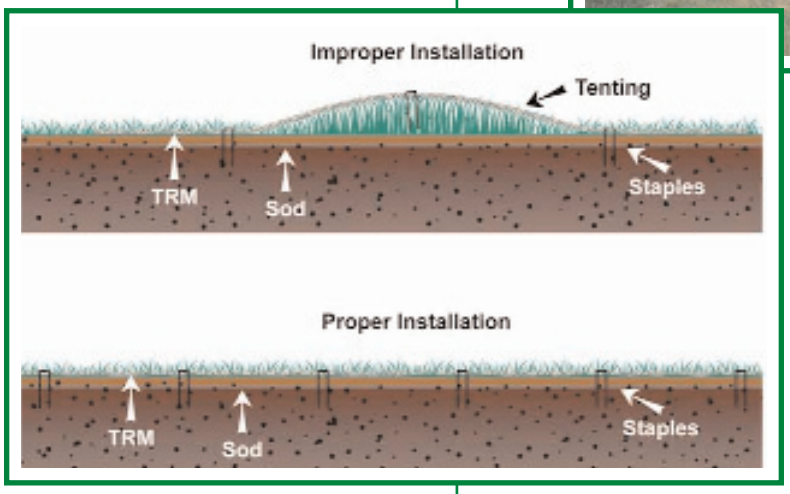
Turf Reinforcement Mats – What, Why, and When

A dense grass cover provides one of the best defenses against soil erosion, provided the velocity of water flowing over the surface is not of sufficient duration and intensity to degrade the vegetative cover.

If there is a risk of degradation, the vegetation must be reinforced by turf reinforcement mats (TRMs) and mechanically anchored to the soil. A turf reinforcement mat consists of various UV-stabilized synthetic fibers and filaments processed into permanent, high-strength, three-dimensional matrices that reinforce either the stems or roots of vegetation.

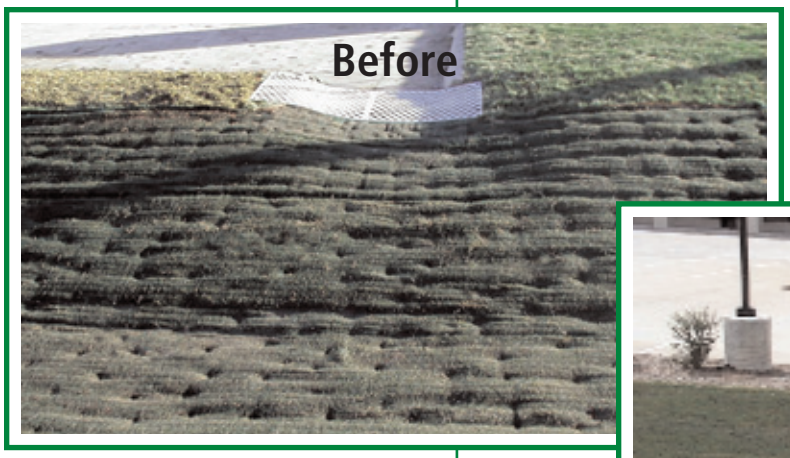
This three-dimensional mat functions as an open, stable matrix for the entanglement of plant roots, stems, and soil, which together form a coherent, living matrix. They are designed for permanent and critical hydraulic applications such as drainage channels where expected discharges result in velocities and tractive shear stresses that exceed the limits of mature, natural vegetation.

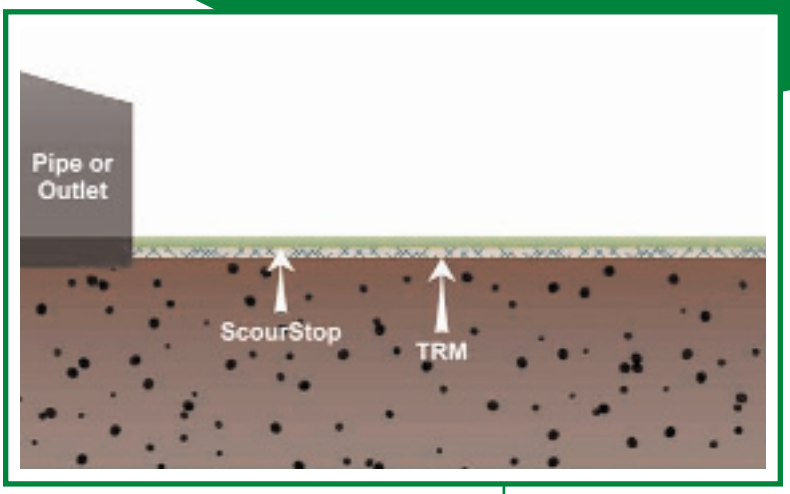
With any mat, it is essential to minimize seepage flow between the mesh and ground surface. The flexibility of the mesh and the method of installation must be adequate to avoid bridging between the mesh and soil. TRMs can not resist the high shear forces and scour below a storm water outlet, thus requiring ScourStop™ transition mats.

