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EROSION AND SEDIMENT CONTROL PLAN APPLICATION AND GUIDE FOR SMALL PROJECTS

Erosion & Sediment Control Plan

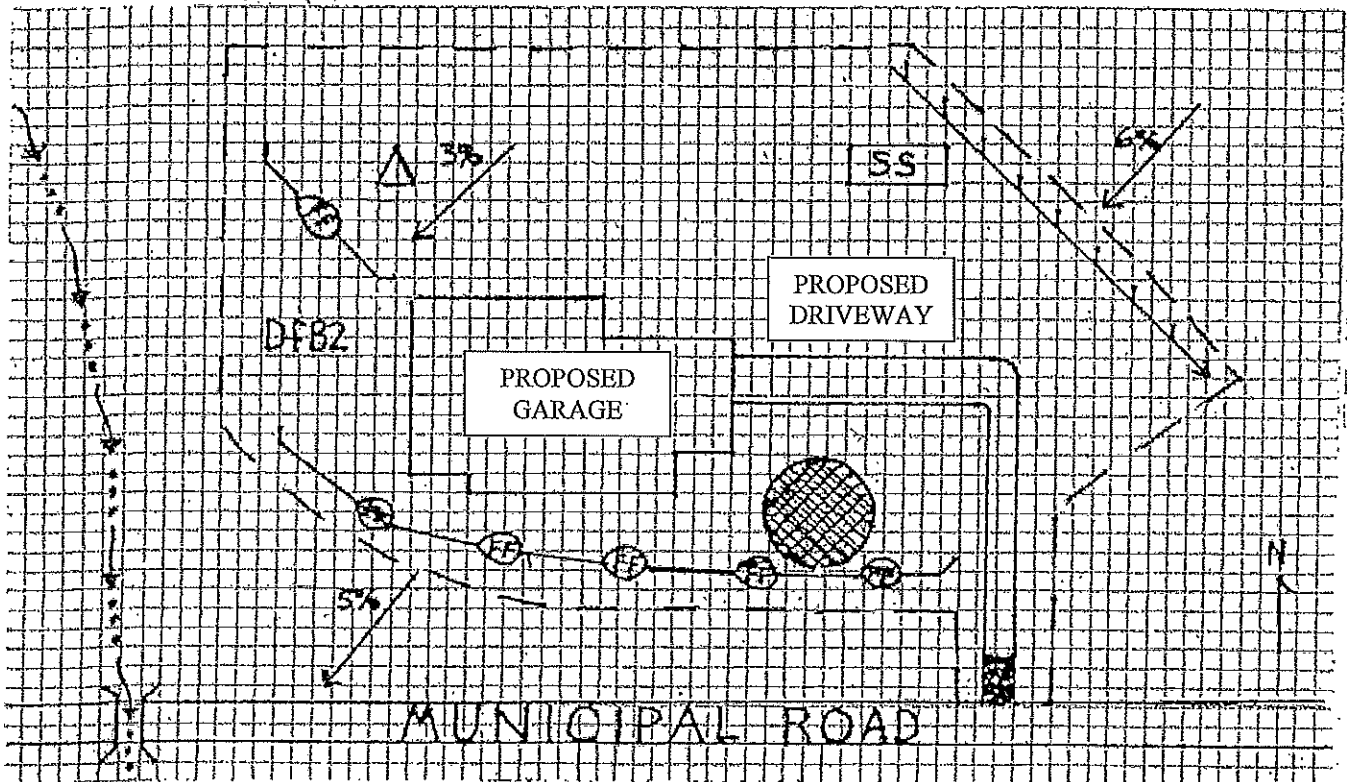


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INTRODUCTION

This document was designed to assist in the development of Erosion and Sediment Control (E&SC) Plans for small projects with earth disturbance activities of more than 5,000 square feet, but less than 43,560 square feet (one acre) on either A, B, or C slopes*. It is not intended to be used for residential lots, commercial or industrial facilities; existing erosion and sediment control publications concentrate on the larger complex projects. The material addressed in these publications is often understandable only by qualified professionals. To determine the essential requirements for a small project is nearly impossible. The existing manuals do not attempt to make a distinction between multi-million dollar projects and small improvements project.

Your local conservation district would like to clear up this confusion and simplify the E&SC planning process. Our intent is to take a step-by-step outlined approach to the development of an E&SC Plan.

E&SC Plans for small projects properly prepared with the assistance of this manual will satisfy the requirements of the Pennsylvania Department of Environmental Protection (PA DEP) Chapter 102, Erosion and Sediment Control, Rules and Regulations, pertaining to plan development and content. The local conservation district reserves the right to determine whether or not this manual can be used due to the objective nature of the term "small projects".

Please be aware that other federal, state and local permits may be required. To check on possible permit requirements, contact the Department of Environmental Protection, Northeast Regional Office, Soils and Waterways Section (570-826-2511). Contact the local municipality in which the earth disturbance activity is to take place to make a determination of their requirements; also, call Pennsylvania One Call (PA-1-CALL) System, Inc., at 1-800-242-1776, several days prior to project initiation.

CHAPTER 102—EROSION & SEDIMENT CONTROL RULES & REGULATIONS:

The reason for the Chapter 102 rules and regulations is to implement the intent of The Clean Streams Law of Pennsylvania. The Clean Streams Law prohibits the discharge of any substance into the Waters of the Commonwealth, which creates a nuisance. The Law is not this simple and straight forward, but the bottom line is essentially the same. Sediment, with its number one rating by volume as a pollutant to PA's Waters, is listed as a nuisance.