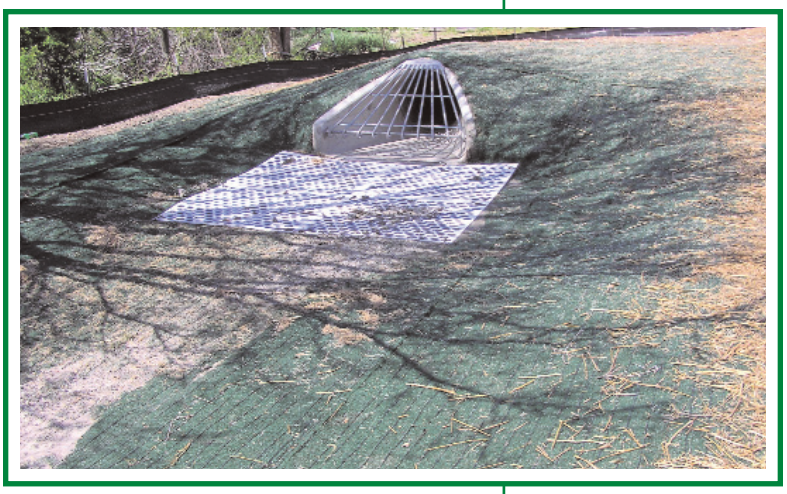


Open-weave TRMs (non-composite) can be installed over sod, and the grass stems will grow through the TRM. The sod should be trimmed less than 2 inches if possible, and the trimmings removed. In fact, if possible, it is easier if you mow it to the shorter length at the sod farm prior to its cutting.

Use at least double, and possibly triple, the manufacturer's recommend staple rate when installing TRMs over sod. The vegetation is much denser and will 'tent' extensively – causing blanket failure, erosion, and mowing problems if not adequately stapled to the ground. Plan on a return trip in 7-10 days to over-staple areas and/or roll the TRM down.