A copy of the Chapter 102 rules and regulations is available from your local conservation district. The rules and regulations attempt to provide controls to minimize the sediment pollution problem. Anyone who disturbs more than 5,000 square feet of soil and exposes the earth's surface to the forces of erosion is subject to these controls. The primary element of Chapter 102 is the E&SC Plan. This plan is required to include information on site characteristics, proposed alterations, and a step-by-step outline on how accelerated erosion and the resulting sedimentation will be minimized throughout the duration of the project. Projects which are subject to a National Pollution Discharge Elimination System (NPDES) Storm Water Discharge Permit cannot use this Small Project Plan Guide. Small projects must develop and implement the required E&SC Plan, but do not require a permit for the earthmoving activity. Any project, which does not have a written E&SC Plan and therefore cannot produce a copy of the plan during an official site inspection, is subject to the same fines and penalties as a larger permitted site.

Local municipalities' and the PA DEP's various permitting Bureaus often require an E&SC Plan to be submitted for review by the conservation district prior to construction. Local municipalities can also have rules and regulations that are more stringent than Chapter 102.

The Chapter 102 rules and regulations attempt to keep sediment from impairing the Waters of the Commonwealth. The rules and regulations require an E&SC Plan to be developed and implemented. The regulations, although complex, simply attempt to minimize the nuisance created by erosion and the resulting sedimentation.

*Projects on D, E and F slopes may apply if a property survey reveals actual slopes of less than 16% in areas of the proposed earth disturbance.

GENERAL FACTORS TO BE CONSIDERED IN DEVELOPING AN E&SC PLAN

A. Practice Proper Site Grading -- Hold Site Grading to a Minimum

The risk of severe erosion increases in relationship to the amount of site disturbances. Steeply sloping sites generally will require more grading than gently sloping sites. Excessive cutting and filling may alter the ground water system, open seeps or expose unstable soils. Improperly compacted fills may also be extremely erosive.

All of the topsoil removed from areas where cuts and fills have been made should be stockpiled and redistributed uniformly after grading. This is the key to revegetating the site.

B. Save Existing Vegetation, Especially Trees

Vegetative cover is the best protection against erosion. Established sod can be up to 98% effective in controlling erosion. Trees and shrubs that are to be saved should be marked and roped off along the entire drip line (area under the crown of the tree). This procedure protects the plants from damage by construction equipment. Filling around trees should be avoided. Advice on how to best protect trees is available from the PA Department of Conservation and Natural Resources, Bureau of Forestry (PA DCNR) at (570) 385-7800.

C. Minimize the Area and Time of Exposure

It is risky to remove all the vegetation and topsoil from areas, but sometimes it cannot be avoided. When this happens, plan the construction sequence to keep the size and time of exposure to a minimum. Stabilize all areas as soon as you can. Applying a stone base to your access or driveway the same day it is cut in, is an excellent example.

D. Timing of Your Project

Always try to schedule earth disturbance activities during the two growing seasons in Lehigh County. Permanent seedings become established best when planted in the spring or early fall.

VEGETATION TO CONTROL EROSION

The use of vegetation to control erosion and sedimentation should be given primary consideration when developing your E&SC Plan. Areas of slight to gentle slopes and fertile soil can be easily stabilized by using plants and cultural methods common in the region. Establishing heavy plant cover on moderate slopes will usually protect the site from erosion. During land use changes, a temporary cover of annual vegetation is sufficient and at the completion of the change, more permanent cover crops should be used. Adequate soil cover for soil stabilization is when vegetation covers 70% of each square yard of the disturbed area.

Sites that have exposed subsoil, shallow depth to bedrock, droughty conditions or other limiting properties require additional treatment. Such sites demand that special attention be given to seedbed preparation, adjusted fertility levels, supplemental irrigation, adapted seedlings or plantings, and site protection until the vegetative cover is established. More emphasis must be placed on the stabilization of critical areas because they are subject to severe erosion and are the greatest source of sediment.

Since vegetation is considered the most effective and practical erosion control practice, it is recommended that you consult the Penn State Agronomy Guide. The Guide is available at the Penn State Cooperative Extension-Lehigh County Office (610-391-9840). The information contained in this publication stems from current research and development of erosion control plantings. Information from selecting good quality seed to maintaining established areas is well presented and will be a valuable asset to your erosion control plan design efforts. The proper grass seed mixtures can be obtained from building supply stores, farm product stores, or even ordered from seed catalogs. Local hardware stores and lawn and garden centers sell seed mixtures, which can be combined with another mixture to obtain the recommended amounts. Included in this Guide are seeding mixtures and preparations for standard sites. This information, if used, will provide adequate stabilization on sites which do not have any special problems.

RECOMMENDATIONS FOR REVEGETATION

A. Lime – Agricultural Grade Limestone

Adding lime to the soil is vital to your revegetation efforts. The soils on the majority of disturbed sites are acid and infertile. Acid precipitation complicates this pH problem. A soil test from a reputable laboratory is recommended. If soil test results are not available, apply lime at the following rates:

Lime	4 tons per acre	184 lbs. Per 1000 square feet
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(N) (P) (K)

B. Fertilizer – Commercial Type 10–20–20 (nitrogen-phosphorous-potassium)

The need for fertilizer can not be underestimated. Fertilizer will greatly increase the growth of both the plant and its roots. Once again, a soil test is the preferred alternative. If soil test results are not available, apply fertilizer as follows:

Fertilizer	930 lbs. per acre	21 lbs. per 1000 square feet
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C. Mulch – Hay, straw, and various wood products

All areas, which are seeded with either temporary or permanent seed mixtures, should be mulched. Mulch is a loose layer ¾" to 1" deep of hay or straw. Mulch reduces soil erosion, aids seed germination, and conserves moisture. Hay or straw should not be chopped or finely broken during application. During the non-growing season, mulch should be bound to the soil with either a cellulose, guar or emulsion resin tackifier. This prevents the removal of the mulch by wind action.