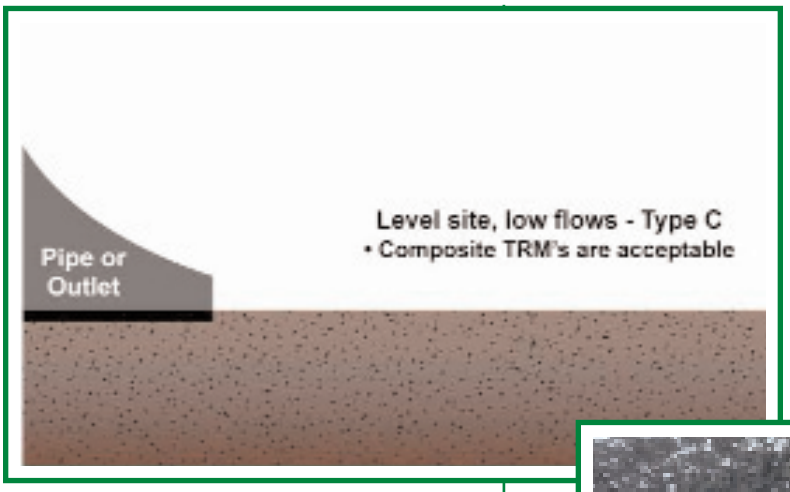






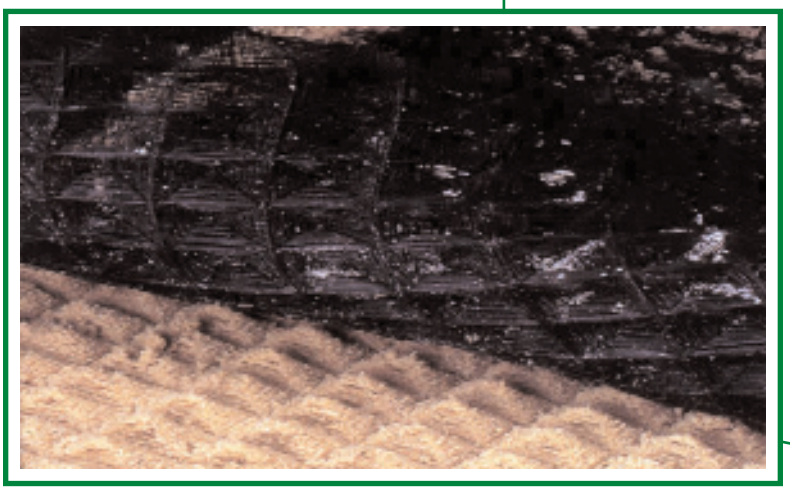
With ScourStop™ and TRM over bare soil, use a quick germinating annual seed and phosphate fertilizer to help vegetate the area as quickly as possible. Once a rill starts, any installation is at high risk for failure. We highly recommend irrigating the annual seed every 3-4 days to promote a quick and thick vegetative growth. Stabilizing the soil with vegetation is extremely important. [TRMs are tested under a fully vegetated condition and anything less than full vegetation creates a high risk scenario for erosion under the TRM.]

Use a higher than recommended rate of native and/or permanent seed mix to follow through with the annual grass. And again, follow-up with maintenance irrigation until the permanent seed is established. We suggest native marsh seeds for wet soils, or as an alternative, consideration of plugs for faster dense vegetation.



Composite TRMs

A combination of synthetic and bio-degradable materials in a three-dimensional mat may be quite effective in the Type C installation mode. However, because they have a bio-degradable feature, composites should be used in non-arid regions where rainfall is adequate to sustain vegetation (which protects the soil after the bio-degradable fibers are gone).



High Performance Turf Reinforcement Mats

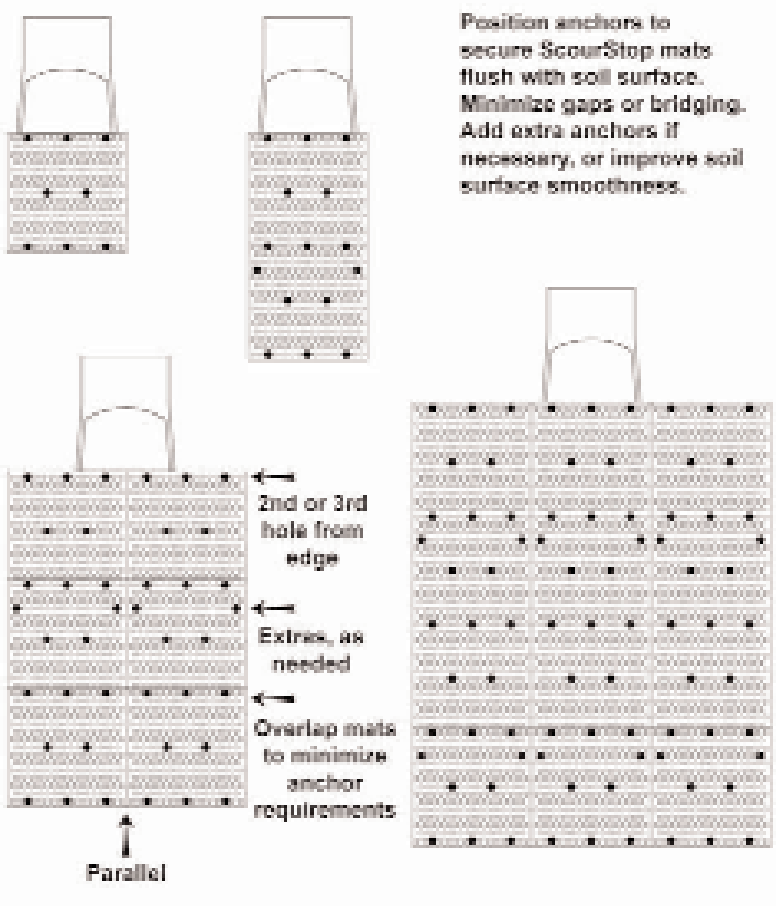
By definition, turf reinforcement mats are permanent structures utilizing materials that do not bio-degrade. Only high-performance TRMs were tested for effectiveness under ScourStop™ at Colorado State University. Colorado State's design parameters require the use of TRMs with a **minimum unvegetated rating of 5.5 feet per second** flow for Type D installations.