Mulch	3 tons per acre	138 lbs. per 1000 square feet
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D. Seed Bed Preparation and Seeding Methods

Prior to seeding, apply the recommended amount of limestone and work as deeply as possible into the soil. At seeding time, work recommended fertilizer as deep as possible into the soil. Seed at the recommended rates and follow with an adequate layer of mulch.

Seed can be applied to disturbed areas in many ways. Broadcasting seed either by hand or spreader, drilling, and hydroseeding are some examples. Hydroseeding is a common practice on construction sites. The lime, fertilizer and seed mixture is added at one time. Warning: To achieve adequate revegetation, the seed bed still must be properly graded and tilled. Wood cellulose, a paper-like product, is often substituted for mulch. The rate of application should be 35 lbs. per 1000 square feet. This is not the preferred alternative. Wood cellulose is better applied at a rate of 18 lbs. per 1000 square feet as a tack coat to hold straw or hay mulch in place.

If temporary seeding is necessary, divide the fertilizer and lime recommendations. Apply the following as part of the temporary seeding:

Lime	1 ton per acre	50 lbs. per 1000 square feet
Fertilizer	150 lbs. per acre	5 lbs. per 1000 square feet

Then apply the remainder of the recommended rates during the permanent seeding process.

E. Temporary Seed Mixture

Annual Ryegrass is a quick germinating species of grass, which can be seeded at almost anytime. If you plan to leave your project disturbed and inactive for 14 days or more, a temporary seeding must be applied immediately. If your site is going to remain inactive for 30 days or more, however, a permanent seeding is necessary.

Annual Ryegrass	40 lbs. per acre	1 lb. Per 1000 square feet
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F. Permanent Seed Mixtures

Establishing a permanent vegetative cover is the final step to effective erosion and sediment pollution control. It is recommended that the Penn State Agronomy Guide be consulted. To make this Guide comprehensive, we have selected a few mixtures, which will meet the requirements of Chapter 102 Erosion Control.

Lawn and Mowed Areas

<i>A. Kentucky Bluegrass</i>	30 lbs. per acre	12 oz. Per 1000 square feet
Redtop	3 lbs. per acre	2 oz. Per 1000 square feet
<u>Perennial Ryegrass</u>	20 lbs. per acre	8 oz. Per 1000 square feet
*TOTAL SEEDING	53 lbs. per acre	22 oz. Per 1000 square feet
	or	
<i>B. Pennlawn-Fine Fescue</i>	40 lbs. per acre	16 oz. Per 1000 square feet
Redtop	3 lbs. per acre	2 oz. Per 1000 square feet
<u>Perennial Ryegrass</u>	20 lbs. per acre	8 oz. Per 1000 square feet
*TOTAL SEEDING	63 lbs. per acre	26 oz. Per 1000 square feet

F. Permanent Seed Mixtures (con't)

Unmowed Areas

**Crownvetch	25 lbs. per acre	10 oz. Per 1000 square feet
Perennial Ryegrass	25 lbs. per acre	10 oz. Per 1000 square feet
*TOTAL SEEDING	50 lbs. per acre	20 oz. Per 1000 square feet

*All mixtures given above are for PLS-Pure Live Seed 100%. To calculate PLS, the percentage of pure seed is multiplied by the percentage of germination, and the product is divided by 100. (85% Pure Seed x 72% germination) divided by 100 = 61% PLS. To determine how much seed to plant, divide the percentage into 100. EXAMPLE: 100 divided by 61 = 1.63. Thus, every pound of seed mixture called for should then be adjusted to 1.63 lbs.

**Crownvetch is a legume and will require an inoculant.

Please contact your seed supplier for specific directions on applying the required inoculant.

G. Time of Seeding – Permanent

For best results, grass and legume seedings should be made in the spring; however, with proper establishment techniques, disturbed sites can be seeded almost anytime from spring to fall. A general rule is as follows:

- 1) Legume seedings need a growing period of at least 10 to 12 weeks prior to hard frosts.
- 2) Grasses generally require at least 4 to 6 weeks of growth prior to hard frosts.

OFFSITE AND UPSLOPE DRAINAGE

It is important to consider the possible problems that can be created by runoff from areas upslope of your project. Runoff should be diverted safely around any disturbed areas or be slowed and carefully directed through the area of disturbance. Unprotected soil erodes severely when exposed to concentrated runoff.

In order to evaluate the issue, purchasing a topographic map of your area may prove beneficial. Topographic maps are available from the U. S. Geological Survey, Map Sales, Federal Center, Box 25286, Denver, CO 80225. Small projects can often be observed in the field. Check for existing signs of erosion within the project area. Look for concentrated runoff sources such as downspouts from roof gutter, swale outlets, and springs.

Methods to divert the runoff will be listed in the Control Practice section. Keeping clean runoff from picking up sediment from your project will be very beneficial.

BEST MANAGEMENT PRACTICES (BMPs) FOR EROSION AND SEDIMENT CONTROL

This next section is devoted strictly to providing the E&SC Plan designer with standards and specifications for the most frequently used Best Management Practices (BMPs). BMPs are defined in the Chapter 102 rules and regulations as activities, facilities, measures or procedures used to minimize accelerated erosion and sedimentation to protect, maintain, reclaim and restore the quality of waters and the existing and designated uses of waters within this Commonwealth. A few of the following designs

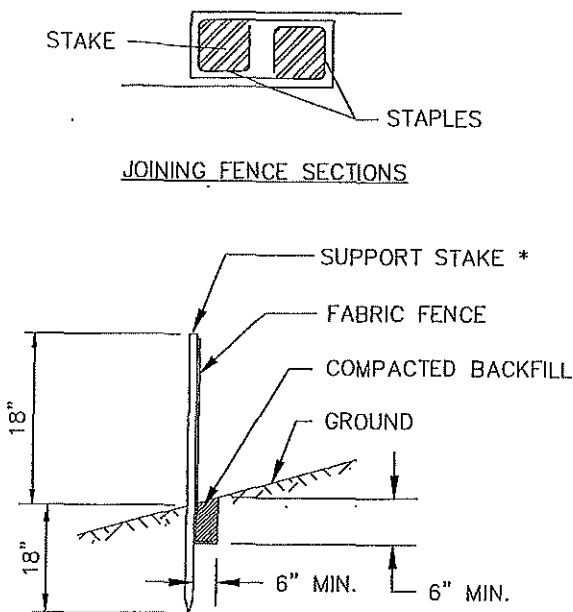
call for specific engineering calculations. If the practice is intended to be left in place for a permanent control structure, the Conservation District highly recommends seeking professional assistance. Since this manual is intended only for Small Project sites, however, the majority of the necessary BMPs can be designed with the following sheets as guidelines.

The design specifications were developed from the requirements presented in the "Erosion and Sediment Control Program Manual of July 2001" by the Bureau of Watershed Management, PA Department of Environmental Protection (DEP).

Alternative BMPs may also be used. If you design BMPs other than those included in this manual, simply include a design sketch with your E&SC Plan. Soil information is presented in the Natural Resources Conservation Service (NRCS) County Soil Survey available from your local conservation district office.

FILTER FABRIC FENCE INSTALLATION DETAILS

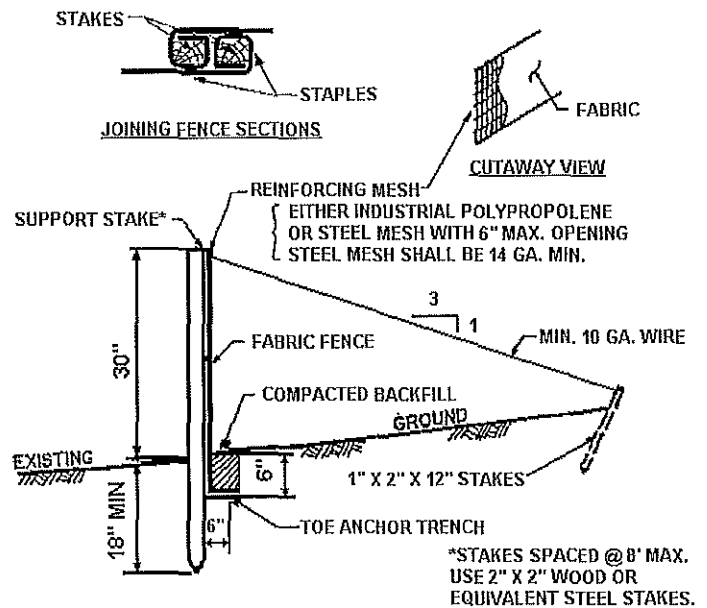
STANDARD SECTION 18" Min. Fence Heights



Use 2" x 2" wood stakes (min)
Or steel stake of equal strength

*SPACING OF SUPPORT STAKES @ 8" MAX.

REINFORCED SECTION 30" Min. Fence Height



**MESH: Either Industrial Polypropylene
or Steel mesh w/ Max 6"
Opening = 1" - Min. 14 Ga.

Maximum Slope Lengths for Filter Fabric Fences		
Slope - Percent	Maximum Slope Length (ft) Above Fences	
	18" High Fence	30" High Fence
2 (or less)	150	500
5	100	250
10	50	150
15	35	100
20	25	70
25	20	55
30	15	45
35	15	40
40	15	35
45	10	30
50	10	25

Slope – Percent: A 2% slope would equal a two-foot vertical drop in 100 feet of horizontal distance. (Slope Length is calculated based on drainage area; multiple rows of silt fence are not acceptable for installation on the same slope.)

FILTER FABRIC FENCE (18" High)

INSTALLATION:

1. A 6" wide and 6" deep trench will be excavated with little, if any, disturbance to the downslope side of the trench. The bottom of the trench and the fence top will be placed at level grade.
2. Support stakes will be driven to the 18" minimum depth below the existing ground surface, at 8' maximum intervals.
3. Stretch and fasten fabric to the upslope side of the support stakes (if a reinforced section, fasten reinforcement mesh prior to fastening the fabric).
4. Where ends of fabric come together, they will be overlapped, folded, and stapled to prevent sediment bypass.
5. The toe anchor will be backfilled and compacted to a density equal to surrounding soils.
6. If constructing a reinforced section, attach guy wires to support stakes. Provisions should be made for easy loosening and removal of guy wires to allow for access to perform maintenance work.
7. Fencing is to be installed parallel to the surface contours, not perpendicular.

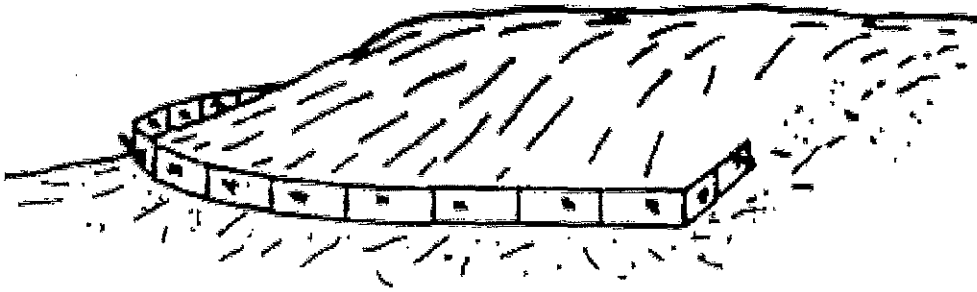
MAINTENANCE:

1. The fence installation should be inspected after every storm event and weekly. Any necessary repairs will be made immediately.
2. Accumulated sediments will be removed as required to keep the fence functional. In all cases, remove deposits where accumulations reach ½ the above ground height of the fence.
3. All undercutting or erosion of the toe anchor will be repaired immediately with compacted backfill materials.