The definition of a turf reinforcement mat by The Erosion Control Technology Council (ECTC) states that a TRM is, "A long term non-degradable RECP composed of **UV stabilized, non-degradable, synthetic fibers, nettings and/or filaments** processed into three dimensional reinforcement matrices designed for permanent…"

Use high performance TRMs under ScourStop™ where velocities up to 12 feet per second are anticipated, or in arid areas where full vegetation may take years, or might not vegetate at all.

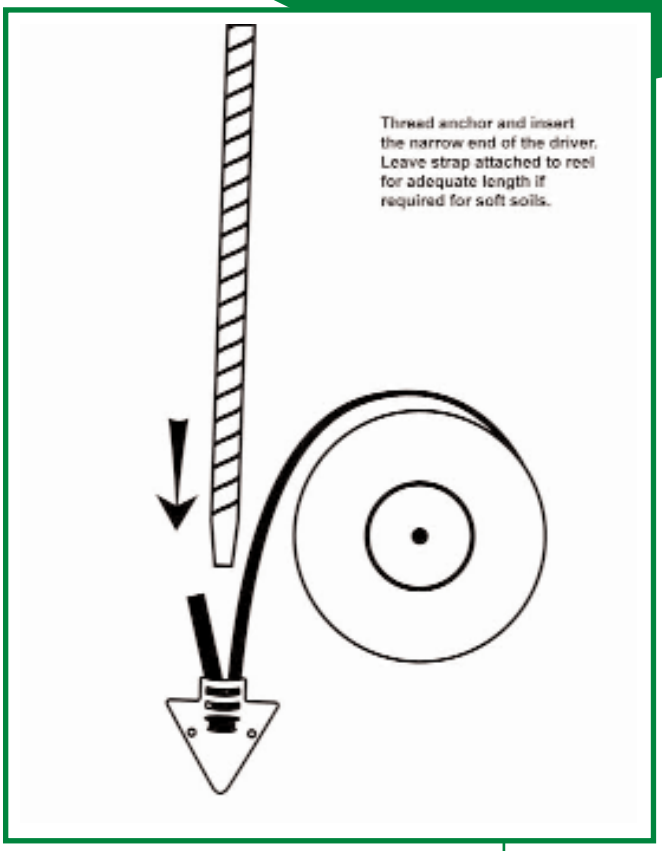
At a Glance

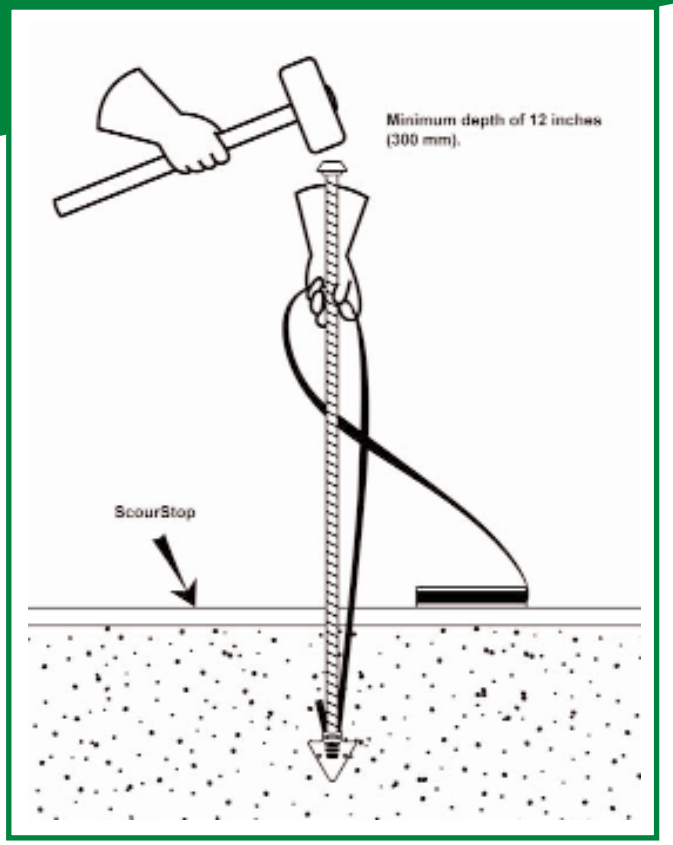
14. Lay the ScourStop™ mats over the designated area, centering the mat layout with the discharge point, and parallel to the flow direction.
15. As the mats are semi-rigid, anchors may be located in 'regions' or 'centers of regions' of the mat, rather than directly in the corners and on the edges. In other words, an anchor could be located 6-8 inches in from an edge, yet still firmly hold down that same edge. The objective is to have the mat flush with the surface, and minimal 'gaps' between the surface and the mat, where water could concentrate and cause erosion.
16. Install at least 5 anchors per sheet of transition mat, in a 3 – 2 – 3 configuration, with the downstream 3 anchors also anchoring the leading edge of the next mat. **Use more anchors if necessary to insure a flush installation** (proper grade preparation should minimize this need). Possibly stand on different regions of the mat before anchoring to determine where the anchors would be best located to minimize the need for extra anchors. Standard packaging provides 6 anchors per mat.
17. **Transition mats doubled up in the immediate scour area of 36+ inch discharge pipes have shown added protection.**