RESTRICTIONS:

1. The formation of concentrated flows on the drainage slope above a filter fabric fence installation is not permitted. If concentrated flows do occur, direct slope stabilization measures must be employed to prevent such conditions.
2. Filter fabric fences will not be placed in any area of concentrated flows such as ditches, swales, channels, etc.

3. Filter fabric fences will not be used in areas where rock or rocky soils prevent the full and uniform anchoring of the fence toe (Straw bales are recommended for this terrain).
4. Filter fabric material will not be placed across the entrance to pipes or culverts.



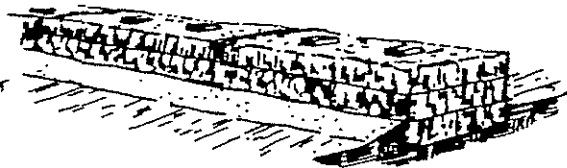
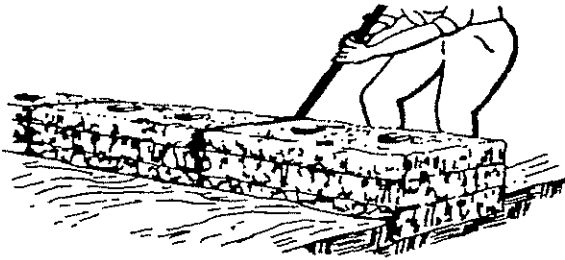
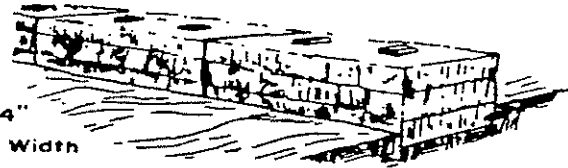
Illustration

Soil stockpile with filter fabric fence installed parallel to the toe of the slope and both end sections at a 45° angle to the slope.

STRAW BALE BARRIERS

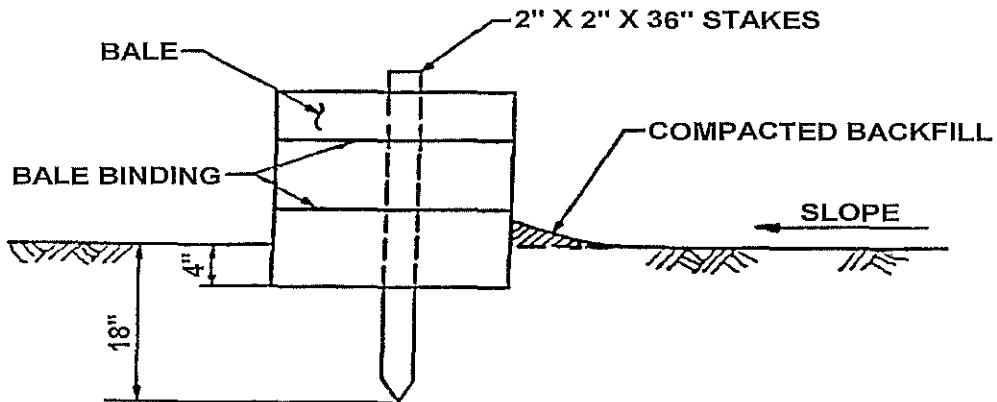
1. EXCAVATE THE TRENCH.

2. PLACE AND STAKE STRAW BALES.



2. WEDGE LOOSE STRAW BETWEEN BALES.

4. BACKFILL AND COMPACT THE EXCAVATED SOIL. (ANCHOR TOE)



INSTALLATION:

1. The anchoring trench will be constructed to the required grade and depth shown.
2. Support stakes will be driven to the 18" minimum depth.
3. The anchoring trench will be backfilled and compacted to a density equal to undisturbed site soils.
4. Straw bales are to be installed parallel to the surface contours, not perpendicular.

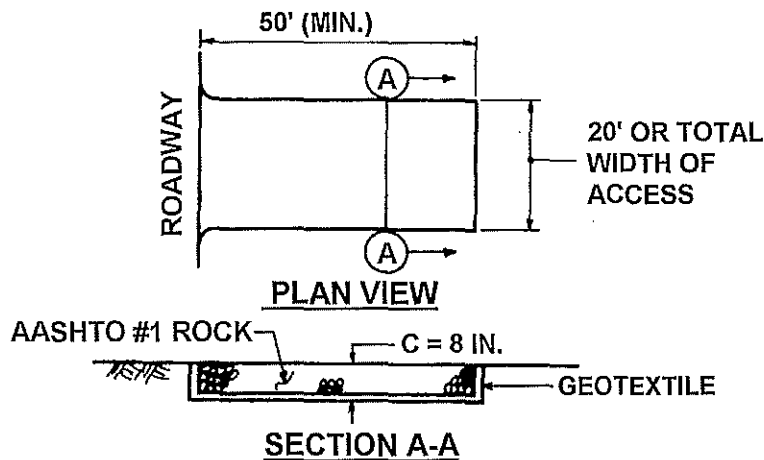
MAINTENANCE:

1. The bales will be inspected after every runoff event. Dislodged bales should be reset, staked, and backfilled to the requirements listed under "Installation". All clogged or inoperative bales will be replaced.
2. Accumulated sediments will be removed as required, and in all cases, where uniform accumulations reach 1/3 the above ground height of the barrier.
3. All undercutting or erosion of the anchor toe will be repaired immediately with compacted backfill materials.

RESTRICTIONS:

1. Restrictions are the same as fabric fence.
2. Slope length limitations are the same as fabric fence.
3. Straw bale barriers will be replaced every three months, or more often, if the bales deteriorate.

ROCK CONSTRUCTION ENTRANCE DETAILS



DESIGN:

1. Rock construction entrances will be constructed to the minimum width, length, and thickness dimensions shown.
2. Rock will be AASHTO # 1 (2 1/2" diameter), as specified in Section 703.2 of the Penn DOT Publication 408 (also referred to as #4's and/or clean 3's).
3. For installation on clay or poorly drained soils, a filter cloth underlayment, of a type recommended for such applications by the manufacturer, will be used.

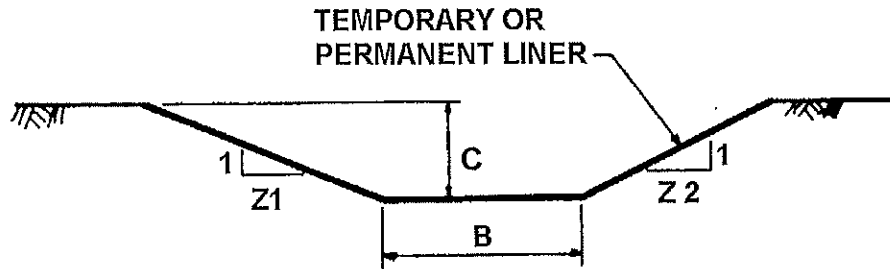
CONSTRUCTION:

1. Construction will be to the dimensions shown on the construction drawings.

MAINTENANCE:

1. The structure's thickness will be constantly maintained to the specified dimension by adding rock. At the end of each construction day, all sediment deposited on public roadways will be removed and returned to the construction site. Washing of the roadway with water is not permitted.

TEMPORARY SWALE/DIVERSION CHANNEL



VEGETATED CHANNELS

DIMENSIONS:

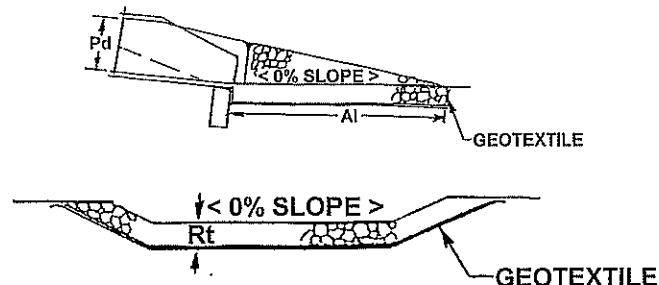
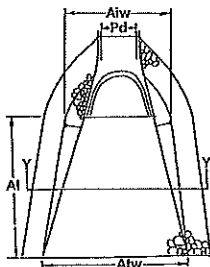
C = Depth 1.5' (includes ½' freeboard)

D = Bottom width 4'

CONSTRUCTION SPECIFICATIONS

1. All temporary swales/diversion channels shall have uninterrupted positive grade to an outlet.
2. Runoff collected from a disturbed area shall not be conveyed via a temporary swale/diversion channel.
3. Diverted runoff from an undisturbed area shall outlet directly into an undisturbed stabilized area at non-erosive velocity.
4. All trees, brush, stumps, obstructions, and other objectionable material shall be removed and disposed of so as not to interfere with the proper functioning of the swale/diversion channel.
5. The swale/diversion channel shall be excavated or shaped to line, grade, and cross-section as required to meet the criteria specified herein and be free of bank projections or other irregularities, which will impede normal flow.
6. Fills shall be compacted by earthmoving equipment.
7. All soil removed and not needed on construction shall be placed so that it will not interfere with the functioning of the swale/diversion channel.
8. All swales shall be immediately stabilized upon completion of construction. An erosion control blanket shall be installed on top of the seed and mulch to prevent the "washing" of the swale.
9. Maximum drainage area is 5 acres.
10. Maximum slope of swale 8.0%.
11. Periodic inspections and maintenance must be provided.

ROCK (RIPRAP) APRON OUTLET PROTECTION



DIMENSIONS:

A.) 12' (Match with grades from outlet of swale)

B.) 10' Length

C.) 16' Outlet end

WATERBARS

DESIGN:

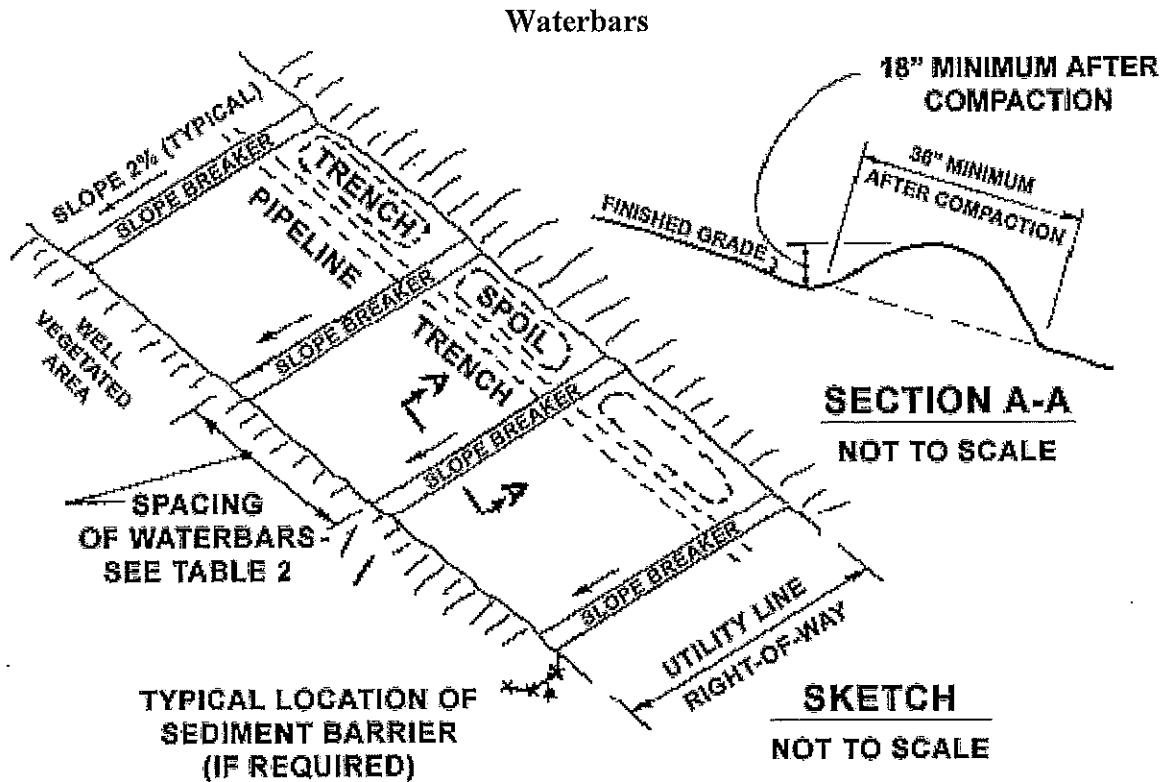
1. Waterbars should be installed across the entire right-of-way on all slopes greater than 5%.
2. Waterbars should be constructed at a slope of 2% and discharge to a well-vegetated area.
3. Waterbars should be oriented so that the discharge does not flow back onto the right-of-way.
4. Obstructions (example: straw bales, silt fence, rock filters) should not be placed in any waterbars.