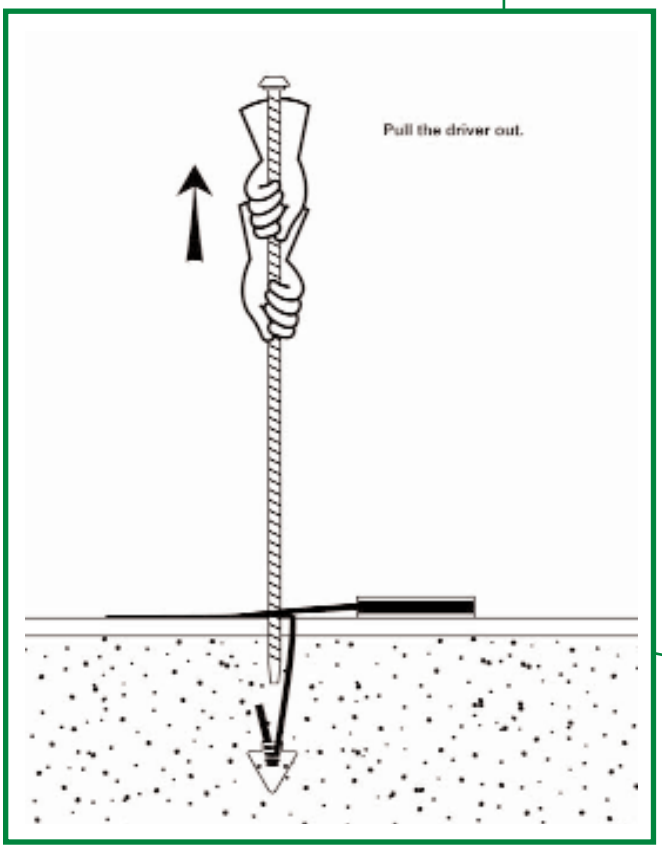


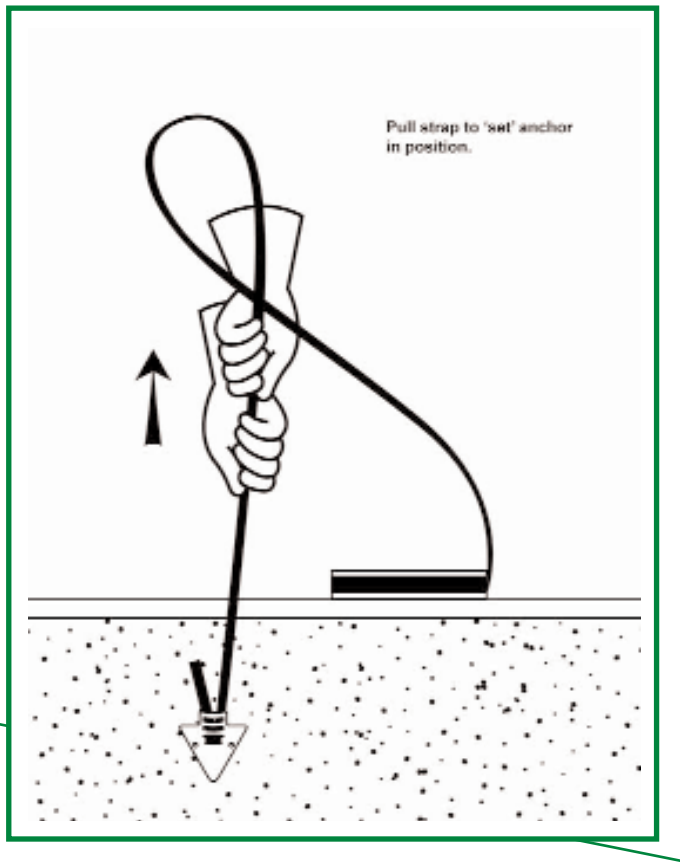
At a Glance

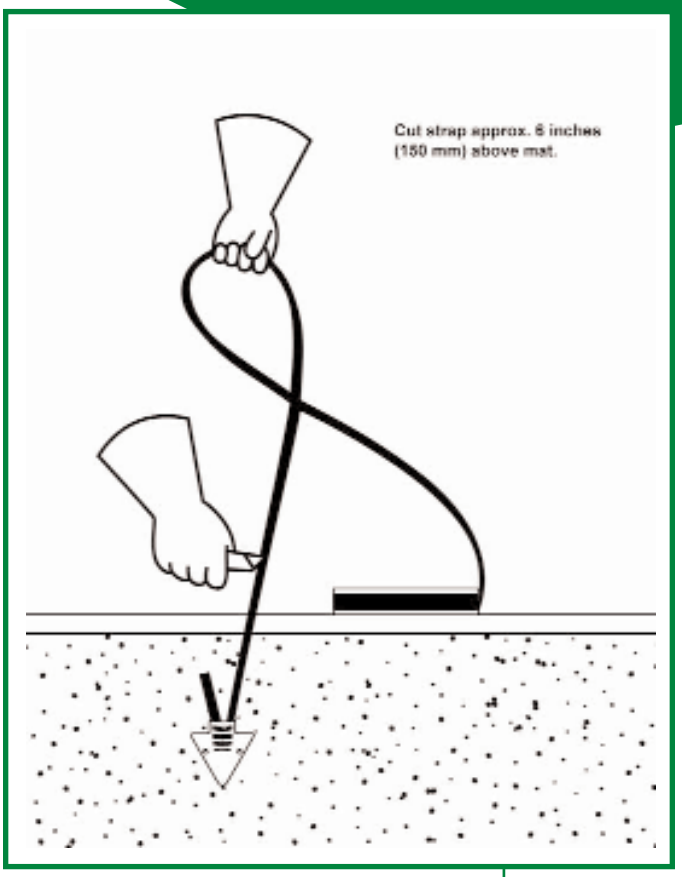
18. Thread the plastic cable through the arrow as indicated. Do not cut the cable from the spool until you have achieved your anchoring depth.
19. Drive the anchors at least 12 inches deep in firm soil, or as deep as necessary in wet soils to achieve effective anchoring.
20. Cut the cable about 6 inches above the transition mat.
21. Install the plastic washer over the cable, and then add the one-way stop over the washer. Pull the cable backwards to 'set' it in the soil while pushing down on the one-way stop. This will create a 'snug' fit of the transition mat with the ground.