Waterbar Spacing

Required Spacing For Permanent Waterbars

Percent Slope	Spacing (Ft.)
<5	*
5-15	150
15-30	100
>30	50

*Waterbars are not required on roadways with a uniform slope of less than 5%.



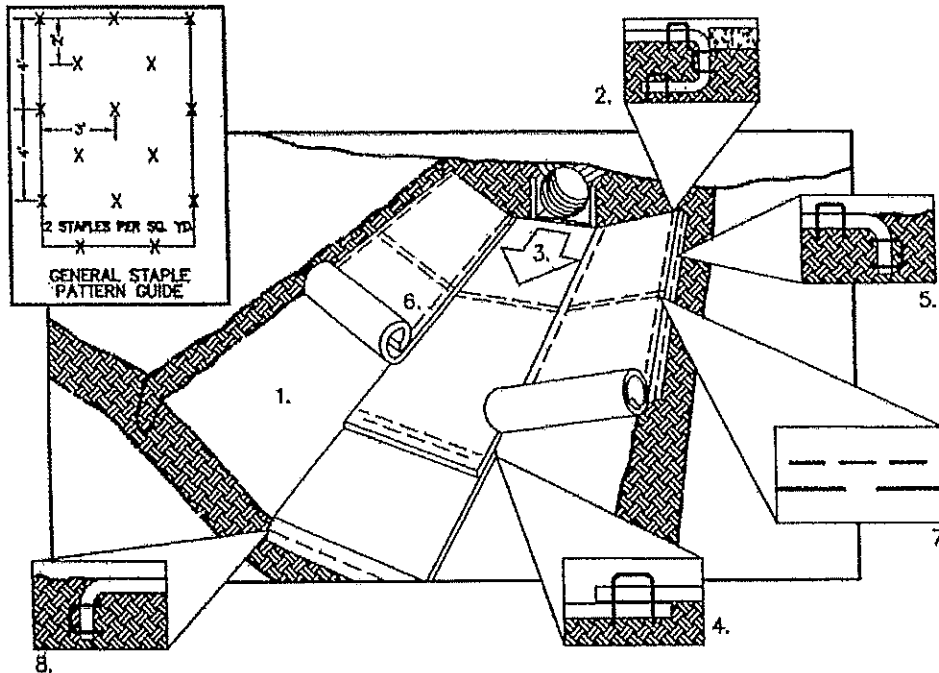
MAINTENANCE:

1. Waterbars will be inspected after each storm event and repaired as necessary.

CONSTRUCTION SPECIFICATIONS:

1. Rip-rap rock aprons are required to reduce the outlet velocity of a swale to 3.0 fps or less.
2. R-3 Rock has a maximum diameter of 6" and a minimum diameter of 2".
3. The placement of a layer of geotextile prior to installing the rock lining is recommended.
4. Outlets must discharge to a stable non-erosive outlet.

DETAIL FOR STABILIZING TEMPORARY SWALES AND PERMANENT DIVERSION CHANNELS WITH EROSION CONTROL BLANKETS (JUTE OR EXCELSIOR MATTINGS)

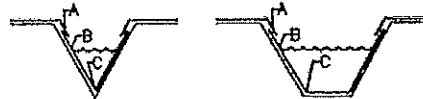


1. PREPARE SOIL BEFORE INSTALLING BLANKETS, INCLUDING APPLICATION OF LIME, FERTILIZER AND SEED.
2. BEGIN AT THE TOP OF THE CHANNEL BY ANCHORING THE BLANKET IN A 6" DEEP X 6" WIDE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING.
3. ROLL CENTER BLANKET IN DIRECTION OF WATER FLOW ON BOTTOM OF CHANNEL.
4. PLACE BLANKETS END OVER END (SHINGLE STYLE) WITH A 6" OVERLAP. USE A DOUBLE ROW OF STAGGERED STAPLES 4" APART TO SECURE BLANKETS.
5. FULL LENGTH EDGE OF BLANKETS AT TOP OF SIDE SLOPES MUST BE ANCHORED IN 8" DEEP X 8" WIDE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING.
6. BLANKETS ON SIDE SLOPES MUST BE OVERLAPPED 4" OVER THE CENTER BLANKET AND STAPLED.
7. IN MEDIUM/HIGH FLOW CHANNEL APPLICATIONS, A STAPLE CHECK SLOT IS RECOMMENDED AT 30 TO 40 FOOT INTERVALS. USE A ROW OF STAPLES 4" APART OVER THE ENTIRE WIDTH OF THE CHANNEL. PLACE A SECOND ROW 4" BELOW THE FIRST ROW IN A STAGGERED PATTERN.