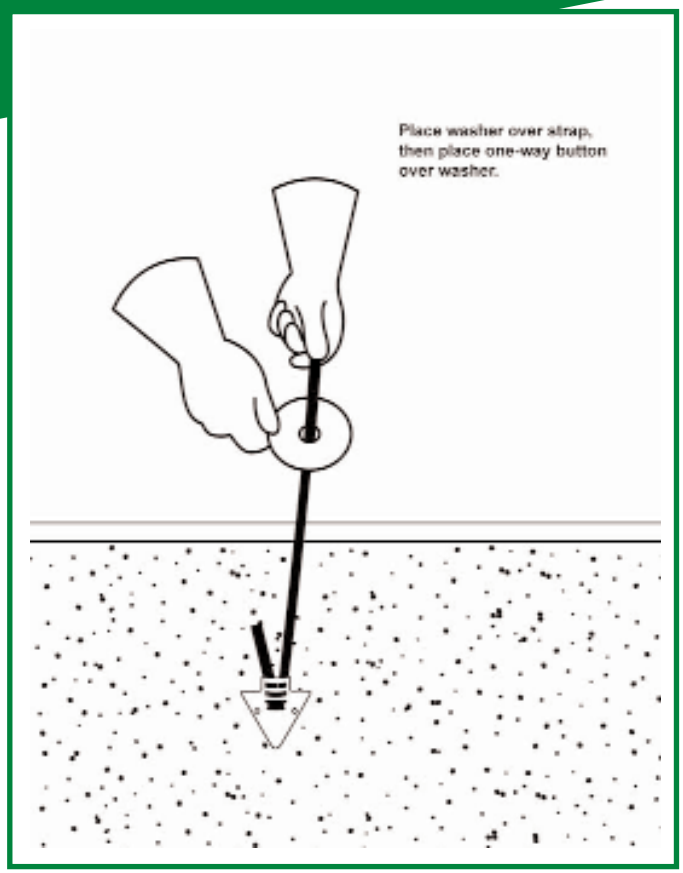

Thread anchor and insert the narrow end of the driver. Leave strap attached to reel for adequate length if required for soft soils.

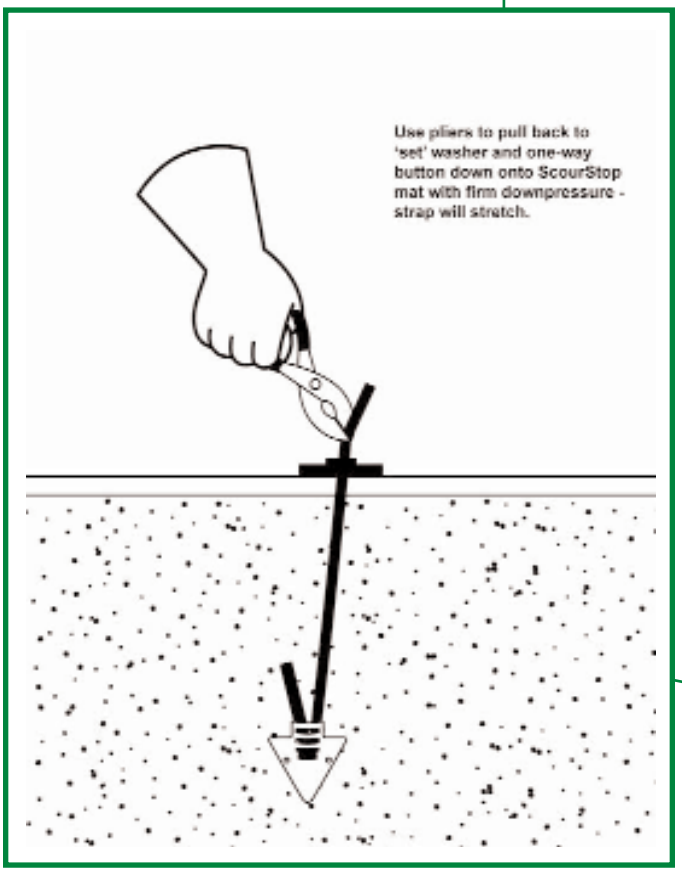

Minimum depth of 12 inches (300 mm).
ScourStop


Pull the driver out.


Pull strap to 'set' anchor in position.

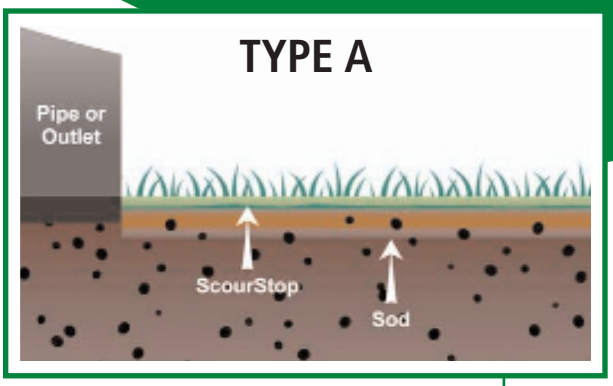


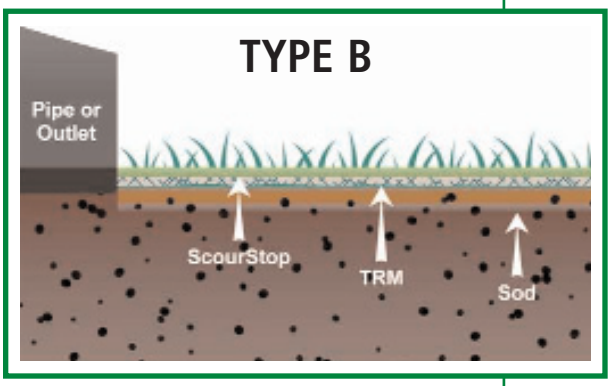


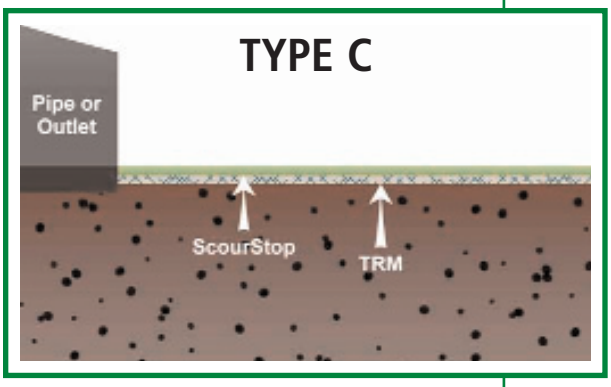


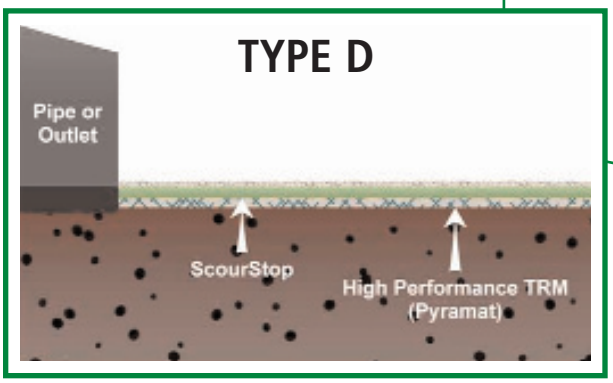
Start by threading the plastic cable through the slots in the anchor. Do not cut the cable from the spool until you have achieved anchoring depth and 'set' the cable by pulling back on it. Insert the driver into the anchor and both into the desired ScourStop™ hole. Drive the anchor at least 12 inches deep, or as deep as needed to set it into firm soil. Pull the driver out of the hole, and then 'set' the anchor by pulling back firmly on the cable lead. Cut the cable approximately 6 inches above the ScourStop™ mat so that you have enough material to re-pull the cable. After it is cut, install a plastic washer over the cable tail, and then add the one-way stop with the flat side down so it will lock the installation down. In a simultaneous operation, pull back on the cable lead while pushing down on the one-way stop. This should create a 'snug' fit with the transition mat against the ground.

Attempt to 'snug' down any area where there is a significant gap between the ground and mat.









Each installation type solves a certain problem or maximizes performance by enhancing the installation parameters.

Type A – up to 16 fps – ScourStop™ protected sod in the scour area eliminates seeding risks and provides aesthetic benefits immediately. General applications would be parking lot discharges and storm pipe up to 60 inches in diameter.

Type B – up to 16 fps – ScourStop™, sod and an open-weave Turf Reinforcement Mat provides for higher velocities and shear forces. The sod eliminates poor germination risks and provides a fully vegetated TRM within a couple of weeks. TRMs are tested and rated at a fully vegetated condition.

Type C – up to 12 fps – ScourStop™ and a TRM combination (composite may be acceptable) for areas where sod is not feasible (possibly hard to irrigate). The area should be fairly level. Utilize a fast germinating seed to stabilize the soil as soon as possible, and a native or permanent seed for permanent vegetation. Irrigate the seedbed, if possible, to improve germination and minimize the risk of washout prior to vegetation.

Type D – up to 16 fps – ScourStop™ and a high performance TRM (minimum 5.5 fps unvegetated rating) combination used where quick vegetation is unlikely, you desire a temporary installation - such as in the construction phase, or in a saturated soil/gravel type streambed area where sedimentation is more likely than vegetation.

Unvegetated TRMs downstream of transition mats should be stapled down at twice the manufacturers' recommended rate because velocities may still be higher than the TRMs' unvegetated rating.