8. THE TERMINAL END OF THE BLANKETS MUST BE ANCHORED IN A 6" DEEP X 6" WIDE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING.

CRITICAL POINTS

- A. OVERLAPS AND SEAMS.
- B. PROJECTED WATER LINE
- C. CHANNEL BOTTOM/SIDE SLOPE VERTICES.

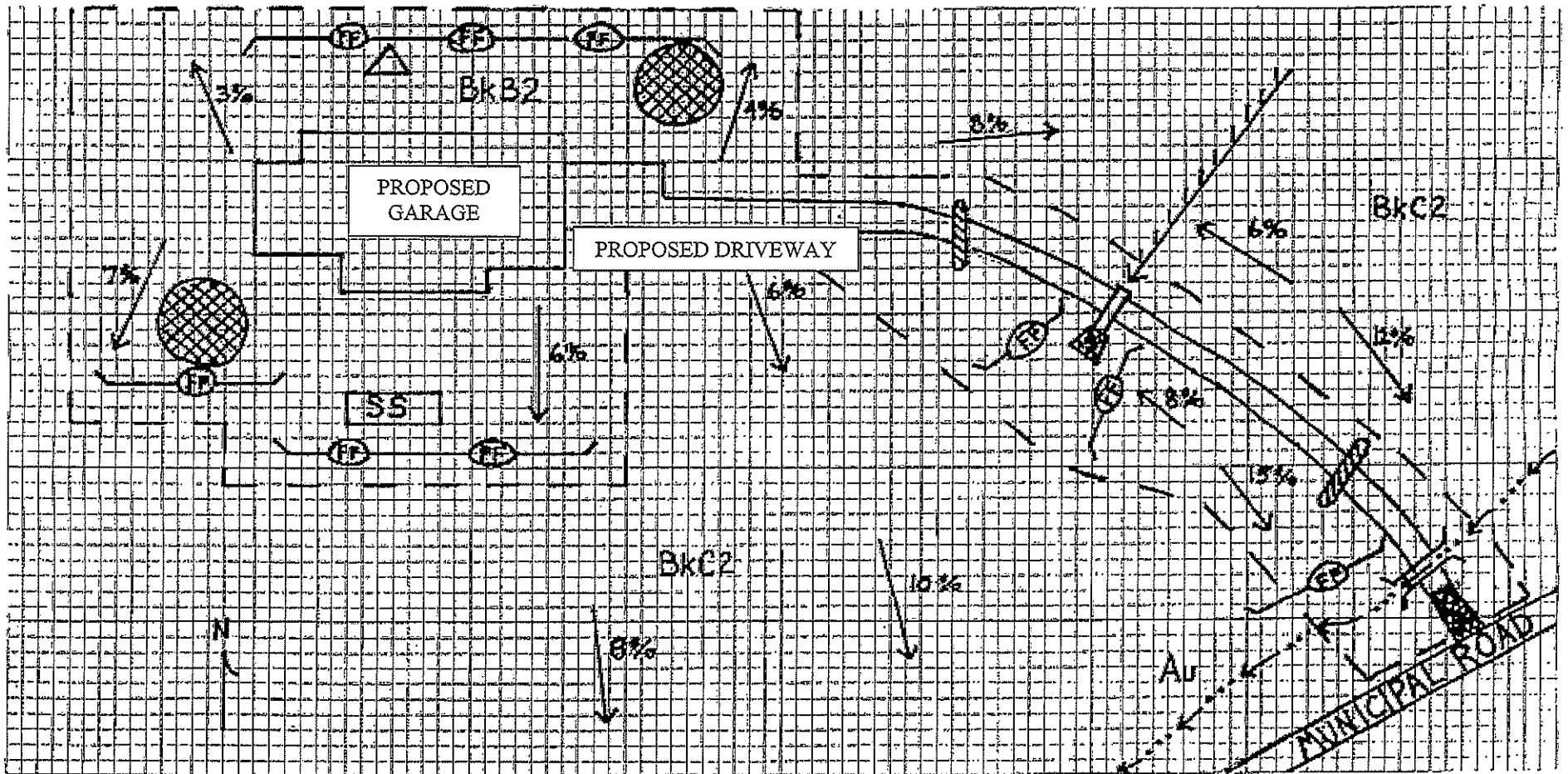


NOTE

HORIZONTAL STAPLE SPACING SHOULD BE ALTERED IF NECESSARY TO ALLOW STAPLES TO SECURE THE CRITICAL POINTS ALONG THE CHANNEL SURFACE.

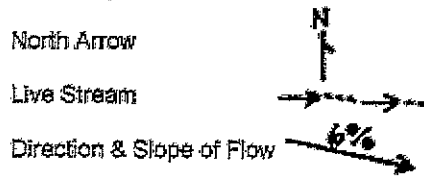
EROSION CONTROL BLANKET INSTALLATION DETAIL

SAMPLE - APPENDIX B EROSION & SEDIMENT CONTROL PLAN

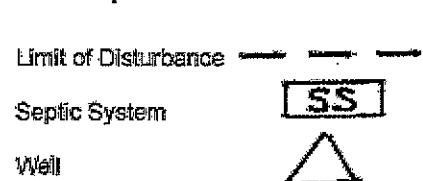


LEGEND & SYMBOLS

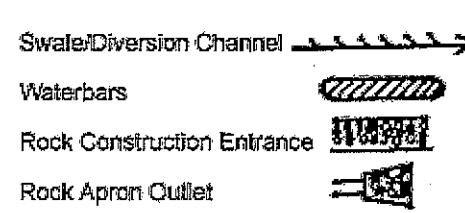
Landscape Features:



Landscape Features:



Conservation:



Conservation:

