APPENDIX A
REVISED UNIVERSAL SOIL LOSS EQUATION (RUSLE)

CONTENTS

Page

List of Tables

List of Figures

Introduction……...……. A.1

Why Use RUSLE?…….…..…… A.1

Soil Erosion Estimates Using Revised Universal Soil Loss Equation For Sheet and Rill Erosion..…….. A.1

Step-by-Step, How To Use RUSLE……...……...……. A.2

Examples ……..……..…… A.2

References

Section prepared by:

Frederick B. Gaffney, former Conservation Agronomist
USDA—Natural Resources Conservation Service,
Syracuse, New York

and

Donald W. Lake Jr., P.E., CPESC, CPSWQ
Engineering Specialist
New York State Soil & Water Conservation Committee

List of Tables

Table	Title	Page
A.1	Approximated K Values for Some Representative Soils on Construction Sites in New York……...	A.6
A.2	Values for Topographic Factor, LS, for High Ratio of Rill to Interrill Erosion[1]……..	A.11
A.3	Factors for Converting Soil Losses (Air-Dry) from Tons (T) to Cubic Yards (Cu. Yds.)……..	A.12
A.4	El Values of Certain Key Cities in the New York Area[1]…….……	A.13
A.5	Construction Site Mulching C Factors……..A.14	
A.6	Cover Factor C Values for Different Growth Periods for Planted Cover Crops for Erosion Control at Construction Sites …….A.14	
A.7	Cover Factor C Values for Established Plants ……..A.15	
A.8	Construction Site P Practice Factors……..A.15	

List of Figures

Figure	Title	Page
A.1	Monthly Percent of Annual Erosion Index—New York……	A.4
A.2	Monthly Percent of Annual Erosion Index—Long Island……..……	A.4
A.3	AVERAGE ANNUAL RAINFALL—RUNOFF EROSIVITY FACTOR (R) for the Northeast….	A.5

REVISED UNIVERSAL SOIL LOSS EQUATION (RUSLE)

Introduction

The science of predicting soil erosion and sediment delivery has continued to be refined to reflect the importance of different factors on soil erosion and runoff. The Revised Universal Soil Loss Equation (RUSLE) has improved the effects of soil roughness and the effects of local weather on the prediction of soil loss and sediment delivery.

The importance of estimating erosion and sediment delivery has long been recognized to minimize pollution by sediments and the chemicals carried by soil particles. The visual effects of erosion include rills and gullies along with sediment blockages found in culverts or drainage ditches. A well planned, engineered and implemented erosion control and/or water management plan will alleviate many concerns about construction site erosion and potential pollution.

Why use RUSLE?

RUSLE is a science-based tool that has been improved over the last several years. RUSLE is a computation method which may be used for site evaluation and planning purposes and to aid in the decision process of selecting erosion control measures. It provides an estimate of the severity of erosion. It will also provide quantifiable results to substantiate the benefits of planned erosion control measures, such as the advantage of adding a diversion ditch or mulch. For example, a diversion may shorten the length of slope used in calculating a LS factor. Also, the application of mulch will break raindrop impact and reduce runoff (See discussion of L,S and C factors).

This section provides a method to calculate soil loss. Following the step-by-step procedure will provide estimated erosion in 'tons per acre per year', which can be converted to the more usable measurement, cubic yards of soil.

Other erosion prediction methods such as computer models are also available. Examples are the USDA-NRCS RUSLE 2 at http://fargo.nserl.purdue.edu/rusle2_dataweb/RUSLE2_Index.htm and USDA-ARS Water Erosion Prediction Project (WEPP) at http://topsoil.nserl.purdue.edu/nserlweb/weppmain/wpslp.html

Soil Erosion Estimates Using Revised Universal Soil Loss Equation For Sheet and Rill Erosion

As mentioned above, soil losses on construction sites can be predicted by using the Revised Universal Soil Loss Equation (RUSLE). The equation is as follows:
A = RK(LS) for bare ground conditions of graded areas of construction sites. Referring to the examples above, the benefit of mulch can be predicted by multiplying the above by an appropriate cover or C-value. The benefit of a diversion ditch can be illustrated by comparing the original LS with the shorter slope length LS created when adding this practice.

Equation: A=RK(LS)C P Where:

A is the computed soil loss per acre per year in units of tons. This quantity may be converted to cubic yards by using conversion factors shown in Table A.3.

R is the rainfall value reflecting the energy factor multiplied by the intensity factor. The R-values for each county are provided in Figure A.3. EI is the abbreviation for energy and intensity and is called the Erosion Index. The energy component is related to the size of the raindrops while the intensity is the maximum intensity for a 30-minute interval and is measured in inches per hour. EI is frequently illustrated in graphs by showing the percent of EI that occurs within a period of days or months. From the index, one can determine the period when the most intense storms are likely to occur. See Figure A.1 and A.2.

K is the soil erodibility factor. The value for the subsoil condition, usually encountered in construction sites, can be determined based on soil texture (relative percent of sand, silt, and clay) or from most county soil surveys, found in the table providing Physical and Chemical Properties of Soils. However, K values for subsoils are not always available. If the soil survey does not list a subsoil K for the soil series encountered, use the surface K value unless there is an obvious change from sand or gravel to silt or clay. Contact the local SWCD or NRCS office for an appropriate K value when in question. Approximated K values for some representative soils on construction sites in NY can be found in Table A.1.

L is the horizontal length of slope measured in feet. It is the point of origin where water will begin flowing down the slope to the point where concentrated flow begins, such as where water flows into a ditch, or deposition occurs and water disperses. S is the slope gradient. Slopes may be uniform, concave (flattening toward the lower end) or convex (steepening toward the lower end). Table A.2 assumes a uniform slope. If the slope is concave, the LS factor will be slightly lower. If convex, then the LS will be slightly higher. These factors are interrelated and the LS factor can be obtained from Table A.2. This LS table is specific for construction sites with little or no cover.

C is the factor to reflect the planned cover over the soil surface. Most construction sites are void of vegetation and therefore would have a value of one (1). On construction sites where mulch or fabrics are used, the benefit derived from intercepting the erosive raindrop impact on the soil surface is calculated. For example, the value of two tons of straw uniformly covering a slope results in a C-value of 0.1.

(see Tables A.5-A.7 at back of this section) Therefore, mulching can substantially reduce the predicted soil loss.

P is the factor that represents management operations and support practices on a construction site. Table A.8 lists P factors for surface conditions on construction sites in relation to bare soils.

Step-by-Step, How to Use RUSLE

1. Determine the County. Use Figure A.3 to determine the R-value.
2. Determine the soil erodibility factor based on the soil series or the texture. Look up the appropriate K-value for subsoil using Table A.1.
3. Measure the horizontal length (plan view) of slope (in feet) from the top of the slope to the bottom. The bottom is either a ditch bank (concentration of water) or flatter slope where deposition occurs and water disperses (actual field measurement).
4. Determine the percent slope (actual field measurement).
5. Look up LS value in Table A.2. Interpolate if necessary to use the measured length and percent slope obtained by field measurement.
6. Determine the Cover (C) factor—Most construction sites are void of vegetation and therefore would have a value of one (1). For values of other cover conditions, such as straw mulch, contact your local SWCD or NRCS office.
7. Multiply the R*K*(LS) to obtain soil loss in tons/acre/ year.
8. Convert to cubic yards if desired. Refer to the conversion factors based on soil texture (Table A.3).
9. Review the examples that follow for specific field conditions where RUSLE may be useful.

Examples

The following are examples showing how the Revised Universal Soil Loss Equation is used for estimating soil losses:

Assume Syracuse, New York, as the locale of a construction site. The disturbed site is 50 acres in size, with an average gradient of 8% and an average slope length of 500 feet. The soil is a Schoharie silt loam with a K value of 0.49 in both the B and C horizons (The K value is obtained from Table A.1). The LS value is 3.11 and is obtained from Table A.2.

1. Compute soil losses from this unprotected surface for a 12 month period. The average annual rainfall erosion index (R) is 80.

R = 80 C = 1
K = 0.49
LS = 3.11 (Interpolate between 400' and 600' at 8%)

A = RK(LS)C = 122 T/ac/yr

50 ac x 122 Tons/ac/yr = 6100 Tons/yr

Convert to cu yds: 6100 T/yr x 0.87 cu yds /Y = 5307 cu yds/yr

(0.87 cu yds/T is obtained from Table A.3, silt loam)

2. Compute soil losses from this unprotected surface for a 3 month period (June, July, August). This EI value is obtained as follows: Refer to the erosion index distribution curve applicable to Syracuse, New York, Figure A.1. The EI reading for June 1 is 17% and for September 1 is 76%. The percent of average annual index for this period is 76% - 17% or 59%. Since the annual erosion index for this location is 80, the EI value for the 3 month period is 59% of 80 or 47.2.

R = 80 C = 1
K = 0.49 LS = 3.11
Annual EI (R) = 80 3 month EI = 47.2

A = (EI)K(LS)C = 72 Tons/ac/3 mo.

50 ac x 72 Tons/ac/3 mo. = 3600 Tons/3 mo.

Convert to cu yds: 0.87 cu yds/Tons x 3600 Tons/3 mo. = 3132 cu yds/3 mo

3. Compute soil losses for the 1 year out of 5 when the rainfall intensity (R) will increase from the normal average annual value of 80 to an annual value of 129 (the latter value is from Table A.4).

R = 129 (Change R from 80 to 129) K = 0.49
LS = 3.11 C = 1

A = RK(LS)C

A = 129 x 0.49 x 3.11 = 197 Tons/ac/yr

50ac x 197 Tons/ac/yr = 9850 Tons/yr

Convert to cu yds = 0.87 cu yds/Tons x 9850 Tons/yr = 8570 cu yds/yr

4. Compute soil losses for the 1 year out of 20 when the rainfall intensity (R) will increase from the average annual R of 80 to an R of 197 (the latter value is from Table A.4).

R = 197 (Change R from 80 to 197)
K = 0.49
LS = 3.11 C = 1
A = RK(LS)C = 300 Tons/ac/yr
50 ac x 300 Tons/ac/yr = 15,000 Tons/yr
Convert to cu yds = 0.87 cu yds/Tons x 15,000 Tons/yr = 13,050 cu yds/yr

Examples (continued)

5. Compute soil losses from the expected magnitude of a single storm that may occur once in 5 years. Looking at Table A.4, the expected magnitude, or EI value, is 38.

EI (R) = 38 C = 1
K = 0.49
LS = 3.11

A = (EI)K(LS)C = 38 x 0.49 x 3.11 = 58 Tons/ac/yr

50 ac x 58 Tons/ac/yr = 2900 Tons/yr

Convert to cu yds = 0.87 cu yds/Tons x 1650 Tons/yr = 2523 cu yds/yr

6. Compute soil losses from the expected magnitude of a single storm that may occur once in 10 years. The EI value of this storm is 51. (Obtained from Table A.4.)

EI (R) = 51 C = 1
K = 0.49
LS = 3.11

A = (EI)K(LS)C = 78 Tons/ac/yr

50 ac x 78 Tons/ac/yr = 3900 Tons/yr

Convert to cu yds = 0.87 cu yds/Tons x 3900 Tons/yr = 3393 cu yds/yr

7. Compute soil losses from the expected magnitude of a single storm that may occur once in 20 years. The EI value of this storm is 65. (Obtained from Table A.4.)

EI (R) = 65 C = 1
K = 0.49
LS = 3.11

A = (EI)K(LS)C = 99 Tons/ac/yr

50 ac x 99 Tons/ac/yr = 4950 Tons/yr

Convert to cu yds = 0.87 cu yds x 4950 Tons/yr = 4307 cu yds/yr

Sediment Yield—MUSLE

The Modified Universal Soil Loss Equation (MUSLE), developed by Williams and Berndt, 1976, can be used to calculate sediment yields from drainage basins to specific locations for selected storm events.

The formula is given as:

$T = 95(V \times Qp)^{0.56} \times K \times LS \times C \times P$

Where:

T = sediment yield per storm event in tons
V = volume of runoff per storm event in acre-feet
Qp = peak flow per storm event in cubic feet per second
K, LS, C, and P are RUSLE factors

Values for V and Qp are determined from the sites drainage analysis.

Example

Compute the sediment yield volume to a basin from a drainage area of 10 acres under construction (all disturbed) for a 2 inch rainfall.

The soil (sandy loam) K = 0.43, LS = 2.34, the volume of runoff is 1.5 acre-feet and the peak discharge for the storm is 5 cubic feet per second.

$T = 95(1.5 \times 5)^{0.56} (0.43)(2.34)(1)(1)$

T = 295.4 tons

295.4 tons x 0.70 cy/ton = 206.99 cubic yards

Figure A.1 (USDA - NRCS)
Monthly Percent of Annual Erosion Index—New York

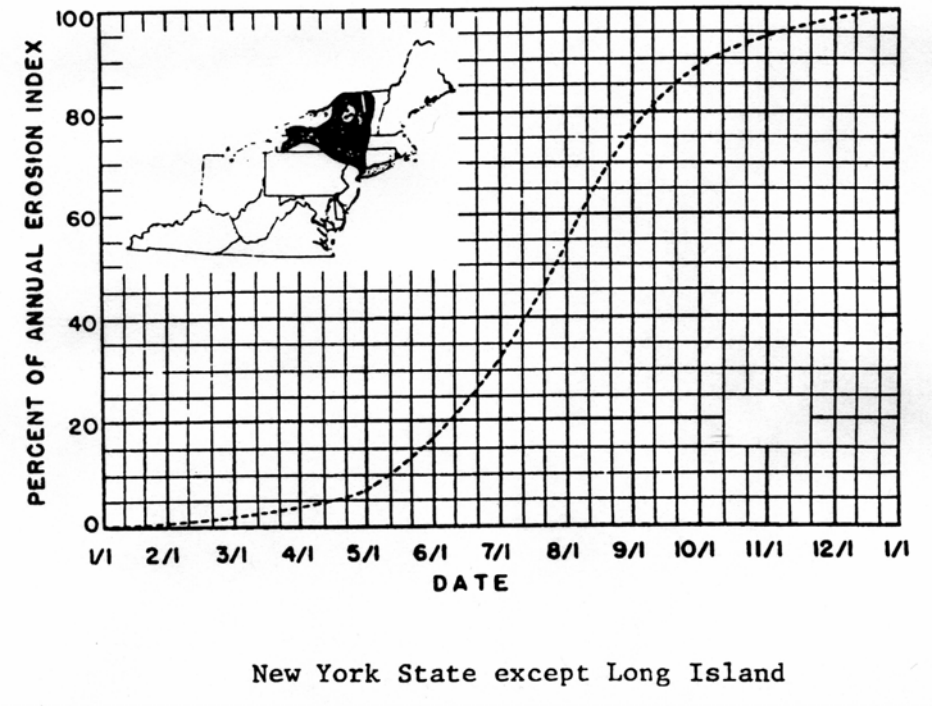
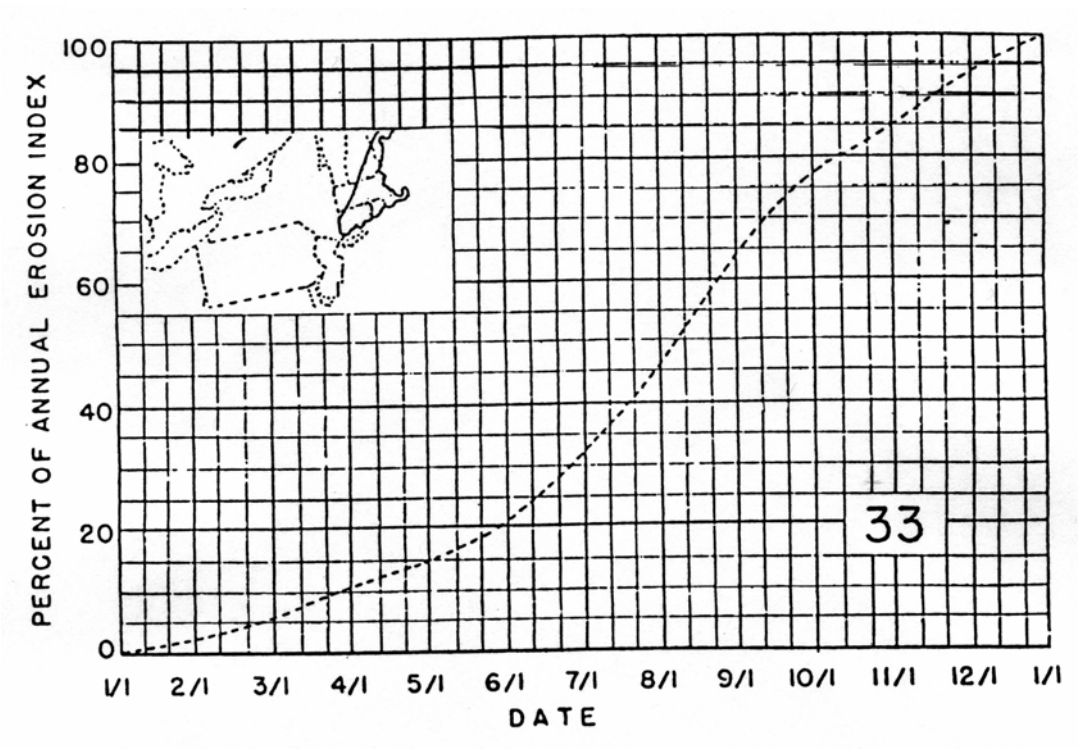


Figure A.2 (USDA - NRCS)
Monthly Percent of Annual Erosion Index—Long Island



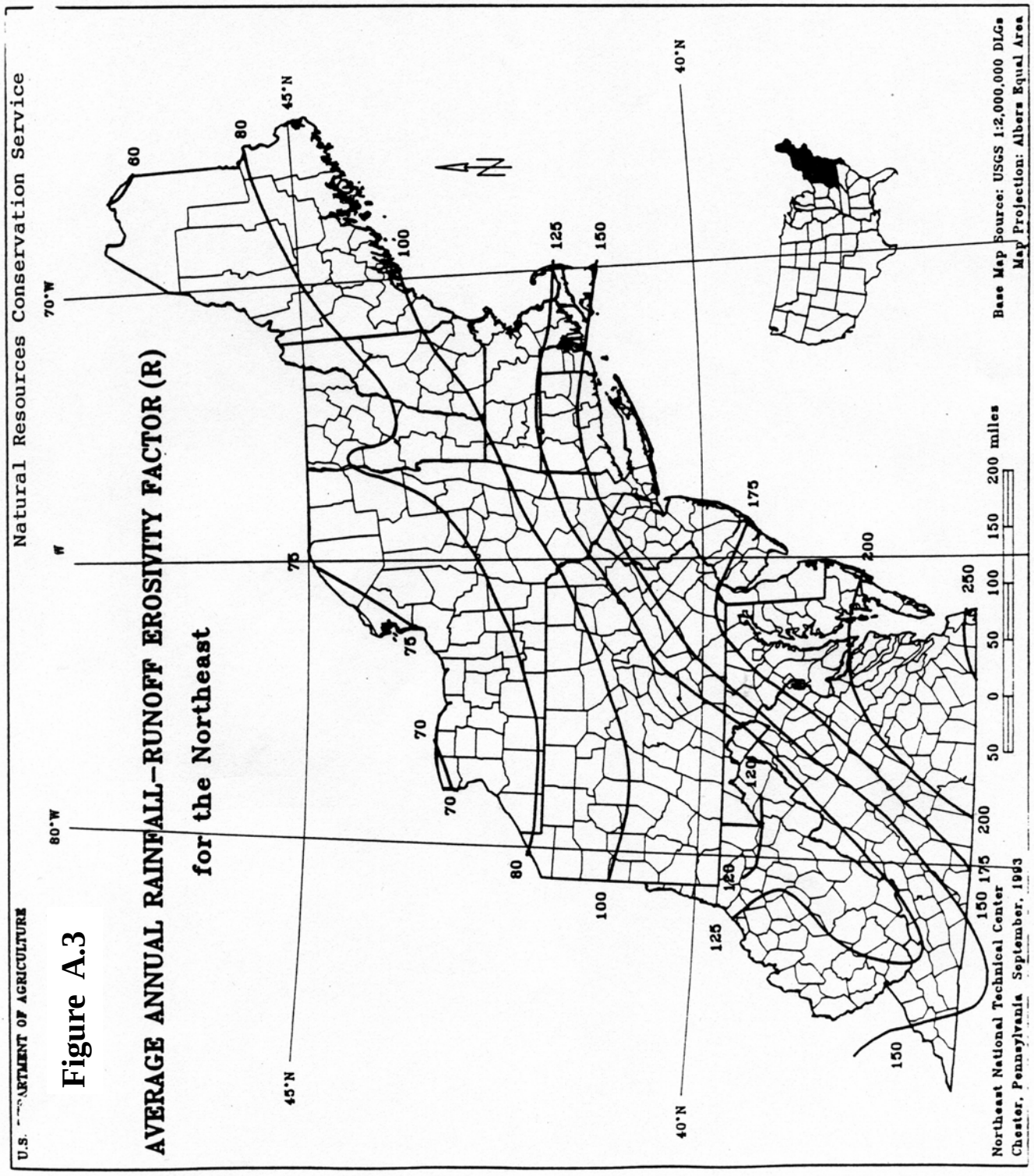

U.S. DEPARTMENT OF AGRICULTURE
Natural Resources Conservation Service
Figure A.3
AVERAGE ANNUAL RAINFALL–RUNOFF EROSIVITY FACTOR (R)
for the Northeast
80°W
75°W
70°W
45°N
40°N
60
80
100
125
150
175
200
250
70
75
120
N
0 50 100 150 200 miles
Base Map Source: USGS 1:2,000,000 DLGs
Map Projection: Albers Equal Area
Northeast National Technical Center
Chester, Pennsylvania September, 1993

Table A.1
Approximated K Values for Some Representative Soils on Construction Sites in New York

(For soils not in this table, contact the county Soil & Water Conservation District for appropriate K value.)

Depositional Unit Family Textural Class and Representative Series	Horizon[1]	Texture[2]	Class	Construction Site K Values
I. Glacial Till				
SANDY SKELETAL				
Glouster	A	sl	Low	.17
	B & C	vglcs	Low	
SANDY w/PAN				
Essex	A	sl	Low	
	B	gls	Low	.20
	Cx	glcs	Low	
COARSE LOAMY w/PAN				
Empeyville	A	stl	Medium	
	B	stsl	Medium	.17
	Bx	vstsl	Low	
	C	vstsl	Low	
Mardin	A	ch sil	Low	
	B	ch sil-1	Medium	.28
	Bx & C	v ch 1	Medium	
Paxton	A	fsl	Medium	
	B	gfsl	Medium	.24
	Cx	gfsl	High	
Crary	A	sil	Medium	
	B	vfsl	High	.43
	IIBx, Cx, C	st fsl	Medium	
COARSE LOAMY w/Bt				
Madrid	A	fsl	Medium	
	Bt	gfsl	Medium	.28
	C	gfsl	Medium	
COARSE LOAM, 20 TO 40” over BEDROCK				
Lordstown	A	ch sil	Low	
	B	ch sil	High	
	C	v ch 1	Low	.43
	R		Siltstone or sandstone bedrock 20—40” below surface	
FINE LOAMY w/Bt				
Ontario	A	l	Medium	.28
	Bt	gl	Medium	
	C	gl	Medium	

Table A.1 (cont'd)
Approximated K Values for Some Representative Soils on Construction Sites in New York

(For soils not in this table, contact the county Soil & Water Conservation District for appropriate K value.)

Depositional Unit Family Textural Class and Representative Series	Horizon[1]	Texture[2]	Class	Construction Site K Values
I. Glacial Till (cont'd)				
Cazenovia	A	sil	High	
	Bt	sicl	High	.43
	C	gsil	Medium	
Nunda	Ap	ch sil	High	
	B2	ch sil	High	
	IIB2t	gcl	Medium	.49
	IIC	gl	Medium	
FINE	A	sil	Medium	
Hornell	B	sic	High	
	C	sh sic	Medium	.43
	R		Shale bedrock 20—40" below surface	
Remsen	A	sicl	High	
	Bt	c	Medium	.43
	C	c	High	
Churchville	A	sil	High	
	Bt	sic	Medium	.49
	IIC	gl	Medium	
COARSE LOAMY, NO PAN				
Charlton	A	fsl	Low	
	B	fsl	High	.43
	C	gfsl	Medium	
Nellis	A	l	Medium	
	B	l	High	.43
	C	gl	Medium	
Pittsfield	A	l	Medium	
	B	gfsl	Low	.43
	C	gfsl	High	
COARSE LOAMY/SAND or SANDY SKELETAL	A	fsl	Medium	
Canton	B	fsl	Very High	.64
	IIC	vgls	Low	
COARSE SILTY w/PAN	A	sil	High	
Canaseraga	B	sil	Very High	.49
	IIBx & C	ch	High	

Table A.1 (cont'd)
Approximated K Values for Some Representative Soils on Construction Sites in New York

(For soils not in this table, contact the county Soil & Water Conservation District for appropriate K value.)

Depositional Unit Family Textural Class and Representative Series	Horizon[1]	Texture[2]	Class	Construction Site K Values
I. Glacial Till (cont'd)				
LOAMY SKELETAL				
Manlius	A	ch sil	Medium	
	B	vsh sil	Low	
	C	fract'd shales w/ silty fines	Low	.28
	R		Shale bedrock 20-40" below surface	
FINE LOAMY w/PAN				
Volusia	A	ch sil	Low	
	Bx	ch sil	High	.43
	C	vch l	Medium	
FINE LOAMY, NO PAN				
Kendaia	A	sil	Medium	.28
	B	gsil	Medium	
	C	gl	Medium	
II. Glacial Outwash and Water Worked Morainic Deposits				
SANDY SKELETAL				
Hinckley	A	gls	Low	.17
	B	gls	Low	
	C	gsl	Low	
SANDY				
Colonie	A	lfs	Medium	
	B	fs	Low	.24
	C	fs	Low	
LOAMY SKELETAL				
Chenango	A	gl	Low	
	B	vgl	Low	.24
	C	gls	Low	
FINE LOAMY/SANDY or SANDY SKELETAL				
Palmyra	A	gl	Low	
	B	gl	Medium	.28
	IIC	g & s	Low	
LOAMY SKELETAL/CLAYEY				
Varysburg	A	gl	Low	
	B2t	vgl	Low	
	IIB2t	sic	Medium	.28
	IIC	layered sic, sil sicl	High	

Table A.1 (cont'd)
Approximated K Values for Some Representative Soils on Construction Sites in New York

(For soils not in this table, contact the county Soil & Water Conservation District for appropriate K value.)

Depositional Unit Family Textural Class and Representative Series	Horizon[1]	Texture[2]	Class	Construction Site K Values
II. Glacial Outwash and Water Worked Morainic Deposits (cont'd)				
COARSE LOAMY	A	sl	Low	
Riverhead	B	sl	Low	.17
	C	s w/ thin layers of g	Low	
COARSE LOAMY/SANDY or SANDY SKELETAL				
Haven	A	l	High	.43
	B	l	High	
	IIC	gs	Low	
III. Lacustrine or Stream Terrace Deposits				
COARSE SILTY				
Unadilla	A	sil	High	.64
	B	sil	Very High	
	C	sil	Very High	
COARSE SILTY w/FRAGIPAN				
Williamson	A	sil	High	
	Bx	sil	Very High	.64
	C	sil	Very High	
COARSE SILTY/SANDY or SANDY SKELETAL				
Allard	A	sil	High	
	B	sil	Very High	.64
	IIC	vgls	Low	
FINE SILTY w/Bt				
Collamer	A	sil	High	
	Bt	sil	High	.64
	C	Layers of sl, vfs	Very High	
FINE				
Schoharie	A	sicl	High	
	Bt	sic	Medium	.49
	C	sic	High	
VERY FINE				
Vergennes	A	c	High	
	Bt	c	Low	.49
	C	c	Low	

Table A.1 (cont'd)
Approximated K Values for Some Representative Soils on Construction Sites in New York

(For soils not in this table, contact the county Soil & Water Conservation District for appropriate K value.)

Depositional Unit Family Textural Class and Representative Series	Horizon[1]	Texture[2]	Class	Construction Site K Values
III. Lacustrine or Stream Terrace Deposits (cont'd)	A	lfs	Medium	
SANDY o/CLAYEY	B	lfs	Low	
Claverack	IIC	sic	High	0.43
	R			
COARSE LOAMY o/CLAYEY				
Elmwood	A	fsl	Medium	
	B	sl	Low	
	C	sicl	High	0.43

1 The thickest B and C horizons in the official series were used in making the K value determinations.

2 Soil texture abbreviations:

Gravel……...…….g
Very coarse sand……..…..vcos
Coarse sand……..…..cos
Sand……..…..s
Fine sand……...…fs
Very fine sand……...vfs
Loamy coarse sand..…….lcos
Loamy sand……..ls
Loamy fine sand……...…lfs
Silty clay loam……..….sisl
Fine sandy loam…….fsl
Very fine sandy loam….vfsl
Gravelly sandy loam…..gs
Loam……..g
Gravelly loam……gl
Stoney loam……...….stl
Silt……..si
Silt loam…….sil
Clay loam……...cl
Sandy clay loam……..…...scl
Stoney clay loam……..…...stcl
Silty clay……..…sic
Clay……..…c
Channery…….ch
Shaly……sh
Very channery……..vch
Very shaly……vsh
Sandy loam……..sl

Table A.2 (USDA - NRCS)
Values for Topographic Factor, LS, for High Ratio of Rill to Interrill Erosion[1]

Values for topographic factor, LS, for high ratio of rill to interrill erosion.[1]

	Horizontal slope length (ft)																
Slope (%)	<3	6	9	12	15	25	50	75	100	150	200	250	300	400	600	800	1000
0.2	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.06
0.5	0.07	0.07	0.07	0.07	0.07	0.07	0.08	0.08	0.09	0.09	0.10	0.10	0.10	0.11	0.12	0.12	0.13
1.0	0.09	0.09	0.09	0.09	0.09	0.10	0.13	0.14	0.15	0.17	0.18	0.19	0.20	0.22	0.24	0.26	0.27
2.0	0.13	0.13	0.13	0.13	0.13	0.16	0.21	0.25	0.28	0.33	0.37	0.40	0.43	0.48	0.56	0.63	0.69
3.0	0.17	0.17	0.17	0.17	0.17	0.21	0.30	0.36	0.41	0.50	0.57	0.64	0.69	0.80	0.96	1.10	1.23
4.0	0.20	0.20	0.20	0.20	0.20	0.26	0.38	0.47	0.55	0.68	0.79	0.89	0.98	1.14	1.42	1.65	1.86
5.0	0.23	0.23	0.23	0.23	0.23	0.31	0.46	0.58	0.68	0.86	1.02	1.16	1.28	1.51	1.91	2.25	2.55
6.0	0.26	0.26	0.26	0.26	0.26	0.36	0.54	0.69	0.82	1.05	1.25	1.43	1.60	1.90	2.43	2.89	3.30
8.0	0.32	0.32	0.32	0.32	0.32	0.45	0.70	0.91	1.10	1.43	1.72	1.99	2.24	2.70	3.52	4.24	4.91
10.0	0.35	0.37	0.38	0.39	0.40	0.57	0.91	1.20	1.46	1.92	2.34	2.72	3.09	3.75	4.95	6.03	7.02
12.0	0.36	0.41	0.45	0.47	0.49	0.71	1.15	1.54	1.88	2.51	3.07	3.60	4.09	5.01	6.67	8.17	9.57
14.0	0.38	0.45	0.51	0.55	0.58	0.85	1.40	1.87	2.31	3.09	3.81	4.48	5.11	6.30	8.45	10.40	12.23
16.0	0.39	0.49	0.56	0.62	0.67	0.98	1.64	2.21	2.73	3.68	4.56	5.37	6.15	7.60	10.26	12.69	14.96
20.0	0.41	0.56	0.67	0.76	0.84	1.24	2.10	2.86	3.57	4.85	6.04	7.16	8.23	10.24	13.94	17.35	20.57
25.0	0.45	0.64	0.80	0.93	1.04	1.56	2.67	3.67	4.59	6.30	7.88	9.38	10.81	13.53	18.57	23.24	27.66
30.0	0.48	0.72	0.91	1.08	1.24	1.86	3.22	4.44	5.58	7.70	9.67	11.55	13.35	16.77	23.14	29.07	34.71
40.0	0.53	0.85	1.13	1.37	1.59	2.41	4.24	5.89	7.44	10.35	13.07	15.67	18.17	22.95	31.89	40.29	48.29
50.0	0.58	0.97	1.31	1.62	1.91	2.91	5.16	7.20	9.13	12.75	16.16	19.42	22.57	28.60	39.95	50.63	60.84
60.0	0.63	1.07	1.47	1.84	2.19	3.36	5.97	8.37	10.63	14.89	18.92	22.78	26.51	33.67	47.18	59.93	72.15

[1]Such as for freshly prepared construction and other highly disturbed soil conditions with little or no cover (not applicable to thawing soil)

Table A.3 (USDA - NRCS)
Factors for Converting Soil Losses (Air-Dry) from Tons (T) to Cubic Yards (Cu. Yds.)

Sands, loamy sands	)
Sandy loam	) - Multiply soil losses in T by 0.70 (105)[1]
Fine sandy loam	)
Loams, sandy clay loams	)
Sandy clay	) - Multiply soil losses in T by 0.87 (85)
Silt loam	)
Silty clay loam, silty clay	)
Clay loam	) - Multiply soil losses in T by 1.06 (70)
Clay	)

[1]The number in parentheses is the air-dry weight of the soil in pounds per cubic foot. The conversion factors were calculated from these air-dry weights using: soil loss (tons) x (2000 lbs/ton) x (ft^3/dry density lbs) x (cubic yard/27ft^3).

Table A.4
El Values of Certain Key Cities in the New York Area[1]

	EI Values at 20% and 5% Probability Levels Probability (EI)		Expected Magnitude of a Single Storm EI Value Normally Exceeded Once in—		
Location[2]	20%*	5%**	5 Years	10 Years	20 Years
New York					
Albany	114	159	38	47	56
Binghamton	106	146	36	47	58
Buffalo	96	139	36	49	61
Geneva	106	152	—	—	—
Marcellus	112	167	38	49	62
Rochester	101	151	38	54	75
Salamanca	106	157	32	40	49
Syracuse	129	197	38	51	65
Pennsylvania					
Erie	181	331	—	—	—
Scranton	140	188	44	53	63
Vermont					
Burlington	114	178	35	47	58
Connecticut					
New Haven	222	310	73	96	122
New Jersey					
Atlantic City	229	311	77	97	117
Marlboro	254	343	85	111	136
Trenton	216	308	76	102	131

* Once each five years
** Once each twenty years
[1] From Agricultural Handbook No. 537
[2] For additional cities, refer to Agricultural Handbook 537, Tables 17 & 18.

Table A.5
Construction Site Mulching C Factors
(Data from Wischmeier and Smith 1978, Pitt 2004)

Type of Mulch	Mulch Rate (tons per acre)	Land Slope (%)	Mulching C Factor	Length Limit (ft)[1]
None	0	all	1.0	n/a
Straw or hay, tied down by anchoring and tacking equipment	1.0	1-5	0.20	200
	1.0	6-10	0.20	100
	1.5	1-5	0.12	300
	1.5	6-10	0.12	150
	2.0	1-5	0.06	400
	2.0	6-10	0.06	200
	2.0	11-15	0.07	150
	2.0	16-20	0.11	100
	2.0	21-25	0.14	75
	2.0	26-33	0.17	50
	2.0	34-50	0.20	35
Wood Chips	7	<16	0.08	75
	7	16-20	0.08	50
	12	<16	0.05	150
	12	16-20	0.05	100
	12	21-33	0.05	75
	25	<16	0.02	200
	25	16-20	0.02	150
	25	21-33	0.02	100
	25	34-50	0.02	75

[1] Maximum slope lengths for which the specified mulch rate is considered effective. If these limits are exceeded, either a higher application rate or mechanical shortening of the effective slope length is required (such as with terracing).

Table A.6
Cover Factor C Values for Different Growth Periods for Planted Cover Crops for Erosion Control at Construction Sites
(Data from Wischmeier and Smith 1978, Pitt 2004)

	SB (seedbed preparation)	**Period 1** (establishment)	**Period 2** (development)	**Period 3a** (maturing crop)	**Period 3b** (maturing crop)	**Period 3c** (maturing crop)
Crop Canopy [1]	0-10%	10-50%	50-75%	75-80%	75-90%	75-96%
Seeding on topsoil, without mulch	0.79	0.62	0.42	0.17	0.11	0.06
Seeding on a desur-faced area, where residual effects of prior vegetation are no longer significant	1.0	0.75	0.50	0.17	0.11	0.06
Sod	0.01	0.01	0.01	0.01	0.01	0.01

[1] Percent canopy cover is the percentage of the land surface that would not be hit by directly falling rain drops because the drops would be intercepted by the plant. It is the portion of the soil surface that would be covered by shadows if the sun were directly overhead.

Table A.7
Cover Factor C Values for Established Plants
(data from NRCS NEH Chapter 3 and Wischmeier and Smith 1978)

			Percentage of surface covered by residue in contact with the soil					
	Percent Cover[1]	Plant Type	0%	20	40	60	80	95+
C factor for grass, grasslike plants, or decaying compacted plant litter	0	Grass	0.45	0.20	0.10	0.042	0.013	0.0003
C factor for broadleaf herbaceous plants (including most weeds with little lateral root networks), or un-decayed residues	0	Weeds	0.45	0.24	0.15	0.091	0.043	0.011
Tall weeds or short brush with average drop height[2] of =20 inches	25	Grass	0.36	0.17	0.09	0.038	0.013	0.003
		Weeds	0.36	0.20	0.13	0.083	0.041	0.011
	50	Grass	0.26	0.13	0.07	0.035	0.012	0.003
		Weeds	0.26	0.16	0.11	0.076	0.039	0.011
	75	Grass	0.17	0.12	0.09	0.068	0.038	0.011
		Weeds	0.17	0.12	0.09	0.068	0.038	0.011
Mechanically prepared sites, with no live vegetation and no topsoil, and no litter mixed in.	0	None	0.94	0.44	0.30	0.20	0.10	Not given

[1] Percent cover is the portion of the total area surface that would be hidden from view by canopy if looking straight downward.
[2] Drop height is the average fall height of water drops falling from the canopy to the ground.

Table A.8 (USDA-NRCS)
Construction Site P Practice Factors

Surface Condition		P Factor
Bare Soil Loose		1.0
Freshly disked or rough irregular surface		0.9
Compact smooth by equipment up and down hill		1.3
Compact smooth by equipment across slope		1.2
Contoured Furrows:		
Slope (%)	**Maximum Downslope Length (ft)**	**P Factor**
1-2	350	0.6
3-5	250	0.5
6-8	200	0.5
9-12	125	0.6
13-16	75	0.7
17-20	60	0.8
>20	50	0.8

Source: USDA-NRCS; HDI, 1987; Wischmeier and Smith, 1978

References

1. Predicting Soil Erosion by Water: A Guide to Conservation Planning With the Revised Universal Soil Loss Equation (RUSLE). USDA-Agricultural Research Service Agric. Hdbk. No. 703. Renard, K.G., G. R. Foster, G.A. Weesies, D.K. McCool, and D.C. Yoder. 1997.

2. (data from Wischmeier and Smith 1978)

3. Construction Site Erosion and Sediment Controls: Planning, Design and Performance. R. Pitt, S. Clark, and D. Luke. 2004.

APPENDIX B
PERFORMANCE EVALUATION FOR TEMPORARY EROSION AND SEDIMENT CONTROL PRACTICES

Background

Standard details and drawings for temporary erosion and sediment control practices have been used since the early 1970's. Many of these details were developed by the United States Department of Agriculture (USDA) Soil Conservation Service (SCS), now known as the Natural Resources Conservation Service (NRCS). These details were incorporated into many state design manuals. These practices included the following:

- Earth Dike
- Temporary Swale
- Perimeter Dike/Swale
- Level Spreader
- Pipe Slope Drain
- Straw Bale Dike
- Silt Fence

What made the use of these details attractive was that they were sized based upon the drainage area, and no extensive engineering calculations were needed for design. For example, if we needed to design a temporary swale to control the runoff from 8 acres above a disturbed construction area by sloping the swale at 3 percent, we would look at page 7A.3 and select Swale B, with a channel treatment of seed and straw mulch. The Swale B cross section is a 6-foot bottom width, 1-foot design depth, and 2:1 side slopes.

This selection process is independent of location in New York State as well as the design rainfall amount. As a result, individuals have often wondered what level of protection is actually being provided.

Site specific practice design depends on a number of variables. These include drainage area, hydrologic soil group, cover, topography, rainfall amount, and intensity or distribution. The following evaluation procedure can be used to incorporate these variables into the practice design. The procedure can also be used to design temporary practices for site specific storm events.

Conveyance Evaluation Procedure

This method of evaluating the performance of a practice is applicable to most of the temporary practices. The first example evaluates the effectiveness of the temporary swale.

CASE 1—Swale A, Average Conditions

Given:

Drainage Area = 4.9 acres

Hydrologic Soil Group = C

Runoff Curve Number = 91
(C soil disturbed for construction)

Slope of Swale = 3%

Rainfall (P) = 2.5 inches
(This represents NY state's average 1-year, 24-hour storm)

Runoff (Q) = 1.6 inches

Time of Concentration for Runoff (T_c) = 6 minutes
(assumed 0.1 hour, the shortest allowed with TR-55)

From Section 4, TR-55 Graphical Method, where:

I_a = Initial Abstraction = 0.198"
Q_{in} = Runoff in inches
q_u = Unit peak discharge in cubic feet per second per square mile
A_m = Drainage area in square miles
F_p = Pond and swamp factor

Drainage Area = 4.9/640 = 0.00766 sq. mi.

if P = 2.5 inches, then I_a/P = 0.00, use 0.1

Q_{in} = 1.6

Then, from Figure 4.15 (Type 2), q_u = 1,000 csmlin

from Equation 4.8 $q_p = (q_u)(A_m)(Q)(F_p)$

Therefore, $q_p = (1{,}000)(.00766)(1.6)$

q_p = 12.2 cfs

For Swale A, the design cross-section shows a bottom width of 4 feet., design depth of 1 foot, and 2:1 side slopes.

Therefore, swale area = 6 ft^2 for design depth

Compute velocity, $V = \frac{1.486}{n}\left(\frac{A}{Wp}\right)^{2/3} S^{1/2}$

Where

n = .040 for vegetated channels

A = 6 sq. ft.
Wp = 8.2 ft. (wetted perimeter)
S = .03 ft/ft (slope)

Therefore, $V = \frac{1.486}{.04} \left(\frac{6}{8.2}\right)^{2/3} (.03)^{1/2}$

= 5 feet per second

Since Q = AV, the swale capacity is

$Q = (6\ ft^2)(5\ ft/sec) = 30$ cfs or more than twice required

CASE 2—Swale B, Average Conditions

Given:

Drainage Area = 10 acres

Hydrologic Soil Group = C

Runoff Curve Number = 91, therefore $I_a = 0.198"$

Slope of Swale = 3%

Rainfall (P) = 2.5 inches

Runoff (Q) = 1.6 inches

Time of Concentration for Runoff (T_c) = 0.1

Similarly to Case 1, q_u = 1,000 CSM

$A_m = 10/640 = 0.01563$

$q_p = (1{,}000)(.01563)(1.6) = 25$ cfs

For Swale B, the design cross-section has a 6-foot bottom width, 1-foot depth, and 2:1 side slopes.

Therefore, the area = 8 ft^2

Computing velocity for a swale slope of 3%,

$V = \frac{1.486}{.04} \left(\frac{8}{10.47}\right)^{2/3} (.03)^{1/2}$

V = (37.15)(.836)(.173) = 5.37 ft/sec

Since Q = AV, the swale capacity is

$Q = (8\ ft^2)(5.37\ ft/sec) = 43$ cfs

CASE 3—This site is adjacent to a significant water body in Westchester County. We want to protect the site for the 2-year, 24-hour storm.

Given:

Drainage Area = 10 acres

Hydrologic Soil Group = D soils

Runoff Curve Number = 94, ("D" under construction)

Slope of Swale = 3%

Rainfall (P) = 3.5 inches; Ia = 0.128"

Runoff (Q) = 2.8 inches; Type 3 rainfall

Assume Time of Concentration for Runoff (T_c) = 0.1 hour (most conservative value)

$A_m = 10/640 = 0.01563$ sq. mi.

$I_a/P = 0.128/3.5 = 0.04$, therefore use 0.1

From Figure 4.16 (Type 3), q_u = 655 CSM

Therefore, qp = (655)(0.01563)(2.8)

= 28.7 cfs

From CASE 2, Swale B, we know that the maximum capacity is 43 cfs with a velocity of 5.37 feet per second.

Our conclusions would indicate that Swale B is adequate for capacity. The velocity is higher and thus a mulch lining should be used to protect the swale from erosion.

Storage Evaluation Procedure

Practices such as silt fence, straw bale dikes, and earthen berms are often used on slopes or near the toes of fill slopes to capture sediment laden runoff. These have failed many times in the field due to poor siting, improper installation, lack of maintenance, and little consideration of the proper use of the practice.

As an example of how careful we need to be in using these practices, look at the use of silt fence in the following typical situations.

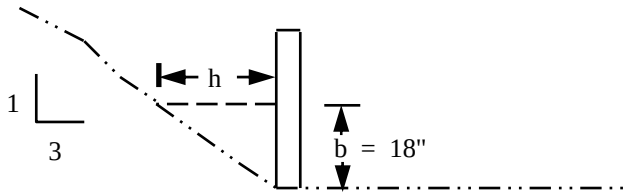
CASE 1—At the toe of a 3:1 earthfill

Given: 30' high earthfill
Hydrologic Soil Group—C
Therefore, Runoff Curve Number = 91

Typically, the installed height of the silt fence is 30-36". The maximum design sediment depth behind the silt fence is 50% of its height, or 18" maximum.

For this case, the design sediment area is equal to:

A = 1/2bh



A = 1/2 (1.5')(4-5') = 3.375 sq. ft. per linear foot

This equals 337.5 cubic feet per 100 feet of fence.

The actual slope surface is approximately 95 feet. For a rainfall of 1 inch on this site, the runoff equals 0.4 inches. The total volume of runoff would equal

$$\frac{0.4 \text{ inches}}{12 \text{ inches/ft}} \times 9500 \text{ sq. ft.} = 317 \text{ cu. ft.}$$

This example shows that the volume required for a 1-inch storm is barely provided, but the location of the fence provides no buffer for material that rolls down the slope nor room for maintenance. The fence should be located at least 10 feet from the toe of the slope.

CASE 2—Determine level of protection for CASE 1 when fence is moved 10 feet from the toe of slope.

When the silt fence is moved 10' away from the 3:1 slope, the design area of storage equals,

337.5 sq. ft. + 1,500 sq. ft. = 1,837.5 cu.ft. per 100 feet of fence

Since this is the maximum runoff volume that can be controlled, the runoff depth is,

$$\frac{1{,}837.5 \text{ ft}^3}{9{,}500 \text{ ft}^2} = 0.193 \text{ feet} = 2.3 \text{ inches}$$

From Section 4, Figure 4.1 for a Q = 2.3 inches, and a Curve Number at 91, P is interpreted at 3.2 inches.

Thus, this design configuration can manage to store the runoff from a 3.2 inch rainfall event.

This method can be used to evaluate the positioning of these sediment control practices on the contour to hold sediment close to its source. It allows a designer to evaluate an existing condition, or to select a specific level of protection higher than that which may be provided by the standard details.

APPENDIX C
COST ANALYSIS OF
EROSION AND SEDIMENT CONTROL PRACTICES

CONTENTS

Page

List of Tables

Analyzing Benefits and Costs……. C.1

Ascribing Effects to Treatment Measures…… C.1

Pricing Treatment Measures and Benefits……..……. C.1

Period of Analysis and Evaluation……...…… C.1

Appraisal of Damages and Treatment Costs…… C.1

Treatment Measures……..……...…… C.1

Benefit-Cost Analysis……..…… C.2

Example……..……...…… C.2

Cost Estimate—SITE EXAMPLE…… C.5

References

Section prepared by:

Donald W. Lake Jr., P.E., CPESC, CPSWQ
Engineering Specialist
New York State Soil & Water Conservation Committee

List of Tables

Table	Title	Page
C.1	Cost Table…….…….	C.3
C.2	Annual Maintenance Cost As Percentage of Installation Cost……..	C.4
C.3	Cost Estimate—SITE EXAMPLE…….	C.5

COST ANALYSIS OF EROSION AND SEDIMENT CONTROL PRACTICES

Analyzing Benefits and Costs

Benefit-Cost analysis is a technique used to determine whether a measure will result in more benefits than it will cost.

For the purposes of making a benefit-cost analysis for erosion and sediment control, the time period associated with erosion and sedimentation is considered to extend from the first disturbance of the land to the time of establishing effective erosion control.

Ascribing Effects to Treatment Measures

The generally accepted basis for attributing effects of treatment measures on a comparable basis is the "with" and "without" approach. This approach compares the expected difference in damages between what is expected if no control is used and what is expected if a measure is installed. The total difference in expected damage is the estimated benefit of the measure.

Sediment damages may be related to (1) deposition of eroded materials on flood plains, in channels, reservoirs, residences, utilities, and other properties that require the removal and disposition of materials, and the repairing of damaged facilities and (2) swamping damage which adversely affects existing features or limits potential improvement of land caused by a rise in the ground water table or by impairing surface drainage.

Sediment resulting from construction sites can be deposited along a stream and cause individual landowners to pay for its removal. Sediment can also destroy aesthetic values of a stream (clean water vs. turbid water) and adversely impact stream fisheries and micro-organisms.

In municipal and industrial uses where water is pumped directly from a river or reservoir, slugs of sediment associated with excessive rainfall may pose sever water quality problems. Turbidity may be increased, necessitating increased treatment, which raises the cost of operations. Sediment may also be deposited in storm drains, reducing their ability to control flooding. This increases flood damage and requires the cleanout of sediment from the storm drain systems.

Pricing Treatment Measures and Benefits

Prices applied should reflect values expected to prevail at the time of occurrence. Current prices are used for installation costs of treatment measures. Projected normalized prices (based on past prices and trends) should be used for estimating future values (benefits, operations and maintenance costs and replacement costs) for permanent type measures only.

Period of Analysis and Evaluation

The period of analysis in years should equal the economic life (need for a measure) or the physical life of treatment measures, whichever is less. The benefits considered over the evaluation period include those accruing over the period.

The annual costs of permanent measures chargeable to the evaluation period include the amortized installation cost and the future annual operation, maintenance, and replacement cost necessary to provide the benefits over the evaluation period. The amortization rate should be based on prevailing local interest rates at the time of installation.

Appraisal of Damages and Treatment Costs

Many people are affected by the damages resulting from erosion and sedimentation. Also, communities and individuals benefit from its prevention, reduction, or mitigation.

Costs will be incurred to: (1) install remedial treatment measures; or (2) correct damages; or (3) a combination of the two.

Treatment Measures

Treatment measures on developing sites are frequently temporary—generally lasting only one or two construction seasons. Benefits and cost for temporary measures can be compared directly using current prices.

Permanent measures are planned to trap sediment and control erosion and runoff during and beyond the construction period. The prevention of sediment damages can be accomplished by either, or both of, two methods:

1. Stabilizing sediment source areas by applying conservation erosion control measures.

2. Trapping sediment before it leaves the construction area (sediment control)

(Erosion control is often more effective than sediment control at preventing sediment damage. It is highly recommended to use both methods to maximize benefits.)

Some of the potential benefits from preventing downstream sediment transport and deposition include:

1. Prevention or reduction in cost of removal and disposition of sediment from properties.
2. Prevention or reduction in damage to property.
3. Prevention of water quality impairment.

Some permanent measures may be retained to provide long-term benefits.

For example, a sediment basin may be cleaned out after construction is finished and utilized for aesthetics, recreation, fish, or stormwater management.

Benefits and costs for permanent measures need to be converted by discounting and amortizing to average annual figures for comparison.

Benefit-Cost Analysis

A simple equation for determining the benefits of controlling sediment is:

B = (SxY) - [C + (SxY)(1.00-P)]

Where: B = Benefits in dollars.

S = Cubic yards of sediment expected to move off the site if no control measures are applied. (See Section 3).

Y = Cost in dollars per yard to recover and dispose of sediment that has moved off the site.

C = Estimated cost of temporary measures to be installed. (See Cost Tables).

P = Estimated effectiveness of proposed measures expressed as a decimal.

Example

This example illustrates the methodology of a benefit-cost analysis:

Given: A construction site of 78 acres, which without erosion or sediment control measures will yield about 5 acre feet or 8,000 cubic yards of sediment (S) to the lower end of the site. There is a channel with several culverts located below the site and it is assumed all the sediment would be deposited in it. It would be necessary to remove all the additional sediment in order to maintain the capacity of the channel and avoid increased hazard to flooding. The cost of removing and disposing the sediment is estimated at $2.00 per cubic yard (Y).
With temporary erosion and sediment control measures, including a sediment basin, in place during the one year construction period, sediment delivered to the channel will be reduced 90 percent (P). The cost of the measures would be as follows, (no amortization is required since costs and benefits are incurred in a similar one year period):

1. Land grading measures…….$2,000
2. Temporary sediment basin……$3,000
   a. Construction……$1,500
   b. Maintenance……$1,000
   c. Restoration……..$500

Total Cost (C)……...…….$5,000

The "without treatment" condition reveals damages in the form of costs to remove sediment. Benefit (costs saved) are derived by subtracting the sediment removal costs under the "with treatment" condition.

1. Without treatment condition

   8,000 cu.yd. (S) x $2.00/cu.yd. (Y) = $16,000 (SxY)

2. With treatment condition

   a. Costs (C) described above = ……...$5,000

   b. Removal costs for the 10% of sediment that passes through the control measure (measure is 90% effective)

   (SxY)(1.00-P) = (16,000)(1.00 - .90) …$1,600

   c. Total Cost = $5,000 + $1,600 =……. .$6,600

3. Benefits

   $16,000—$6,600 = ……..$9,400 (B)
($9,400 is money saved by installing sediment treatment)

Using the formula directly, the computations show the same results:

B = (SxY)-[c + (SxY)(1.00-P)]

B = ($8,000 x 2.00)-[($5,000 + (8,000 x 2.00)(1.00-0.90)]

B = ($16,000)-($5,000 + 1,600)

B = ($16,000)-($6,600)

B = $9,400

In this example, the more economical approach would be to install treatment measures rather than correct damages at a later date. A third alternative would be "do nothing" which would result in a higher flood damage hazard that would need evaluation under a more sophisticated analytical model. **Also, in this simple example, water quality issues (such as habitat loss) were not included even though society, in general, does place a value on such issues.**

Table C.1—Cost Table

The cost of implementing erosion and sediment control practices is highly variable and dependent upon many factors including availability and proximity of materials, time of year, prevailing wage rates, and regional cost trends to name a few. It is therefore difficult to develop cost estimates that are applicable statewide and year-round. The cost data contained in this chapter is based on actual bid prices from county and state highway construction projects, and suppliers for the year 2000. The following cost figures are provided to aid project planners in estimating erosion and sediment cost for feasibility studies. The actual dollar amounts are not recommended for use in estimating and bidding construction contracts. It is advisable to check with local suppliers and contractors for this purpose.

Erosion and Sediment Control Measures	$ Low	$ High	$ Median
VEGETATIVE MEASURES			
Temporary Seeding	400/ac.	1,020/ac.	550/ac.
Permanent Seeding	1,500/ac.	2,690/ac.	2,000/ac.
Straw Mulch	660/ac.	1,000/ac.	750/ac.
Wood Mulch		23,000/ac.	23,000/ac.
Topsoil Stripping			1.60 cu.yd.
Topsoil Spreading			20/cu.yd.
Sodding			12/sq.yd.
RECP Netting	4.00/sq.yd.	4.53/sq.yd.	4.50 sq.yd.
Tree Protection			5/ln.ft.
BIOTECHNICAL MEASURES			
Willow Wattles			10/ln.ft.
Live Stakes			1.50/ln.ft.
Brush Layering			8/ln.ft.
RUNOFF CONTROL MEASURES			
Temporary Swale	2.00/ln.ft.	3.00/ln.ft.	2.50/ln.ft.
Rock Check Dam	130/ea.	450/ea.	200/ea.
Diversion or Grass Channel	6/ln.ft.	12/ln.ft.	10/ln.ft.
Riprap Channel	36.40/cu.yd.	55.00/cu.yd.	45.00/cu.yd.
Level Lip Spreader			25/ln.ft.
Rock Outlet Structure			1,000/ea.

Table C.1 (cont'd)
Cost Table

Erosion and Sediment Control Measures	$ Low	$ High	$ Median
SEDIMENT CONTROL MEASURES			
Silt Fence	2.00/ln.ft.	2.68/ln.ft.	2.50/ln.ft.
Straw Bale Berm	3.25/ln.ft.	5.00/ln.ft.	4.00/ln.ft.
Stabilized Construction Entrance			30/cu.yd.
Temporary Sediment Basin			50/cu.yd.
Temporary Sediment Trap	600/ea.	2,000/ea.	1,500/ea.
Temporary Silt Dike			12/ln.ft.
Turbidity Curtain	4/sq.yd.	55/sq.yd.	20/sq.yd.
Filter Fabric Inlet Protection			100/ea.
Excavated Drop Inlet Protection			500/ea.
Temporary Sediment Tank			2,600/ea.
Block & Gravel Inlet Protection			500/ea.

Table C.2
Annual Maintenance Cost As Percentage of Installation Cost

Item	Percentage (%)
Seeding	20
Mulch	2
Silt Fence	100
Sediment Trap	20
Sediment Basin	25
Inlet Protection	60
Stabilized Construction Entrance	100
Rock Riprap	10
Grass Channel	10
Temporary Swale	50
Level Lip Spreader	50
Tree Protection	50
Rock Outlet Structure	20

Cost Estimate—SITE EXAMPLE

This example illustrates the use of Tables C.1 and C.2 to compute a cost estimate for erosion and sediment control for a site plan.

For the site example shown in Appendix F, the following cost estimate table (Table C.3) can be constructed. Unit costs are based on the median value in Table C.1. Since the construction schedule indicates a 9-month period to complete, we will use the annual maintenance figure in Table C.2 for the estimate.

It should be noted that many items are permanent practices, such as the rock riprap lined channel, permanent seeding, grass-lined channel, level lip spreader, and the rock outlet structures.

Table C.3
Cost Estimate For Site Example in Appendix F

ITEM	QUANTITY	UNIT COST	AMOUNT ($)	MAINTENANCE ($)	TOTAL ESIMATED COST ($)
1. Stabilized Construction Entrance	22.2 cu.yd.	$30 cu.yd.	666	666	1,332
2. Rock Riprap	350 cu.yd.	$45/cu.yd.	15,750	1,575	17,325
3. Seeding	2.5 ac.	$2,000/ac.	5,000	1,000	6,000
4. Grass Channel	1,100 ln.ft..	$10/ln.ft.	11,000	1,100	12,100
5. Temporary Swale	900 ln.ft.	$2.50/ln.ft.	2,250	1,125	3,375
6. Level Lip Spreader	10 ln.ft.	$25/ln.ft.	250	125	375
7. Drop Inlet Protection					
a. Filter Fabric	1 ea.	$100/ea.	100	60	160
b. Block & Gravel	1 ea.	$500/ea.	500	300	800
8. Silt Fence	100 ft.	2.50/ln.ft.	250	250	500
9. Tree Protection	80 ln.ft.	$5.00/ln.ft.	400	200	600
10. Sediment Trap	1 ea.	$1,500/ea.	1,500	300	1,800
11. Sediment Basin	285 cu.yd.	$50/cu.yd.	14,250	3,600	17,850
12. Rock Outlet Structure	2 ea.	$1,000/ea.	2,000	400	2,400
				TOTAL	64,617

References

1. Soil Conservation Service, USDA. Oct. 1977. National Handbook for Conservation Practices, U.S. Government Printing Office, Washington, D.C.

2. Soil Conservation Service, USDA. July 1984. Engineering Field Manual of Conservation Practices, 4th Printing, U.S. Government Printing Office, Washington, D.C.

3. Soil Conservation Service, USDA. June 1986. Urban Hydrology for Small Watersheds, Technical Release 55, Second Edition, U.S. Government Printing Office, Washington, D.C.

4. Soil Conservation Service, USDA. Sept. 1987. Drainage Guide for New York State, Syracuse, N.Y.

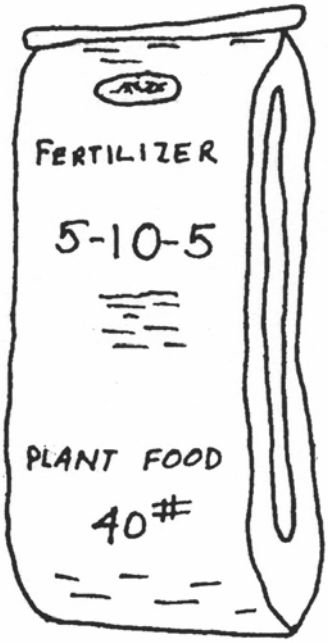
APPENDIX D
FERTILIZER LABELS AND PURE LIVE SEED

FERTILIZER GRADE

5-10-5

MEANS

5%	-	10%	-	5%
NITROGEN	-	PHOSPHORUS	-	POTASH
(N)	-	(P_2O_5)	-	(K_2O)



OR

2 lbs.	-	4 lbs.	-	2 lbs.
N/40 lb. bag	-	P_2O_5/40 lb. bag	-	K_2O/40 lb. bag

FERTILZER CALCULATION EXAMPLE

EXAMPLE

A one-half acre lawn area needs 20 pounds of nitrogen (N) (40 pounds per acre) to achieve vigorous, green growth. The supplier has 10-10-10 in 50 pound bags. How many bags of fertilizer are needed?

NOTE: Always apply as closely as possible the required amount of fertilizer to meet the requirements of the site. Adding surplus nitrogen may cause pollution of drinking water and saltwater ecosystems. Excessive phosphorus may accelerate the aging process of freshwater ecosystems. Excessive amounts of N and K2O may result in 'burning' the grass and killing it.

ANSWER

10-10-10 has 10% of each N, P2O5, and K2O in the bag. Based on the N needed,

40-lbs/ac divided by 0.1 (10%) = 400 lbs. for one acre.
Divide by 2 for ½ acre=200 lbs. of fertilizer or 4-fifty pound bags of 10-10-10 fertilizer.

HOW TO CALCULATE PURE LIVE SEED

Pure Live Seed, or PLS, refers to the amount of live seed in a lot of bulk seed. The cost of PLS seed is proportionally higher than bulk price. Calculating Pure Live Seed can help you save money and do the best jobs possible. Take a look at the label on a bag of seed. You will find a lot of information such as the type of seed, the supplier, test date and where the seed came from. More importantly, you will see seed purity, and germination percent. To compute pure live seed, multiply the "germination percent" times the "purity" and divide that by "100" to get PURE LIVE SEED.

(*Purity* is the percentage of pure seed. A high percentage of pure seed is required for crop seed, but some chaffy grasses and native plants may have a lower percent purity. A high pure seed percentage will provide the best results. *Germination percentage* is the percentage of pure seed that will produce normal plants when planted under favorable conditions.)

Example:

$$\frac{\text{96\% germination x 75\% purity}}{100} = \text{72\% PLS}$$

Then divide the "Cost per pound" by "Pure Live Seed" and you will have the cost per pound of the Pure Live Seed.

$$\frac{\$2.50 \text{ per pound}}{72\%} = \$\ 3.47 \text{ per Pound of PLS}$$

APPENDIX E
EROSION & SEDIMENT CONTROL PLAN
FOR SMALL HOMESITE CONSTRUCTION

CONTENTS

Page

List of Figures

Definition…….…….……. E.1

Purpose……...…… E.1

Criteria……..…….. E.1

Specifications……..……...……. E.1

Small Homesite Minimum Requirements……..…… E.1

Small Homesite Examples (with Vegetative Requirements and Compliance Form)…… E.3

Appendix prepared by:

Paula Smith, CPESC, CPSWQ
Executive Director
Monroe County Soil & Water Conservation District

List of Figures

Figure	Title	Page
E.1	Erosion Control Plan Condition 1…….……	E.3
E.2	Erosion Control Plan Condition 2.……..……	E.5
E.3	Erosion Control Plan Condition 3……..……	E.7
E.4	Erosion Control Plan Condition 4...……..	E.9
E.5	Construction Details for Stabilized Construction Entrance and Silt Fence……	E.11
E.6	Construction Details for Straw Bale Dike and Rock Check Dam……..	E.12

EROSION AND SEDIMENT CONTROL PLAN FOR SMALL HOMESITE CONSTRUCTION

Definition

Small homesite erosion and sediment control plans are a group of minimum erosion and sediment control practices and management techniques that apply to small homesite construction activity on a single residential lot, in order to prevent polluted discharge.

Purpose

This appendix lays out a series of minimum requirements for erosion and sediment control, and management practices that may be used to meet these requirements. Use of these templates will help show compliance with the general requirements for construction activities that require basic stormwater pollution prevention plans (SWPPP). This applies to the construction of small homesites. The owner/ developer must complete the relevant conditions (1-4), or small parcel erosion and sediment control plan included in this section, and submit the NOI in order to meet compliance with the SPDES General Permit for Stormwater Discharges From Construction Activities.

Criteria

Generally, several types of practices are required on any one site for effective erosion and sediment control. There are three broad categories of construction-related practices for controlling erosion and sediment on small homesite developments:

1. **Cover practices** prevent erosion by protecting the soil surface from rainfall and runoff. Prevention of erosion is the most preferable and cost-effective approach. These practices include: protection of existing vegetation; temporary covering of exposed soil by mulching, matting, or covering; and permanent site stabilization by topsoiling, seeding, and/or sodding.

2. **Structural Practices** are structural controls that either reduce erosion, control runoff, or keep sediment on the construction site. Examples of these practices include stabilized construction entrances, filter fences, sediment traps, berms, and check dams.

3. **Management Measures** are construction management methods that prevent or reduce erosion potential and ensure the proper functioning of erosion and sediment control practices. Careful construction management can dramatically reduce the costs associated with erosion and sediment problems. Examples of these management measures include:

- Preserving existing trees and grass where possible to prevent erosion;
- Re-vegetating the site as soon as possible;
- Locating soil piles away from roads or waterways;
- Limiting tracking of mud onto streets by requiring all vehicles to use designated access drives;
- Removing sediment carried off-site by vehicles or storms;
- Installing downspout extenders to prevent erosion from roof runoff; and
- Maintaining erosion and sediment practices through sediment removal, structure replacement, etc.

Specifications

Each construction site is different. The owner/developer of a small construction site may choose and follow one of the four variations of ESC plans included in this section to develop a SWPPP in compliance with the SPDES Construction Permit For Stormwater Discharges From Construction Activities. However, because of the general nature of the following conditions, **the plans included in this section may not cover all of the resource protection needs on a particular site, and this form does not exempt an owner from the responsibility of filing an NOI.**

Small Homesite Minimum Requirements:

1. Stabilized Construction Entrance:
To prevent vehicles and equipment from tracking sediment and mud off-site, apply gravel or crushed rock to the driveway area and restrict traffic to this one route. This practice will help keep soil from sticking to tires and stop soil from washing off into the street. Carry out periodic inspections and maintenance including washing, top-dressing with additional stone, reworking, and compaction. Plan for periodic street cleaning to remove any sediment that may have been tracked off-site. Remove sediment by shoveling or sweeping and transport to a suitable disposal area where it can be stabilized.

2. Stabilization of Denuded Areas:
Stabilization measures must be initiated as soon as practicable, but in no case more than 14 days after the construction activity has ceased. In frozen ground conditions, stabilization measures must be initiated as soon as practicable. Where construction activity on a portion of the site is temporarily ceased, and earth-disturbing activities will be resumed within twenty-one (21) days, temporary stabilization measures need not be initiated on that portion of the site.

Stabilize denuded areas by implementing soil covering practices (e.g. mulching, matting, sodding). Exposed soils are the most prone to erosion from rainfall and runoff. Vegetation helps protect the soil from these forces and provides natural erosion control. Plan construction to limit

the amount of exposed area, and avoid grading activities during the rainy season (November through March) as much as possible. Clearing limits should be clearly marked and kept as small as possible. Once construction is completed, the site must be permanently stabilized with topsoiling, seeding and plantings, or sodding if needed.

3. Protection of Adjacent Properties:
Keep sediment on-site by using structural and source control practices (e.g. vegetative buffer strips, sediment barriers, soil berms or dikes, etc). See Sections 3, 4, or 5 as appropriate. Wherever possible, preserve a buffer of existing vegetation around the site boundary. This will help to decrease runoff velocities and trap sediment suspended in the runoff. Other structural controls such as filter fence or straw bale barriers should also be used to filter runoff and trap sediment on-site.

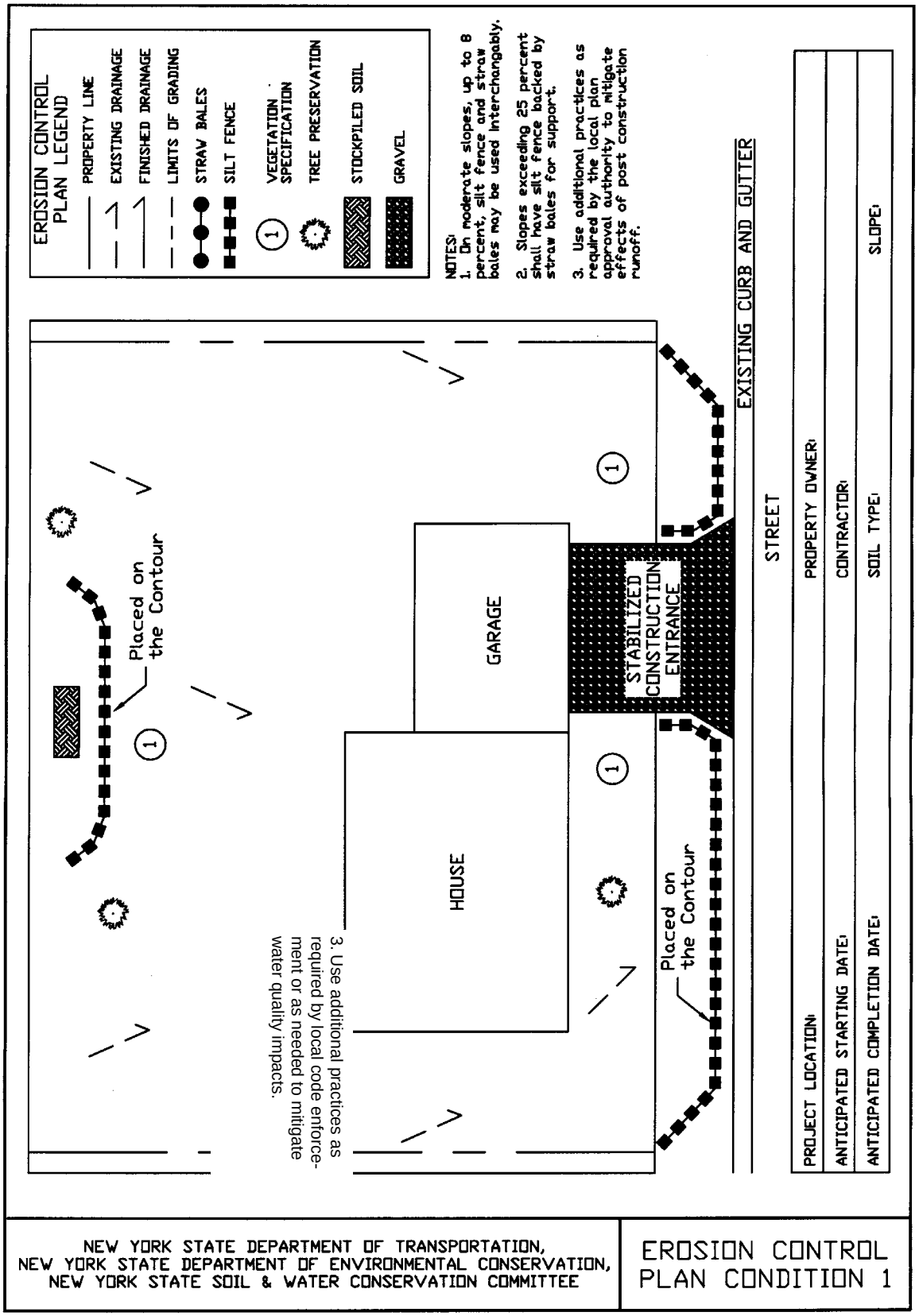
When excavating basement soils, move the soil to a location that is, or will be, vegetated, such as in the backyard or side yard area. This will increase the distance eroded soil must travel, through vegetation, to reach the storm sewer system. Piles should be situated so that sediment does not run into the street or adjoining yards. Soil piles should be temporarily seeded and circled with silt fence until the soil is either replaced or removed. Backfill basement walls as soon as possible and rough grade the lot. This will eliminate the large soil mounds, which are highly erodible, and prepare the lot for temporary cover. After backfilling, grade or remove excess soil from the site quickly, to eliminate any sediment loss from surplus fill.

4. Concentrated Flow:
For constructed drainage ways, or other areas of concentrated flow, install check dams according to the specifications on page E.12 to reduce erosion in the channel. As with other erosion controls, check dams must be inspected regularly. Remove sediment accumulated behind the dam as needed to allow channel to drain through the stone check dam and prevent large flows from carrying sediment over the dam Replace stones as needed to maintain the design cross section of the structures. Sediment removal is crucial to the effectiveness of the dam—if not maintained, high flows could cause erosion around the sides of the structures, adding significant sediment loads downstream.

5. Maintenance:
Maintain erosion and sediment control practices through regular inspection. Regular maintenance is extremely important for the proper operation of structural practices. After initial groundbreaking, the builder shall conduct site inspections at least once every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater.

6. Other Practices:
Use additional practices as required by the local plan approval authority to mitigate effects of increased runoff. This may include providing additional controls to a locally protected stream or resource area, protecting riparian corridors (vegetative stream buffers), etc. Individual homeowners and/or developers are responsible for researching additional requirements related to erosion and sediment runoff control established by their local jurisdictions.

Figure E.1
Erosion Control Plan Condition 1



Condition 1—Vegetative Requirements & Compliance Form

Vegetation Requirements:

1.) Site Preparation

A. Install needed water and erosion control measures and bring area to be seeded to desired grades using a minimum of 4 in. topsoil.
B. Prepare seedbed by loosening soil to a depth of 4-6 inches.
C. Lime to a pH of 6.5
E. Fertilize as per soil test or, if fertilizer must be applied before soil test results are received, apply 850 pounds of 5-10-10 or equivalent per acre (20 lbs/1,000 sq. ft.)
F. Incorporate lime and fertilizer in top 2-4 inches of topsoil.
G. Smooth. Remove all stones over 1 inch in diameter, sticks, and foreign matter from the surface. Firm the seedbed.

2.) Planting—Sunny Location.

Use a cultipacker type seeder if possible. Seed to a depth of 1/8 to 1/4 inch. If seed is to be broadcast, cultipack or roll after seeding. If hydroseeded, lime and fertilizer may be applied through the seeder and rolling is not practical. Seed using the following mix and rates:

Species (% by weight)	lbs/1,000sq. ft	lbs./acre
65% Kentucky bluegrass blend…… ..	2.0-2.6……..	85-114
20% perennial ryegrass…….	0.6-0.8……..	26-35
15% fine fescue…….	0.4-0.6……..	19-26
Total……..	3.0-4.0…….	130-175
or,		
100% Tall fescue, Turf-type, fine leaf……..	3.4-4.6…….	150-200

3.) When using the cultipacker or broadcast seed method, mulch using small grain straw, applied at a rate of 2 tons per acre; and anchor with a netting or tackifier. Hydroseed applications should include mulch, fertilizer and seed.

Common white clover can be added to mixtures at the rate of 1-2 lbs/acre to help maintain green color during the dry summer period, however, they will not withstand heavy traffic. Fertilizing—First year, (spring seedlings) three to four weeks after germination apply 1 pound nitrogen/1,000 square feet using a complete fertilizer with a 2-1-1 or 4-1-3 ratio or as recommended by soil test results. For summer and early fall seedings, apply as above unless air temperatures are above 85ºF for extended period. Wait until heat wave is over to fertilize. For late fall/ winter seedings, fertilize in spring. Restrict use—new seedlings should be protected from use for one full year to allow development of a dense sod with good root structure.

Certification Statement

Please complete and sign this 2-sided document (with Typical Erosion Control Plan) and attach to BLUEPRINTS and SITE PLAN prior to any earth disturbance. These documents must be kept on site and be available for review as requested by any agent of the NYSDEC. **This 2-sided form can be used as a basic stormwater pollution prevention plan, but will not exempt a landowner from filing a Notice of Intent.**

"I certify under penalty of law that I understand and agree to comply with the terms and conditions of the ESC plan for the construction site identified in such ESC plan as a condition of authorization to discharge stormwater. I also understand that the operator must comply with the terms and conditions of the New York State Pollutant Discharge Elimination System ("SPDES") general permit for stormwater discharges from construction activities and that it is unlawful for any person to cause or contribute to a violation of water quality standards."

_____

Builder/Contractor (print) Signature

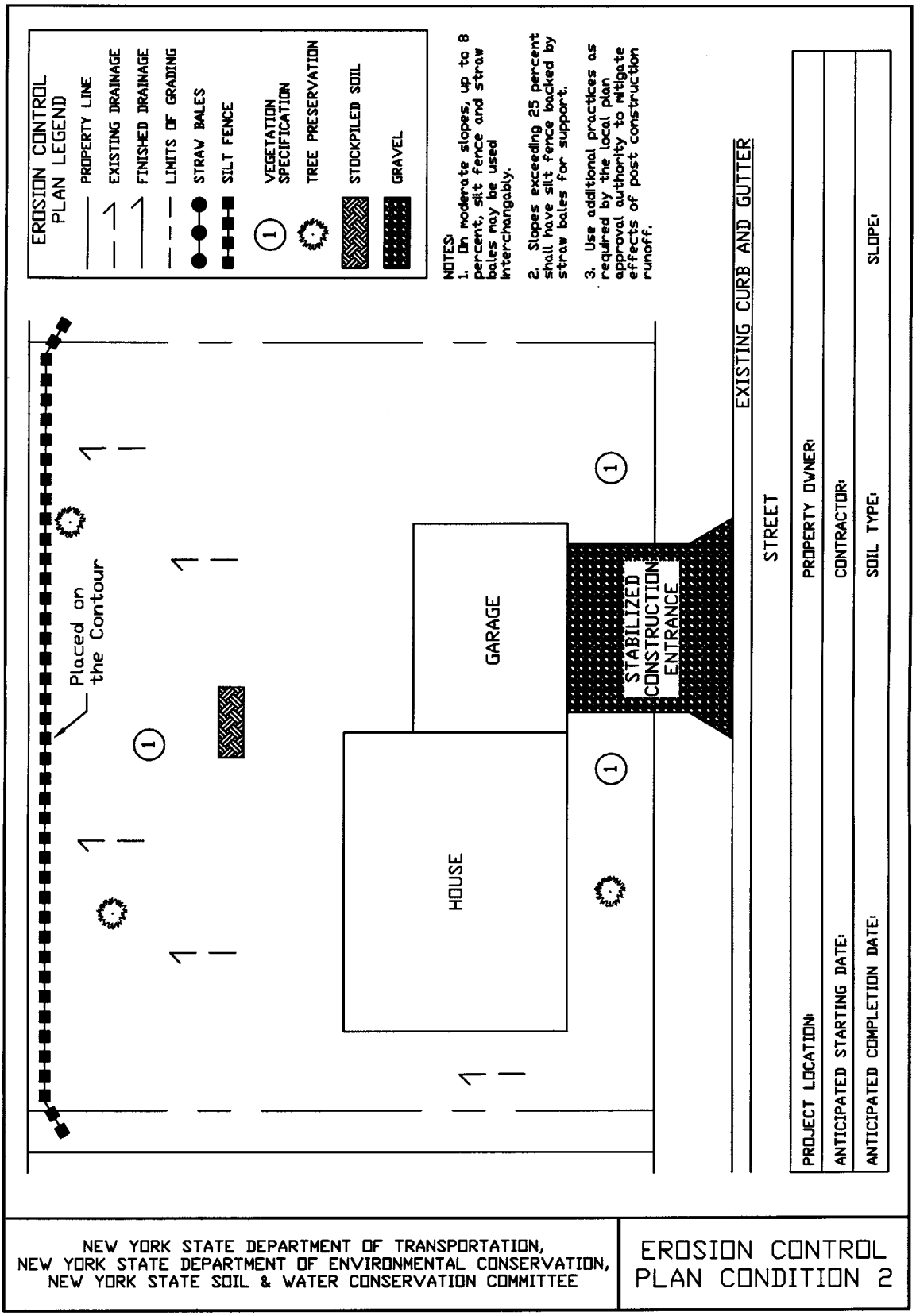
_____

Address

_____

Telephone Fax E-mail

Figure E.2
Erosion Control Plan Condition 2



Condition 2—Vegetative Requirements & Compliance Form

Vegetation Requirements:

1.) Site Preparation

A. Install needed water and erosion control measures and bring area to be seeded to desired grades using a minimum of 4 in. topsoil.
B. Prepare seedbed by loosening soil to a depth of 4-6 inches.
C. Lime to a pH of 6.5
E. Fertilize as per soil test or, if fertilizer must be applied before soil test results are received, apply 850 pounds of 5-10-10 or equivalent per acre (20 lbs/1,000 sq. ft.)
F. Incorporate lime and fertilizer in top 2-4 inches of topsoil.
G. Smooth. Remove all stones over 1 inch in diameter, sticks, and foreign matter from the surface. Firm the seedbed.

2.) Planting—Sunny Location.

Use a cultipacker type seeder if possible. Seed to a depth of 1/8 to 1/4 inch. If seed is to be broadcast, cultipack or roll after seeding. If hydroseeded, lime and fertilizer may be applied through the seeder and rolling is not practical. Seed using the following mix and rates:

Species (% by weight)	lbs/1,000sq. ft	lbs./acre
65% Kentucky bluegrass blend…… ..	2.0-2.6……..	85-114
20% perennial ryegrass…….	0.6-0.8……..	26-35
15% fine fescue…….	0.4-0.6……..	19-26
Total……..	3.0-4.0…….	130-175
or,		
100% Tall fescue, Turf-type, fine leaf……..	3.4-4.6…….	150-200

3.) When using the cultipacker or broadcast seed method, mulch using small grain straw, applied at a rate of 2 tons per acre; and anchor with a netting or tackifier. Hydroseed applications should include mulch, fertilizer and seed.

Common white clover can be added to mixtures at the rate of 1-2 lbs/acre to help maintain green color during the dry summer period, however, they will not withstand heavy traffic. Fertilizing—First year, (spring seedlings) three to four weeks after germination apply 1 pound nitrogen/1,000 square feet using a complete fertilizer with a 2-1-1 or 4-1-3 ratio or as recommended by soil test results. For summer and early fall seedings, apply as above unless air temperatures are above 85ºF for extended period. Wait until heat wave is over to fertilize. For late fall/ winter seedings, fertilize in spring. Restrict use—new seedlings should be protected from use for one full year to allow development of a dense sod with good root structure.

Certification Statement

Please complete and sign this 2-sided document (with Typical Erosion Control Plan) and attach to BLUEPRINTS and SITE PLAN prior to any earth disturbance. These documents must be kept on site and be available for review as requested by any agent of the NYSDEC. **This 2-sided form can be used as a basic stormwater pollution prevention plan, but will not exempt a landowner from filing a Notice of Intent.**

"I certify under penalty of law that I understand and agree to comply with the terms and conditions of the ESC plan for the construction site identified in such ESC plan as a condition of authorization to discharge stormwater. I also understand that the operator must comply with the terms and conditions of the New York State Pollutant Discharge Elimination System ("SPDES") general permit for stormwater discharges from construction activities and that it is unlawful for any person to cause or contribute to a violation of water quality standards."

_____

Builder/Contractor (print) Signature

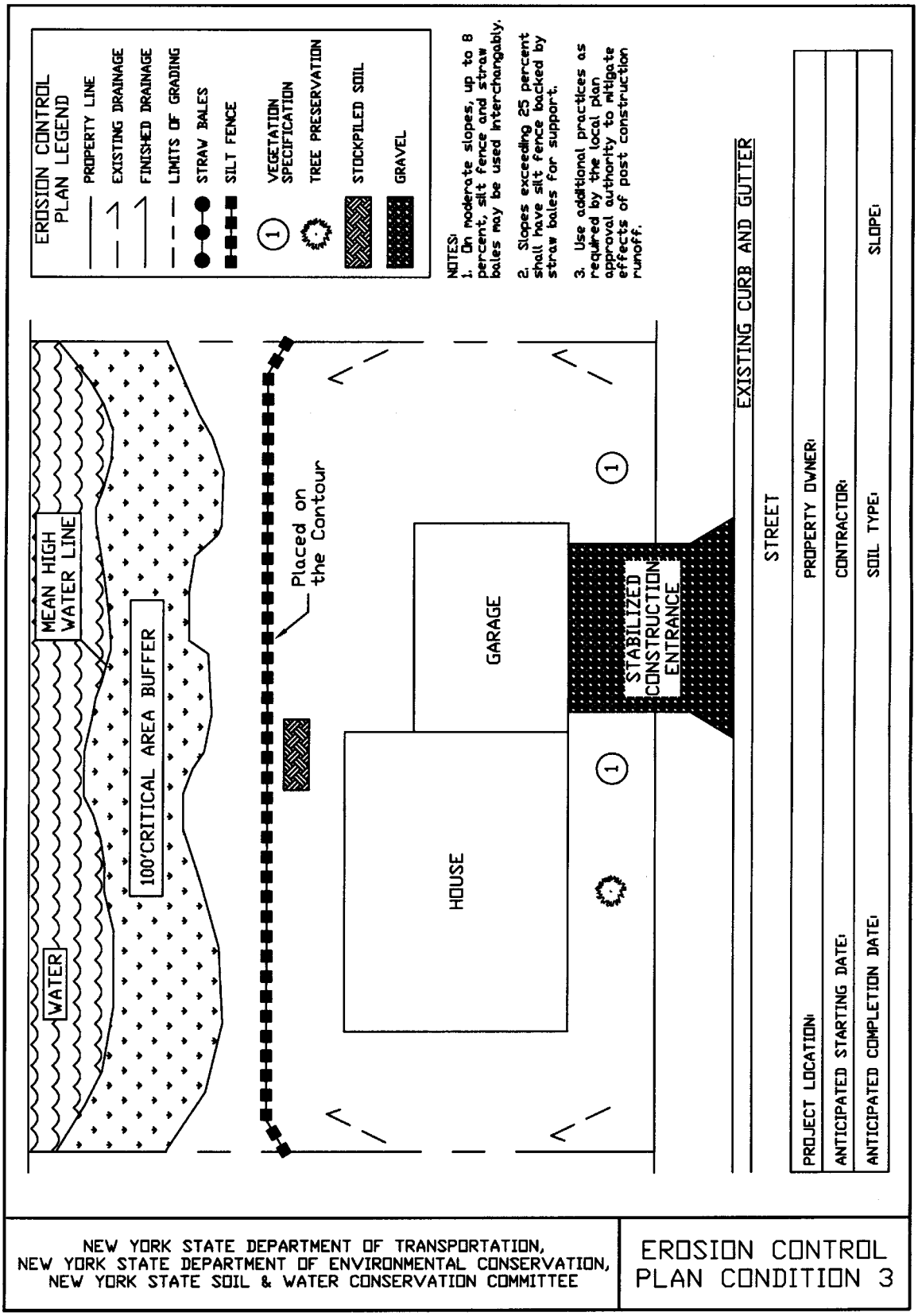
_____

Address

_____

Telephone Fax E-mail

Figure E.3
Erosion Control Plan Condition 3



Condition 3—Vegetative Requirements & Compliance Form

Vegetation Requirements:

1.) Site Preparation

A. Install needed water and erosion control measures and bring area to be seeded to desired grades using a minimum of 4 in. topsoil.
B. Prepare seedbed by loosening soil to a depth of 4-6 inches.
C. Lime to a pH of 6.5
E. Fertilize as per soil test or, if fertilizer must be applied before soil test results are received, apply 850 pounds of 5-10-10 or equivalent per acre (20 lbs/1,000 sq. ft.)
F. Incorporate lime and fertilizer in top 2-4 inches of topsoil.
G. Smooth. Remove all stones over 1 inch in diameter, sticks, and foreign matter from the surface. Firm the seedbed.

2.) Planting—Sunny Location.

Use a cultipacker type seeder if possible. Seed to a depth of 1/8 to 1/4 inch. If seed is to be broadcast, cultipack or roll after seeding. If hydroseeded, lime and fertilizer may be applied through the seeder and rolling is not practical. Seed using the following mix and rates:

Species (% by weight)	lbs/1,000sq. ft	lbs./acre
65% Kentucky bluegrass blend…… ..	2.0-2.6……..	85-114
20% perennial ryegrass…….	0.6-0.8……..	26-35
15% fine fescue…….	0.4-0.6……..	19-26
Total……..	3.0-4.0…….	130-175
or,		
100% Tall fescue, Turf-type, fine leaf……..	3.4-4.6…….	150-200

3.) When using the cultipacker or broadcast seed method, mulch using small grain straw, applied at a rate of 2 tons per acre; and anchor with a netting or tackifier. Hydroseed applications should include mulch, fertilizer and seed.

Common white clover can be added to mixtures at the rate of 1-2 lbs/acre to help maintain green color during the dry summer period, however, they will not withstand heavy traffic. Fertilizing—First year, (spring seedlings) three to four weeks after germination apply 1 pound nitrogen/1,000 square feet using a complete fertilizer with a 2-1-1 or 4-1-3 ratio or as recommended by soil test results. For summer and early fall seedings, apply as above unless air temperatures are above 85ºF for extended period. Wait until heat wave is over to fertilize. For late fall/ winter seedings, fertilize in spring. Restrict use—new seedlings should be protected from use for one full year to allow development of a dense sod with good root structure.

Certification Statement

Please complete and sign this 2-sided document (with Typical Erosion Control Plan) and attach to BLUEPRINTS and SITE PLAN prior to any earth disturbance. These documents must be kept on site and be available for review as requested by any agent of the NYSDEC. **This 2-sided form can be used as a basic stormwater pollution prevention plan, but will not exempt a landowner from filing a Notice of Intent.**

"I certify under penalty of law that I understand and agree to comply with the terms and conditions of the ESC plan for the construction site identified in such ESC plan as a condition of authorization to discharge stormwater. I also understand that the operator must comply with the terms and conditions of the New York State Pollutant Discharge Elimination System ("SPDES") general permit for stormwater discharges from construction activities and that it is unlawful for any person to cause or contribute to a violation of water quality standards."

_____

Builder/Contractor (print) Signature

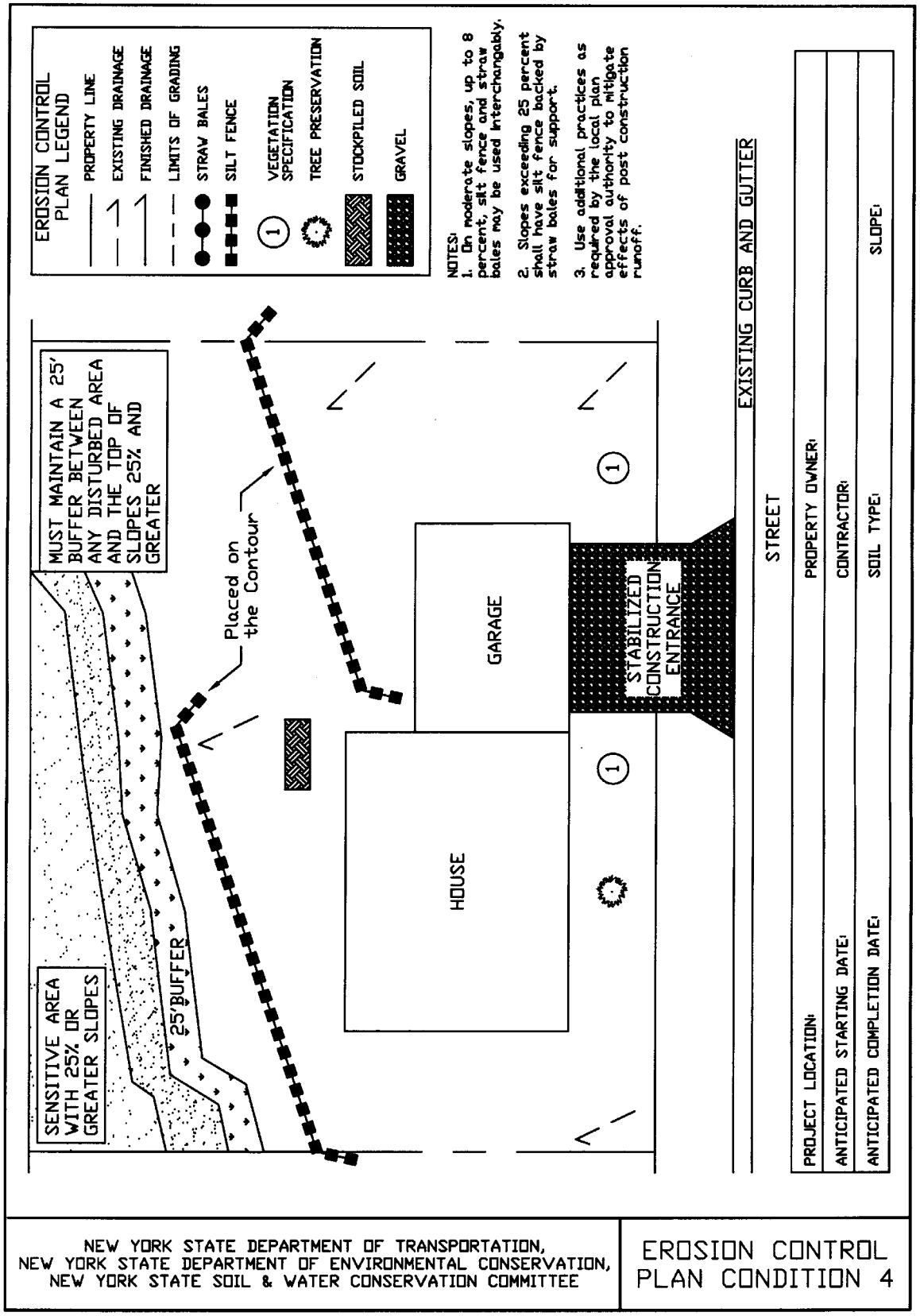
_____

Address

_____

Telephone Fax E-mail

Figure E.4
Erosion Control Plan Condition 4



Condition 4—Vegetative Requirements & Compliance Form

Vegetation Requirements:

1.) Site Preparation

A. Install needed water and erosion control measures and bring area to be seeded to desired grades using a minimum of 4 in. topsoil.
B. Prepare seedbed by loosening soil to a depth of 4-6 inches.
C. Lime to a pH of 6.5
E. Fertilize as per soil test or, if fertilizer must be applied before soil test results are received, apply 850 pounds of 5-10-10 or equivalent per acre (20 lbs/1,000 sq. ft.)
F. Incorporate lime and fertilizer in top 2-4 inches of topsoil.
G. Smooth. Remove all stones over 1 inch in diameter, sticks, and foreign matter from the surface. Firm the seedbed.

2.) Planting—Sunny Location.

Use a cultipacker type seeder if possible. Seed to a depth of 1/8 to 1/4 inch. If seed is to be broadcast, cultipack or roll after seeding. If hydroseeded, lime and fertilizer may be applied through the seeder and rolling is not practical. Seed using the following mix and rates:

Species (% by weight)	lbs/1,000sq. ft	lbs./acre
65% Kentucky bluegrass blend…… ..	2.0-2.6……..	85-114
20% perennial ryegrass…….	0.6-0.8……..	26-35
15% fine fescue…….	0.4-0.6……..	19-26
Total……..	3.0-4.0…….	130-175
or,		
100% Tall fescue, Turf-type, fine leaf……..	3.4-4.6…….	150-200

3.) When using the cultipacker or broadcast seed method, mulch using small grain straw, applied at a rate of 2 tons per acre; and anchor with a netting or tackifier. Hydroseed applications should include mulch, fertilizer and seed.

Common white clover can be added to mixtures at the rate of 1-2 lbs/acre to help maintain green color during the dry summer period, however, they will not withstand heavy traffic. Fertilizing—First year, (spring seedlings) three to four weeks after germination apply 1 pound nitrogen/1,000 square feet using a complete fertilizer with a 2-1-1 or 4-1-3 ratio or as recommended by soil test results. For summer and early fall seedings, apply as above unless air temperatures are above 85ºF for extended period. Wait until heat wave is over to fertilize. For late fall/ winter seedings, fertilize in spring. Restrict use—new seedlings should be protected from use for one full year to allow development of a dense sod with good root structure.

Certification Statement

Please complete and sign this 2-sided document (with Typical Erosion Control Plan) and attach to BLUEPRINTS and SITE PLAN prior to any earth disturbance. These documents must be kept on site and be available for review as requested by any agent of the NYSDEC. **This 2-sided form can be used as a basic stormwater pollution prevention plan, but will not exempt a landowner from filing a Notice of Intent.**

"I certify under penalty of law that I understand and agree to comply with the terms and conditions of the ESC plan for the construction site identified in such ESC plan as a condition of authorization to discharge stormwater. I also understand that the operator must comply with the terms and conditions of the New York State Pollutant Discharge Elimination System ("SPDES") general permit for stormwater discharges from construction activities and that it is unlawful for any person to cause or contribute to a violation of water quality standards."

_____

Builder/Contractor (print) Signature

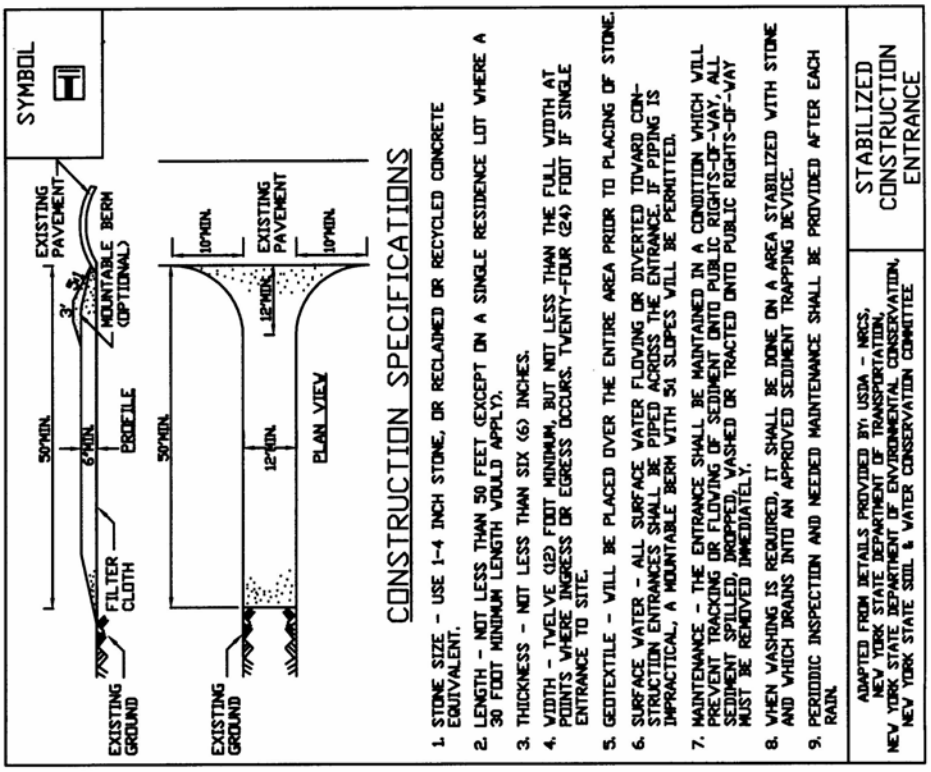
_____

Address

_____

Telephone Fax E-mail

Figure E.5
Construction Details for Stabilized Construction Entrance and Silt Fence



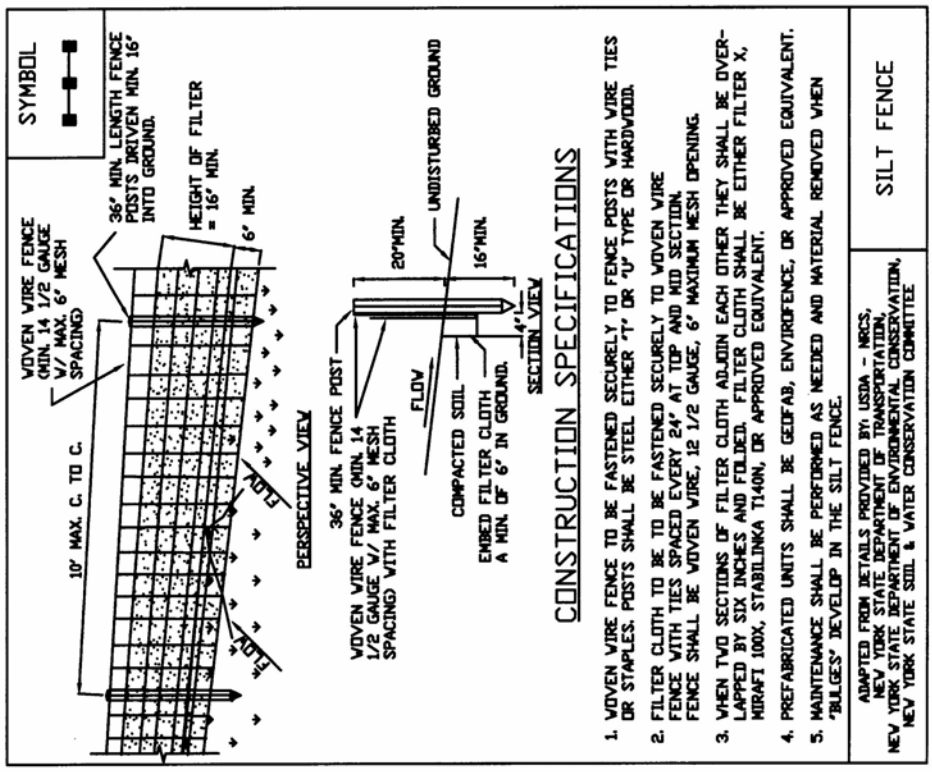
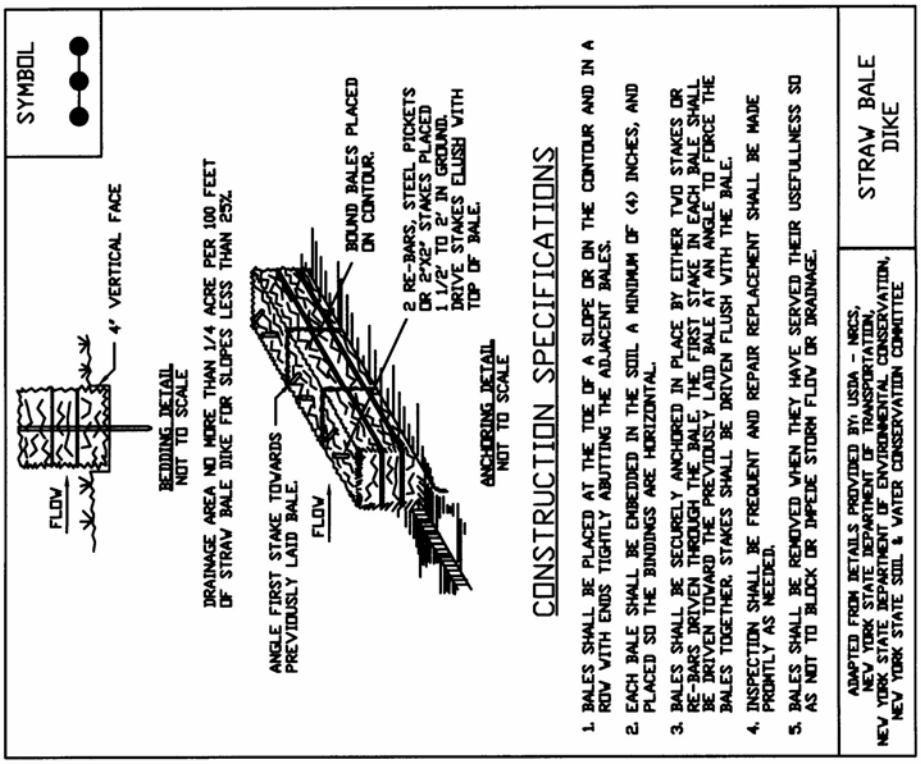
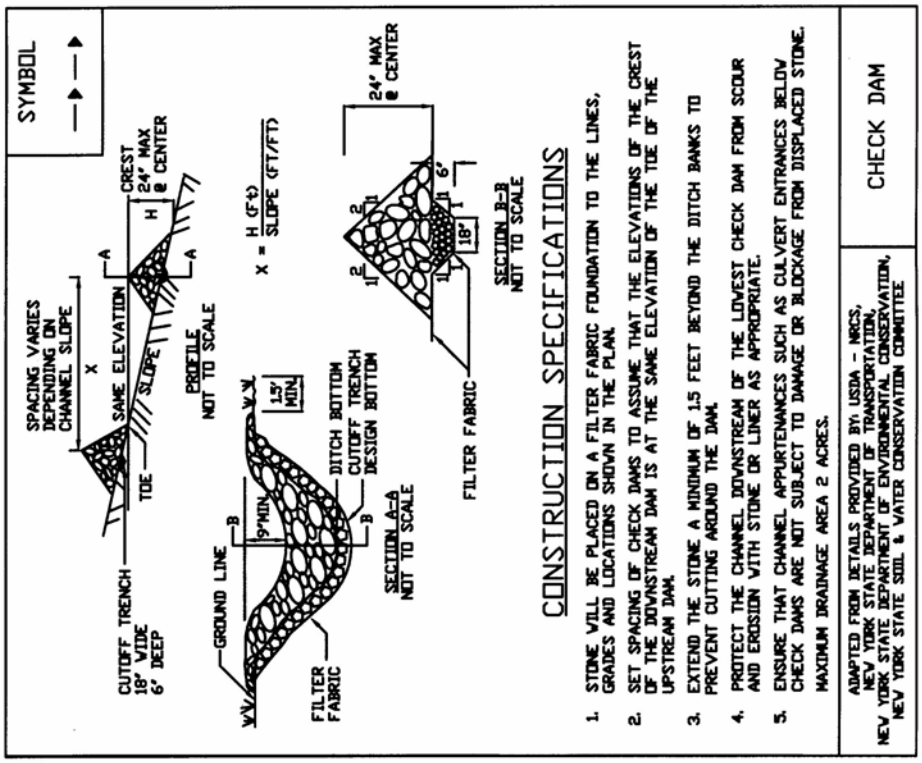


Figure E.6
Construction Details for Straw Bale Dike and Check Dam





APPENDIX F
SAMPLE EROSION AND SEDIMENT CONTROL PLAN

CONTENTS

	Page
Introduction……..…….…….	F.1
Narrative……..……	F.2
Planned Erosion and Sedimentation Control Practices……..	F.3
Construction Schedule……...…….	F.5
Maintenance Plan…….……	F.6
Vicinity Map……..…….	F.6
Site Topographic Map—Exhibit 1…...……..	F.7
Site Development Map—Exhibit 2……...…….	F.8
Site Erosion and Sediment Control Plan—Exhibit 3…….	F.9
Drawings and Specifications……...……	F.10
Vegetative Plan…….……..…….	F.31

This appendix is adapted from the North Carolina Erosion and Sediment Control Planning and Design Manual, North Carolina Sedimentation Control Commission by Donald W. Lake Jr., P.E., CPESC, CPSWQ, Engineering Specialist, New York State Soil &Water Conservation Committee

EXAMPLE EROSION AND SEDIMENT CONTROL PLAN

Introduction

What follows is an example erosion and sedimentation control plan based on one from the files of the State of North Carolina. The site is located in the Piedmont region. The plan was modified to demonstrate the application of a variety of erosion and sedimentation control practices.

This example plan was developed in detail for instructive purposes. The specific number of maps, practices, drawings, specifications, and calculations required depends on the size and complexity of the development. The vegetative treatment is from a sample North Carolina plan and no attempt was made to modify the treatment for New York conditions. The designer should select the most practical and effective practices to control erosion and prevent sediment from leaving the site. The plan should be organized and presented in a clear, concise manner. Sufficient design and background information should be included to facilitate review by erosion control personnel. Construction details should be precise and clear for use by an experienced general contractor.

An acceptable erosion and sedimentation control plan must, at a minimum, contain:

1. brief narrative
2. construction schedule
3. maintenance plan
4. vicinity map
5. site topographic map including soil survey information
6. site development plan
7. erosion and sedimentation control plan drawing[1]
8. detail drawings and specifications
9. vegetative plan

Although this example is from North Carolina, its organization, analysis, and detail are appropriate in all locations. The original content of the example was retained for continuity. Regarding practices selected, refer to the flow charts in Section 2 to correlate with the control groups. In the example, the temporary diversion equates to New York's earth dike. Supporting calculations for these practices are not included to maintain the size of this publication. However, the criteria in each of the practice standards in the appropriate sections, will guide the user in their design.

[1] On large projects, the designer should show the erosion and sediment control plan on separate sheets, reflecting the actual topography at the time the phase starts, and show only existing and final grades for that phase under construction.

Narrative

Project Description

The purpose of the project is to construct two large commercial buildings with associated paved roads and parking area. Another building will be added in the future. Approximately 6 acres will be disturbed during this construction period. The site is 11.1 acres located in Granville County, 2 miles north of Deal, NC, off Terri Road (see Vicinity Map).

Site Description

The site has rolling topography with slopes generally 4 to 6%. Slopes steepen to 10 to 20% in the northwest portion of the property where a small, healed-over gully serves as the principal drainageway for the site. The site is now covered with volunteer heavy, woody vegetation, predominately pines, 15 to 20 ft. high. There is no evidence of significant erosion under present site conditions. The old drainage gully indicates severe erosion potential and receives flow from 5 acres of woods off-site. There is one large oak tree, located in the western central portion of the property, and a buffer area, fronting Terri Road, that will be protected during construction.

Adjacent Property

Land use in the vicinity is commercial/industrial. The land immediately to the west and south has been developed for industrial use. Areas to the north and east are undeveloped and heavily wooded, primarily in volunteer pine. Hocutt Creek, the off-site outlet for runoff discharge, is presently a well stabilized, gently flowing perennial stream. Sediment control measures will be taken to prevent damage to Hocutt Creek. Approximately 5 acres of wooded area to the east contribute runoff into the construction area.

Soils

The soil in the project area is mapped as Creedmoor sandy loam in B and C slope classes. Creedmoor soils are considered moderately well to somewhat poorly drained with permeability rates greater than 6 inches/hour at the surface, but less than 0.1 inches/hour in the subsoil. The subsurface is pale brownstone loam, 6 inches thick. The subsoil consists of a pale brown and brownish yellow sandy clay loam ranging from light gray clay, 36 inches thick. Below 36 inches is a layer of fine sandy loam to 77 inches. The soil erodibility factor (K value) ranges from 0.20 at the surface to 0.37 in the subsoil.

Due to the soil permeability of the subsoil that will be exposed during grading, a surface wetness problem with high runoff is anticipated following significant rainfall events. No groundwater problem is expected. The tight clay in the subsoil will make vegetation difficult to establish. A small amount of topsoil exists on-site and will be stockpiled for use in landscaping.

Planned Erosion and Sedimentation Control Practices

1. **Sediment Basin**: A sediment basin will be constructed in the northwest corner of the property. All water from disturbed areas, about 6 acres, will be directed to the basin before leaving the site (Note: The undisturbed areas to the east and north could have been diverted, but this was not proposed because it would have required clearing to the property line to build the diversion and the required outlet structure). See pages F.10-F.12 for details.

2. **Temporary Gravel Construction Entrance/Exit**: A temporary gravel construction entrance will be installed near the northwest corner of the property. During wet weather it may be necessary to wash vehicle tires at this location. The entrance will be graded so that runoff water will be directed to an inlet protection structure and away from the steep fill area to the north. See page F.12 for specifications.

3. **Temporary Block and Gravel Drop Inlet Protection**: A temporary block and gravel drop inlet protection will be installed at the drop inlet located on the south side of the construction entrance. Runoff from the device will be directed into the sediment basin (Note: The presence of this device reduces the sediment load on the sediment basin and provides sediment protection for the pipe. In addition, sediment removal at this point is more convenient than from the basin). See page F.13 for specifications.

4. **Temporary Diversion**: Temporary diversions will be constructed above the 3:1 cut slopes south of Buildings A and B to prevent surface runoff from eroding these banks (Note: Sediment-free water may be diverted away from the project sediment basin). A temporary diversion will be constructed near the middle of the disturbed area to break up this long, potentially erosive slope, should the grading operation be temporarily discontinued. A temporary diversion dike will be constructed along the top edge of the fill slope at the end of each day during the filling operation to protect the fill slope. This temporary diversion will outlet to the existing undisturbed channel near the north edge of the construction site and/or to the temporary inlet protection device at the construction entrance as the fill elevation increases. See page F.14 for specifications.

5. **Level Spreader**: A level spreader will serve as the outlet for the diversion east of Building A and south of Building B. The area below the spreader is relatively smooth and heavily vegetated with a slope of approximately 4%. See page F.15 for specifications.

6. **Tree Preservation and Protection**: A minimum 2.0 ft. high protective fence will be erected around a large oak tree at the dripline to prevent damage during construction. Sediment fence materials may be used for this purpose. See page F.16 for specifications.

7. **Land Grading**: Heavy grading will be required on approximately 6 acres. The flatter slope after grading will reduce the overall erosion potential of the site. The buildings will be located on the higher cut areas, and the access road and open landscaped areas will be located on fill areas. See pages F.16–F.17 for specifications.

All cut slopes will be 3:1 or flatter to avoid instability due to wetness, provide fill material, give an open area around the buildings, and allow vegetated slopes to be mowed. Cut slopes will be fine graded immediately after rough grading; the surface will be disked and vegetated according to the Vegetation Plan (pages F.29–F.31).

Fill slopes will be 2:1 with fill depths as much as 12 to 15 ft. Fill will be placed in layers not to exceed 9 inches in depth and compacted (Note: Fills of this depth should have detailed compaction specifications in the general construction contract. These specifications are not part of the erosion and sedimentation control plan).

The fill slope in the north portion of the property is the most vulnerable area to erosion on the site. Temporary diversions will be maintained at the top of this fill slope at all times, and the filling operation will be graded to prevent overflow to the north. Filling will be done as a continuous operation until final grade is reached. The paved road located on the fill will be sloped to the south and will function as a permanent diversion. The area adjacent to the roads and parking area will be graded to conduct runoff to the road culverts. Runoff water from the buildings will be guttered to the vegetated channels. The finished slope face to the north will not be back-bladed. The top 2 to 6 inches will be left in a loose and roughened condition. Plantings will be protected with mulch, as specified in the Vegetation Plan.

A minimum 15-ft undisturbed buffer zone will be maintained around the perimeter of the disturbed area (Note: This will reduce water and wind erosion, help contain sediment, reduce dust, and reduce final landscaping costs).

8. **Temporary Sediment Trap**: A small sediment trap will be constructed at the intersection of the existing road ditch and channel number 3 to protect the road ditch. Approximately 2 acres of disturbed area will drain into this trap. See pages F.18–F.19 for specifications.

9. **Sediment Fence**: A sediment fence will be constructed around the topsoil stockpile and along the channel berm adjacent to the deep cut area as necessary to prevent sediment from entering the channels. See pages F.19–F.20 for specifications.

10. **Grass-Lined Channel**: Grass-lined channels with temporary straw-net liners will be constructed around Buildings A and B to collect and convey site water to the project's sediment basin. See pages F.21–F.23 for specifications.

11. **Riprap-Lined and Paved Channels**: A riprap channel will be constructed in the old gully along the north side of the property starting in the northwest corner after all other construction is complete. This channel will replace the old gully as the principal outlet from the site. See pages F.24–F.25 for specifications.

12. **Construction Road Stabilization**: As soon as final grade is reached on the entrance road, the subgrade will be sloped to drain to the south and stabilized with a 6-inch course of NC DOT standard ABC stone. The parking area and its entrance road will also be stabilized with ABC stone to prevent erosion and dust during the construction of the buildings prior to paving. See pages F.25–F.26 for specifications.

13. **Outlet Stabilization Structure**: A riprap apron will be located at the outlet of the three culverts to prevent scour. See pages F.26–F.27 for specifications.

14. **Surface Roughening**: The 3:1 cut slopes will be lightly roughened by disking just prior to vegetating, and the surface 4 to 6 inches of the 2:1 fill slopes will be left in a loose condition and grooved on the contour. See page F.28 for specifications.

15. **Surface Stabilization**: Stabilization of the surface will be accomplished with vegetation and mulch as specified in the vegetation plan. One large oak tree, southwest of Building A, and a buffer area between the parking lot and Terri Road, will be preserved. Roadway and parking lot base courses will be installed as soon as finished grade is reached.

16. **Dust Control**: Dust control is not expected to be a problem due to the small area of exposure, the undisturbed perimeter of trees around the site, and the relatively short time of exposure (not to exceed 9 months). Should excessive dust be generated, it will be controlled by sprinkling.

Construction Schedule

1. Obtain plan approval and other applicable permits.

2. Flag the work limits and mark the oak tree and buffer area for protection.

3. Hold pre-construction conference at least one week prior to starting construction.

4. Install sediment basin as the first construction activity.

5. Install storm drain with block and gravel inlet protection at construction entrance/exit.

6. Install temporary gravel construction entrance/exit.

7. Construct temporary diversions above proposed building sites. Install level spreader and sediment trap and vegetate disturbed areas.

8. Complete site clearing except for the old gully channel in the northwest portion of the site. This area will be cleared during the last construction phase for the installation of the riprap liner.

9. Clear waste disposal area in the northeast corner of property, only as needed.

10. Rough grade site, stockpile topsoil, construct channels, install culverts and outlet protection, and install sediment fence as needed. Maintain diversions along top of fill slope daily. NOTE: A temporary diversion will be constructed across the middle of the graded area to reduce slope length and the bare areas mulched should grading be discontinued for more than 3 weeks.

11. Finish the slopes around buildings as soon as rough grading is complete. Leave the surface slightly roughened and vegetate and mulch immediately.

12. Complete final grading for roads and parking and stabilize with gravel.

13. Complete final grading for buildings.

14. Complete final grading of grounds, topsoil critical areas, and permanently vegetate, landscape, and mulch.

15. Install riprap outlet channel and extend riprap to the pipe outlet under the entrance road.

16. All erosion and sediment control practices will be inspected weekly and after rainfall events. Needed repairs will be made immediately.

17. After the site is stabilized, remove all temporary measures and install permanent vegetation on the disturbed areas.

18. Estimated time before final stabilization—9 months.

Maintenance Plan

1. All erosion and sediment control practices will be checked for stability and operation following every runoff-producing rainfall but in no case less than once every week. Any needed repairs will be made immediately to maintain all practices as designed and installed for their appropriate phase of the project.

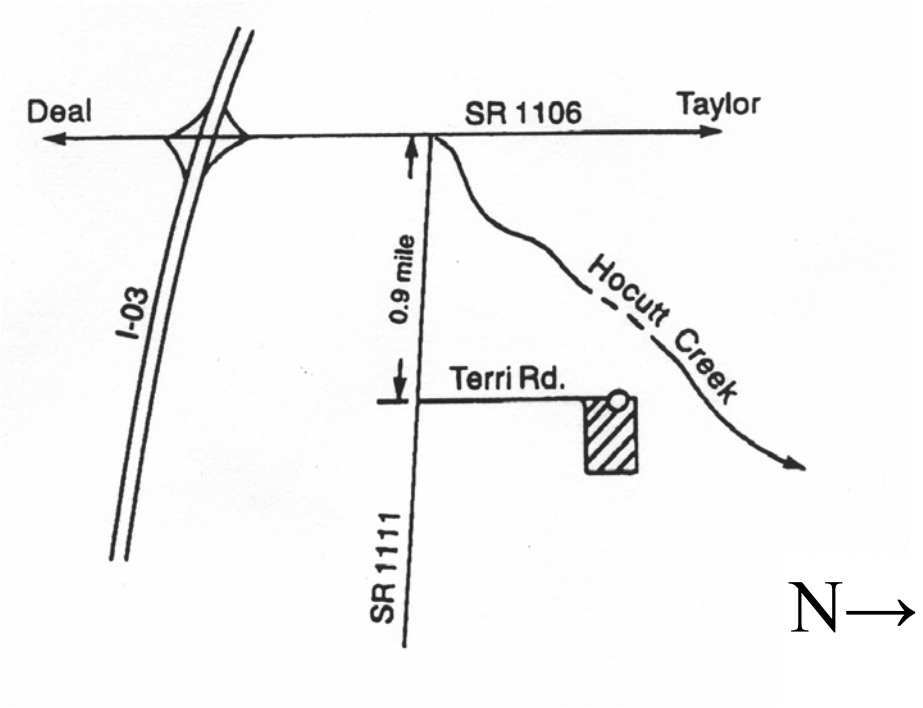
2. The sediment basin will be cleaned out when the level of sediment reaches 2.0 ft below the top of the riser. Gravel will be cleaned or replaced when the sediment pool no longer drains properly.

3. Sediment will be removed from the sediment trap and block and gravel inlet protection device when storage capacity has been approximately 50% filled. Gravel will be cleaned or replaced when the sediment pool no longer drains properly.

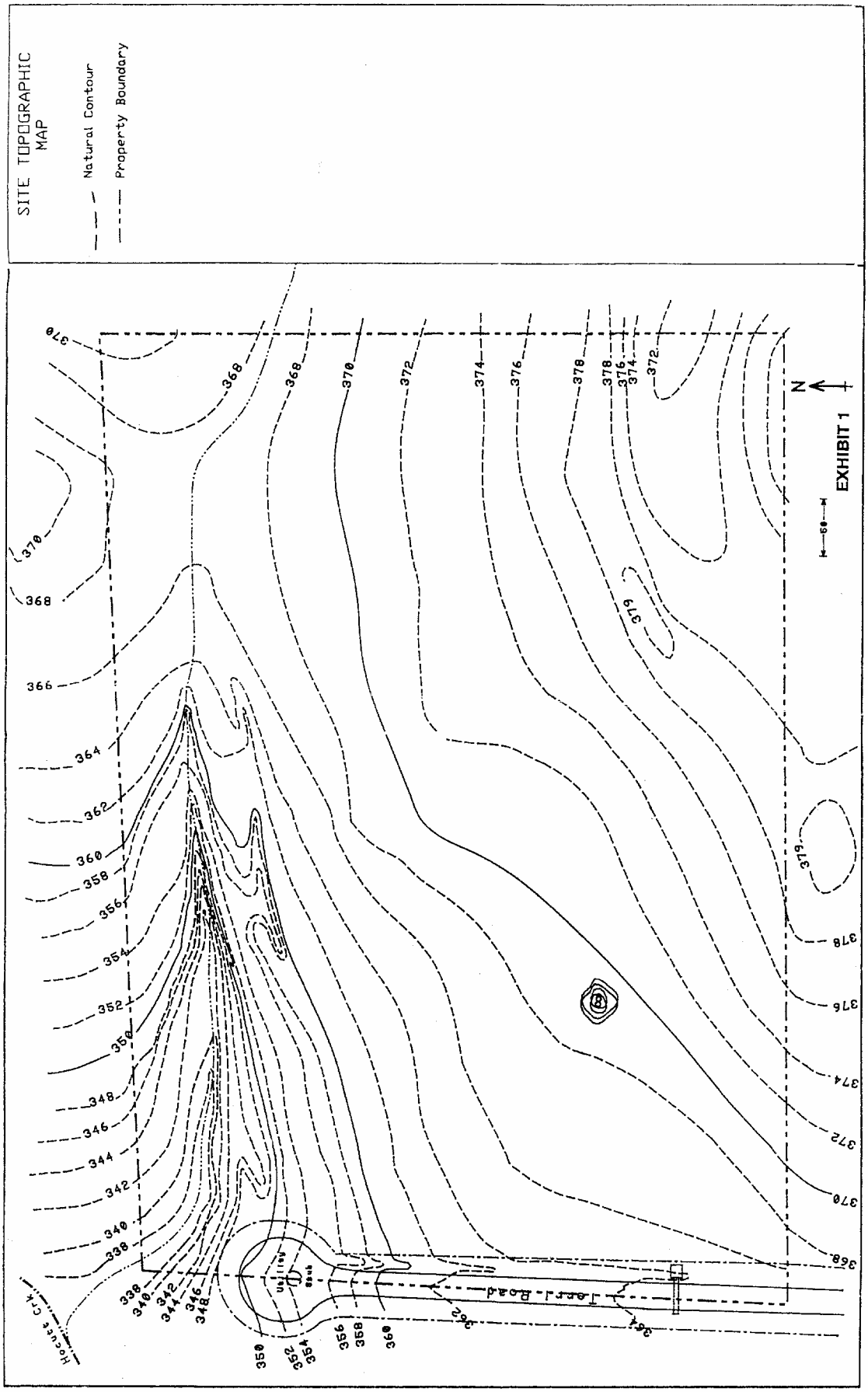
4. Sediment will be removed from behind the sediment fence when it becomes about 0.5 ft deep at the fence. The sediment fence will be repaired as necessary to maintain a barrier.

5. All seeded areas will be fertilized, reseeded as necessary, and mulched according to specifications in the vegetative plan to maintain a vigorous, dense vegetative cover.

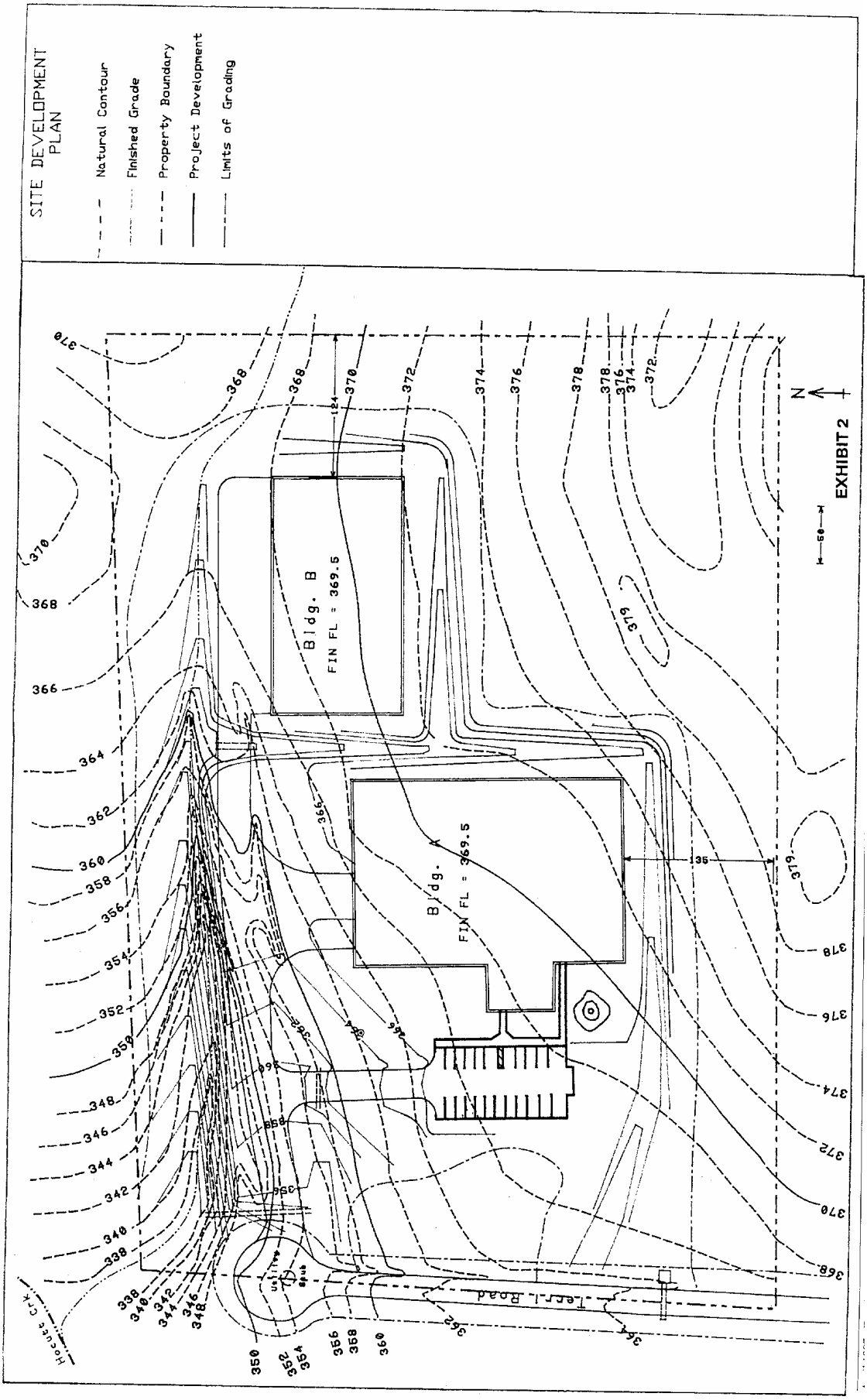
Vicinity Map



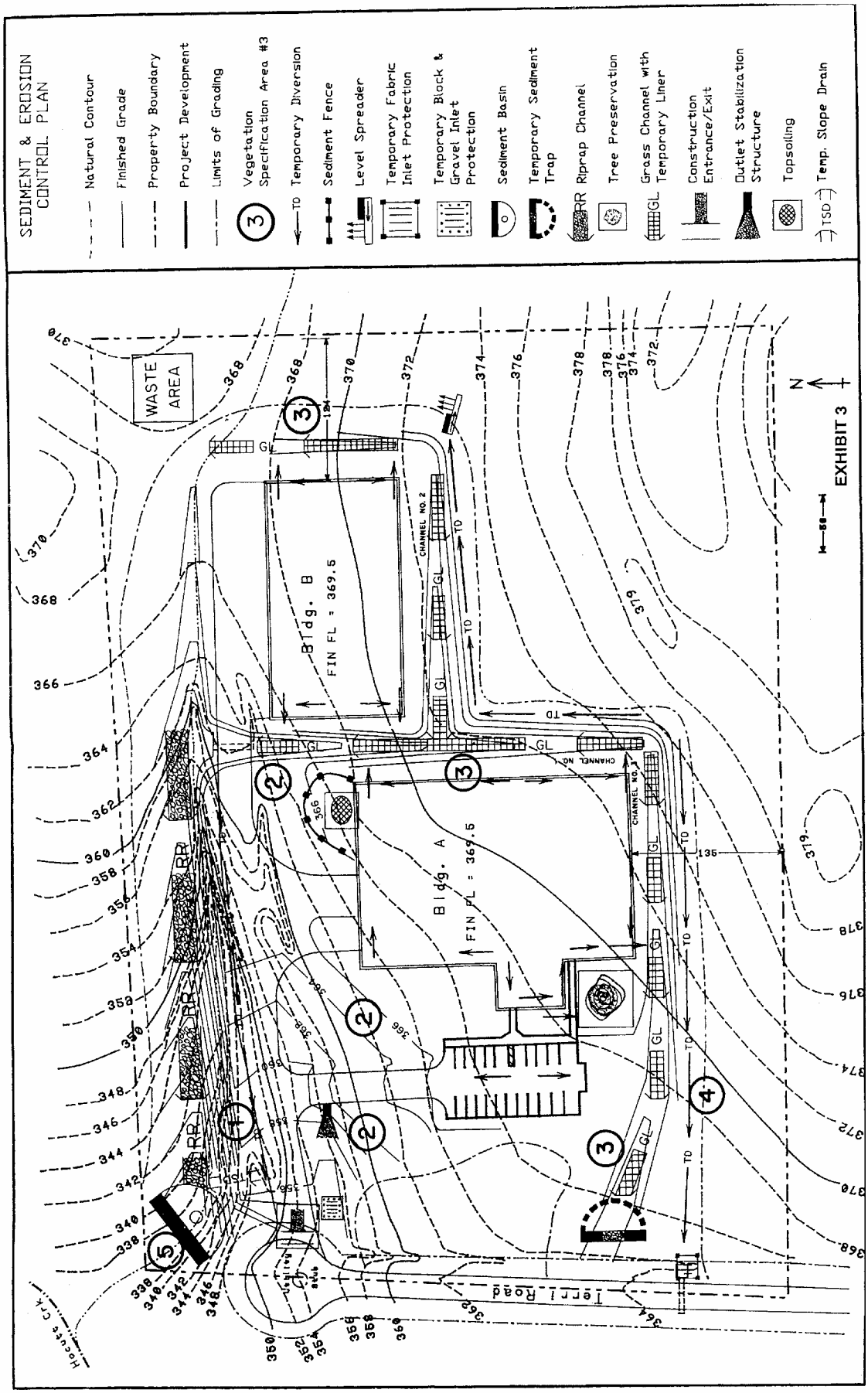
Site Topographic Map—Exhibit 1



Site Development Map—Exhibit 2

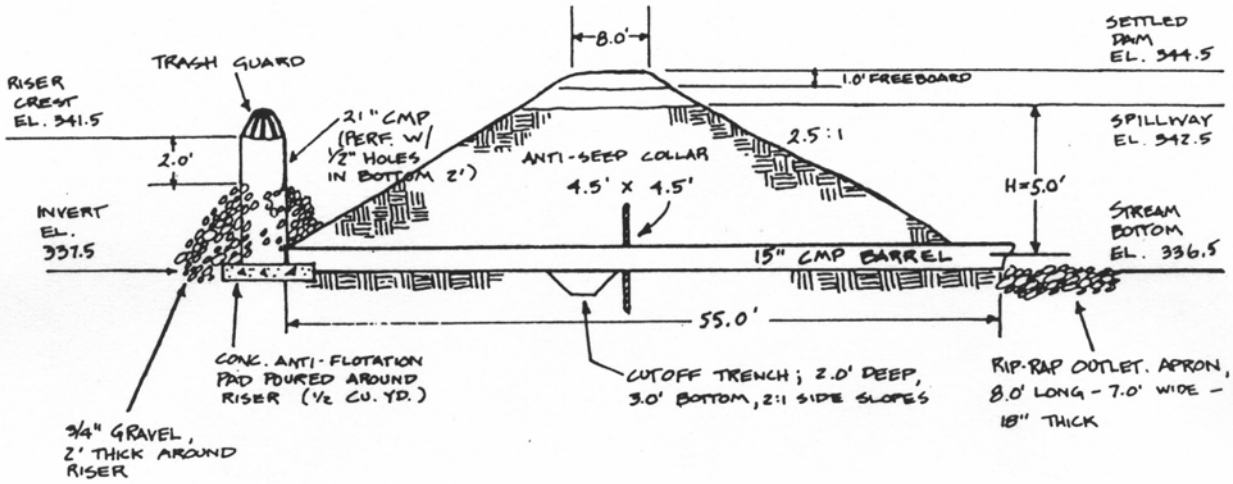


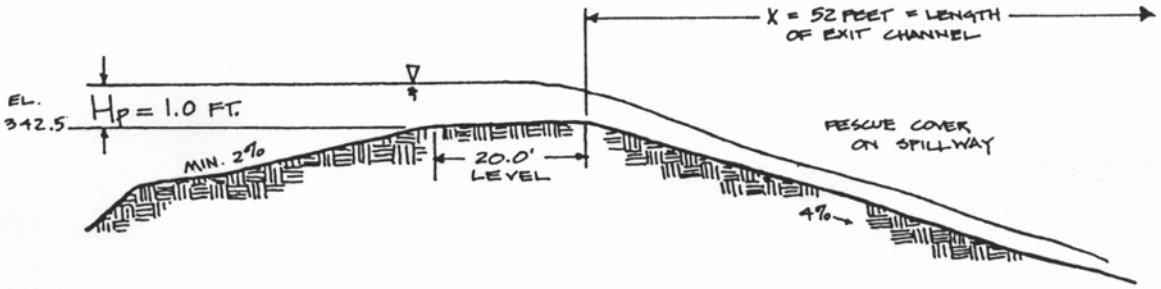
Site Erosion and Sediment Control Plan—Exhibit 3



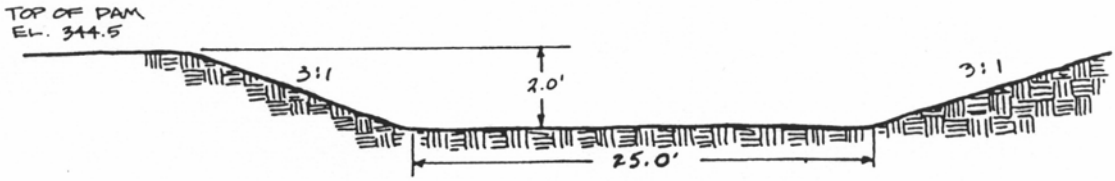
DETAIL DRAWINGS AND SPECIFICATIONS

1. SEDIMENT BASIN





SPILLWAY PROFILE



SPILLWAY : CROSS SECTION AT CONTROL SECTION

(1.) CONSTRUCTION SPECIFICATIONS:

1. CLEAR AND GRUB FOUNDATION FOR EMBANKMENT AND EXCAVATE THE AREA FOR THE RIPRAP OUTLET PAD. AREA TO BE 8.0' LONG, 7.0' WIDE AND 15' DEEP. (NOTE: THIS EXCAVATION WILL SERVE AS A SEDIMENT TRAP WHILE STRUCTURE IS BEING BUILT.)

2. EXCAVATE CUTOFF TRENCH ALONG EMBANKMENT CENTERLINE AND UP ABUTMENTS TO ELEVATION 544.0 AS SHOWN. KEEP TRENCH DRY WHEN BACKFILLING AND COMPACTING.

3. USE SEDIMENT POOL AREA AS SOURCE OF FILL MATERIAL FOR THE DAM. MATERIAL SHOULD BE CLEAN MINERAL SOIL, FREE OF ROOTS, WOODY MATERIAL, ROCKS OR OTHER OBJECTIONABLE MATERIAL. SCARIFY FOUNDATION AND PLACE FILL IN LAYERS NOT TO EXCEED 8" OVER THE ENTIRE LENGTH OF DAM. COMPACT BY HEAVY WHEEL EQUIPM NT. THE ENTIRE SURFACE OF EACH LAYER MUST BE TRAVERSED BY AT LEAST ONE WHEEL OF THE COMPACTION EQUIPMENT. THE FILL MATERIAL MUST BE MOIST BUT NOT SO WET THAT WATER CAN BE SQUEEZED FROM IT.

4. PERFORATE 24" CMP RISER WITH ½" HOLES SPACED 3" APART IN EACH OUTSIDE VALLEY TO WITHIN 2.0' OF THE TOP. SECURE TRASH RACK TO RISER TOP. MAXIMUM OPENING BETWEEN BARS OF RACK NOT TO EXCEED 3".

5. SECURELY ATTACH THE RISER TO THE BARREL AND ALL OTHER PIPE JOINTS WITH ROD AND LUG CONNECTOR BANDS WITH RUBBER GASKETS TO ASSURE WATER TIGHTNESS. PLACE THE BARREL AND RISER ON A SMOOTH, FIRM FOUNDATION. PLACE FILL AROUND THE PIPE IN 4" LAYERS AND HAND COMPACT. TAKE CARE NOT TO RAISE THE PIPE FROM FIRM CONTACT WITH ITS FOUNDATION WHEN COMPACTING UNDER PIPE HAUNCHES.

6. SECURE ONE STANDARD CORRUGATED METAL ANTI-SEEP COLLAR AROUND BARREL. MAKE SURE CONNECTION IS WATERTIGHT. HAND COMPACT AROUND ANTI-SEEP COLLAR.

7. PLACE A MINIMUM OF 2 FT. OF HAND COMPACTED BACKFILL OVER PIPE BEFORE CROSSING IT WITH CONSTRUCTION EQUIPMENT.

8. ANCHOR RISER IN PLACE WITH ½ YD^3 CONCRETE PAD POURED AROUND RISER.

9. PLACE 3/4" GRAVEL (D.O.T. #5 WASHED STONE) OVER THE PERFORATED HOLES APPROXIMATELY 2" THICK.

10. INSTALL EMERGENCY SPILLWAY IN UNDISTURBED SOIL TO THE LINES AND GRADES SHOWN IN DRAWINGS.

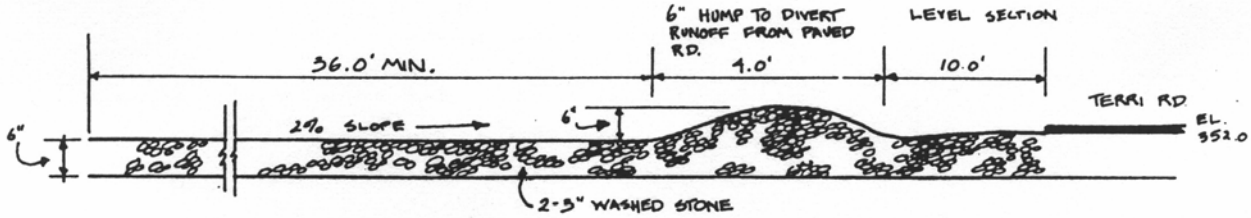
11. PLACE CLASS A EROSION CONTROL STONE OVER FILTER FABRIC ON LEVEL GRADE FOR RIPRAP APRON AT PIPE OUTLET. TOP OF RIPRAP TO BE SAME ELEVATION AS OUTLET CHANNEL BOTTOM. NO OVERFALL.

12. CLEAR SEDIMENT POOL AREA TO ELEVATION 341.5 AFTER THE EMBANKMENT IS COMPLETE.

13. VEGETATE ALL DISTURBED AREAS (EXCEPT THE SEDIMENT POOL) IN ACCORDANCE WITH THE VEGETATIVE PLAN.

14. SEDIMENT TO BE REMOVED FROM BASIN WHEN THE LEVEL IS WITHIN 2.0' OF THE TOP OF THE RISER. (SAME LEVEL AS TOP OF GRAVEL.)

2. TEMPORARY GRAVEL CONSTRUCTION ENTRANCE



GRAVEL ENTRANCE / EXIT : WIDTH — 15.0', FLARED TO 25.0' AT ROAD
LENGTH — 50.0'
GRADE — 2.0%

(2.) CONSTRUCTION SPECIFICATIONS

1. CLEAR THE ENTRANCE / EXIT AREA OF ALL VEGETATION, ROOTS, AND OTHER OBJECTIONABLE MATERIAL.

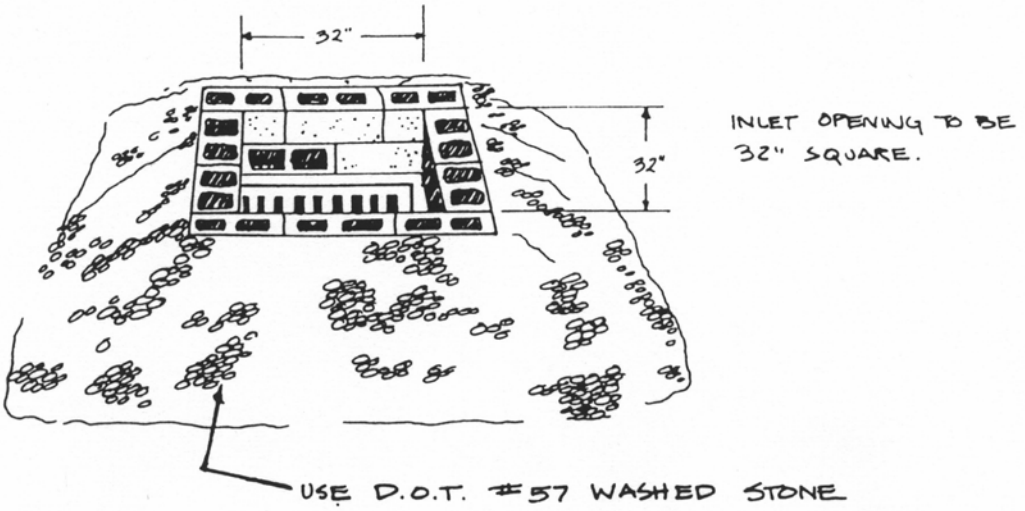
2. GRADE THE ROAD FOUNDATION SO THAT THE ENTRANCE / EXIT WILL HAVE A CROSS SLOPE TO THE SOUTH AND ALL RUNOFF WILL DRAIN TO THE BLOCK AND GRAVEL DROP INLET PROTECTION STRUCTURE.

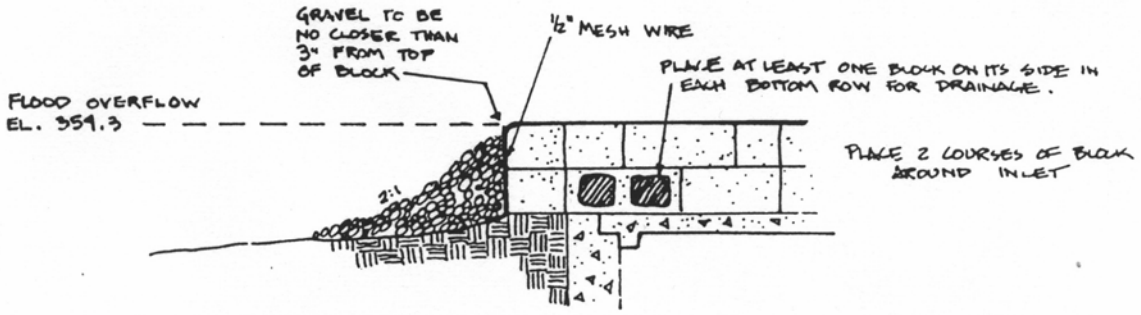
3. PLACE STONE TO THE DIMENSIONS, GRADE AND ELEVATION SHOWN.

4. USE WASHED STONE 2" TO 3" IN SIZE.

NOTE: MAINTAIN THE GRAVEL PAD IN A CONDITION TO PREVENT MUD OR SEDIMENT FROM LEAVING THE SITE. SHOULD MUD BE TRACKED OR WASHED ONTO TERRI ROAD, IT MUST BE REMOVED IMMEDIATELY.

3. TEMPORARY BLOCK AND GRAVEL DROP INLET PROTECTION





(3.) CONSTRUCTION SPECIFICATIONS

1. LAY CONCRETE BLOCKS ON FIRM, SMOOTH FOUNDATION EXCAVATED 3" BELOW STORM DRAIN TOP. PLACE BLOCKS AGAINST DRAIN INLET FOR LATERAL SUPPORT.

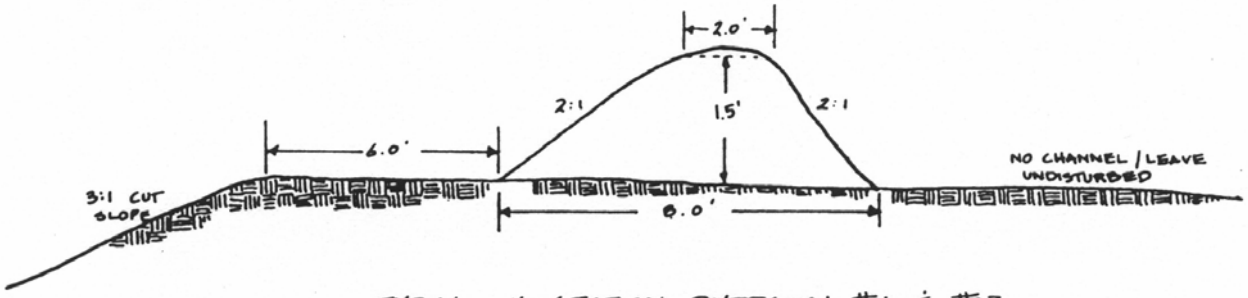
2. PLACE AT LEAST ONE CONCRETE BLOCK ON ITS SIDE IN EACH BOTTOM ROW OF BLOCKS.

3. PLACE WIRE MESH WITH 1/2" OPENINGS OVER ALL BLOCK OPENINGS USED FOR DRAINAGE.

4. USE D.O.T. #57 WASHED STONE TO REDUCE FLOW RATE BUT ALLOW DRAINAGE. PLACE STONE ON 2:1 SLOPE TO WITHIN 3" OF TOP OF BLOCK.

5. ANY SOIL LEFT EXPOSED BETWEEN THE BLOCK AND CONCRETE DRAIN INLET SHOULD BE FILLED WITH 3" DIAMETER STONE TO PREVENT WASHING WHEN WATER FLOWS OVER BLOCKS INTO DRAIN.

4. TEMPORARY DIVERSIONS



TYPICAL X-SECTION DIVERSION #1 & #2

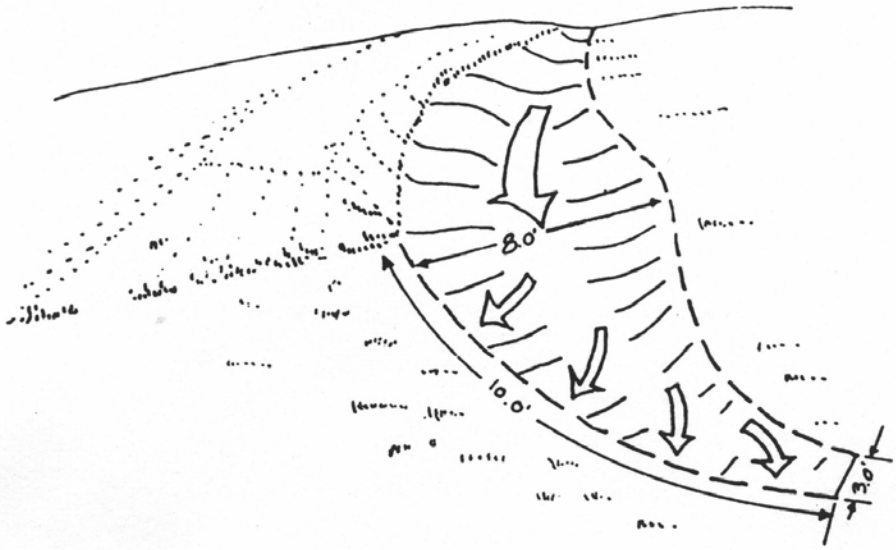
DIVERSION #1 — GRADE = 2%
LENGTH = 450'

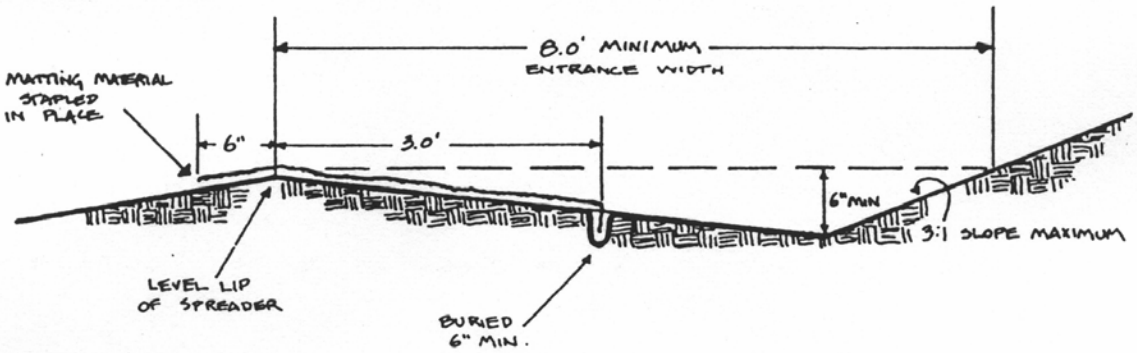
DIVERSION #2 — GRADE = 0.5%
LENGTH = 400'

(4.) CONSTRUCTION SPECIFICATIONS

1. REMOVE ALL TREES, BRUSH & STUMPS FROM DIVERSION FOUNDATION.
2. CONSTRUCT RIDGE TO FULL DIMENSIONS SHOWN — ALLOW 10% FOR SETTLING.
3. COMPACT RIDGE BY WHEELS OF CONSTRUCTION EQUIPMENT.
4. ENSURE THAT THE TOP OF THE DIVERSION IS ON DESIGN GRADE OR HIGHER AT ALL POINTS.
5. SEED AND MULCH IMMEDIATELY AFTER CONSTRUCTION. SEE VEGETATIVE PLAN.

5. LEVEL SPREADER





CROSS SECTION

(5.) CONSTRUCTION SPECIFICATIONS

1. FIBERGLASS MATTING, 4.0 FT. WIDE, SHOULD EXTEND 6" OVER THE LEVEL LIP AND BE BURIED 6" DEEP AT THE LOWER EDGE.

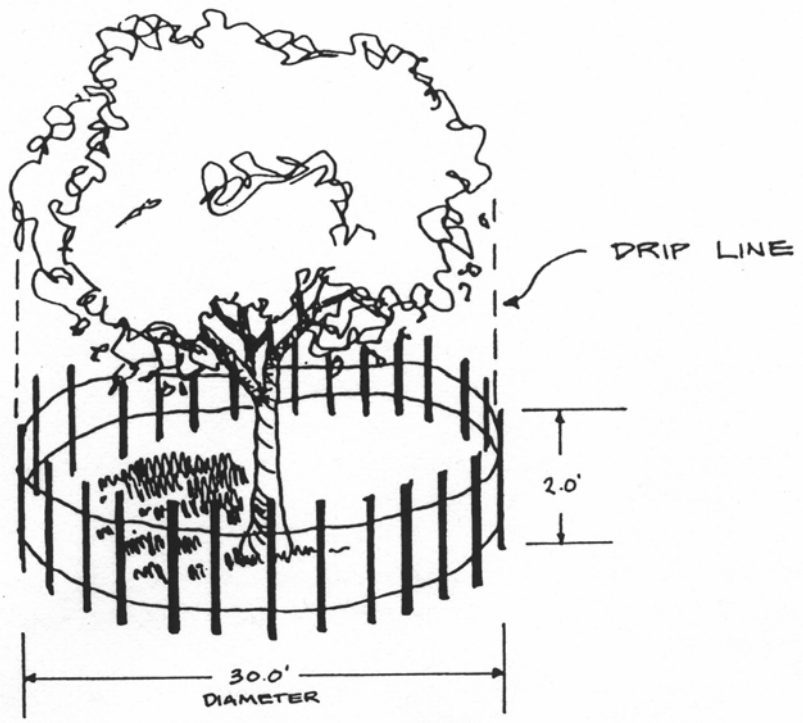
2. ENSURE THAT THE SPREADER LIP IS LEVEL THROUGHOUT ITS LENGTH.

3. CONSTRUCT THE LEVEL SPREADER ON UNDISTURBED SOIL (NOT ON FILL.)

4. CONSTRUCT A TRANSITION SECTION FROM THE DIVERSION TO BLEND SMOOTHLY TO THE WIDTH AND DEPTH OF THE SPREADER.

5. IMMEDIATELY AFTER CONSTRUCTION, APPROPRIATELY SEED AND MULCH THE ENTIRE DISTURBED AREA OF THE SPREADER. SEE VEGETATIVE PLAN.

6. TREE PRESERVATION & PROTECTION



NOTE: SEDIMENT FENCE MATERIAL MAY BE USED TO BUILD FENCE.

- DRIVE STAKES FIRMLY INTO GROUND – AT LEAST 12"

7. LAND GRADING

1. FINISHED LAND SURFACES WILL BE GRADED AS SHOWN ON SITE DEVELOPMENT PLAN.

2. CUT SLOPES WILL BE 3:1 OR FLATTER FOR MAINTENANCE BY MOWING AND ROUGHENED FOR VEGETATIVE ESTABLISHMENT.

3. THE HIGH FILL SLOPE ON THE NORTH WILL NOT BE STEEPER THAN 2:1 AND ROUGHENED BY GROOVING ACROSS THE SLOPE.

4. TOPSOIL WILL BE REMOVED FROM AREAS TO BE GRADED AND FILLED AND IT WILL BE STOCKPILED IN LOCATIONS SHOWN.

5. AREAS TO BE FILLED WILL BE CLEARED AND GRUBBED.

6. FILL WILL BE PLACED IN LAYERS NOT TO EXCEED 9" AND COMPACTED AS REQUIRED IN THE SPECIFICATIONS FOR THE DEVELOPMENT PLAN (NOT A PART OF SEDIMENT CONTROL PLAN.)

7. FROZEN MATERIAL OR SOFT, HIGHLY COMPRESSIBLE MATERIAL WILL NOT BE USED AS FILL.

8. FILL WILL NOT BE PLACED ON A FROZEN SURFACE.

9. ROAD AND PARKING SURFACES WILL BE SLOPED AS SHOWN ON SITE DEVELOPMENT PLAN TO CONTROL RUNOFF.

10. LAND ADJOINING PAVED AREAS WILL BE SLOPED NO STEEPER THAN 6:1 AND GRADED TO DRAIN AS SHOWN.

11. SURFACE RUNOFF FROM BUILDINGS WILL BE COLLECTED IN GUTTERS AND PIPED TO CHANNELS 1, 2, 3 AND 4.

12. DIVERSIONS WILL BE INSTALLED ABOVE CUT SLOPES PRIOR TO LAND CLEARING AND GRADING.

13. A DIVERSION WILL BE MAINTAINED AT ALL TIMES ABOVE THE FILL SLOPE TO PREVENT OVERFLOW ON THIS STEEP AREA.

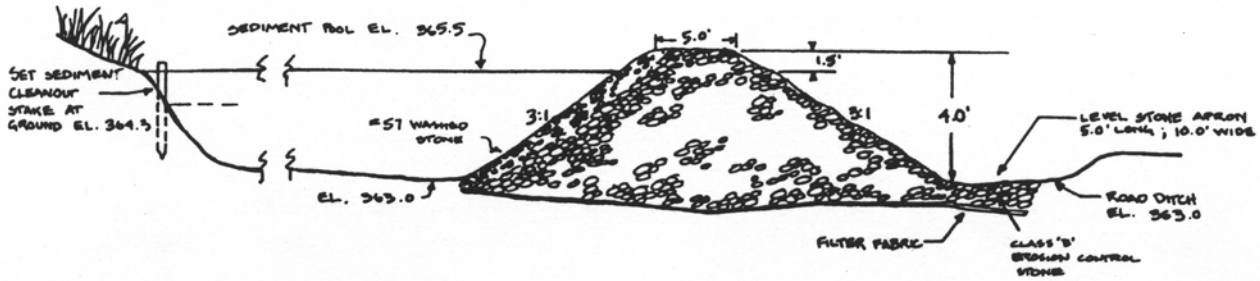
14. CUTTING AND FILLING WILL BE DONE AS A CONTINUOUS OPERATION UNTIL FINAL GRADE IS REACHED. SHOULD GRADING BE TEMPORARILY DISCONTINUED, A TEMPORARY DIVERSION WILL BE CONSTRUCTED ACROSS THE MIDDLE OF THE DISTURBED AREA TO BREAK UP THE LONG SLOPE TO THE NORTH.

15. AS SOON AS FINAL GRADES ARE REACHED THE GRADED AREAS WILL BE STABILIZED IN ACCORDANCE WITH THE VEGETATIVE PLAN.

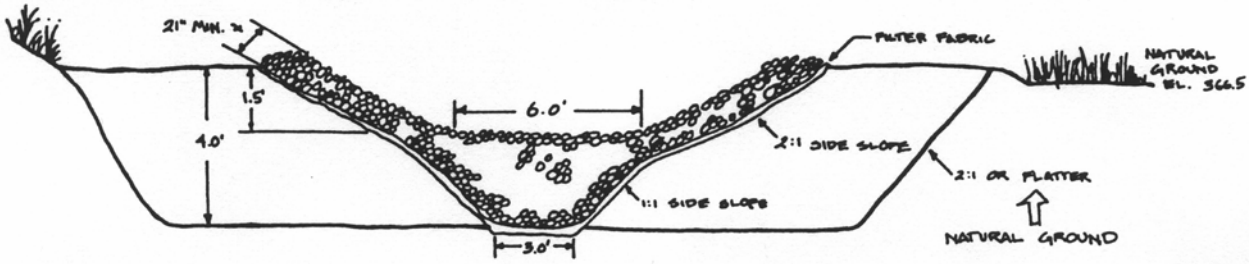
16. AN UNDISTURBED AREA WILL BE LEFT AS A BUFFER AROUND THE ENTIRE GRADED SITE EXCEPT AT ROAD ENTRANCE AND CHANNEL #3 OUTLET.

17. WHEN THE DEVELOPED SITE HAS BEEN PROPERLY STABILIZED, ALL THE TEMPORARY SEDIMENT AND EROSION CONTROL MEASURES WILL BE REMOVED, THE DISTURBED AREA GRADED TO BLEND WITH THE SURROUNDING AREA, AND VEGETATED.

8. TEMPORARY SEDIMENT TRAP



CROSS SECTION



STONE SECTION

(8.) CONSTRUCTION SPECIFICATIONS

1. CLEAR, GRUB AND STRIP THE AREA UNDER THE EMBANKMENT OF ALL VEGETATION AND ROOT MAT.

2. CLEAR POND AREA BELOW ELEVATION 365.5

3. USE FILL MATERIAL FREE OF ROOTS, WOODY VEGETATION AND ORGANIC MATTER. PLACE FILL IN LIFTS NOT TO EXCEED 9" AND MACHINE COMPACT.

4. CONSTRUCT DAM AND STONE SPILLWAY TO DIMENSIONS, SLOPES AND ELEVATIONS SHOWN.

5. ENSURE THAT THE SPILLWAY CREST IS LEVEL AND AT LEAST 1.5' BELOW THE TOP OF THE DAM AT ALL POINTS.

6. STONE USED FOR SPILLWAY SECTION — CLASS "B" EROSION CONTROL STONE.

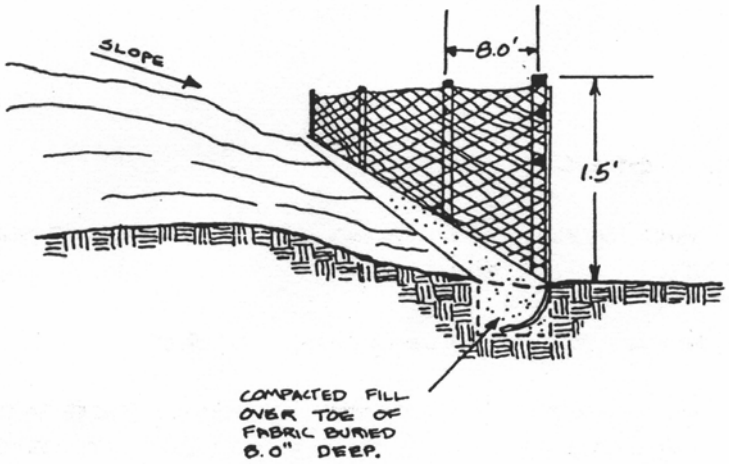
7. STONE USED ON INSIDE SPILLWAY FACE TO CONTROL DRAINAGE — D.O.T. # 57 WASHED STONE.

8. EXTEND STONE OUTLET SECTION TO VEGETATED ROAD DITCH ON ZERO GRADE WITH TOP ELEVATION OF STONE LEVEL WITH BOTTOM OF DRAIN.

9. ENSURE THAT THE TOP OF THE DAM AT ALL POINTS IS 0.5' ABOVE NATURAL SURROUNDING GROUND.

10. STABILIZE THE EMBANKMENT AND ALL DISTURBED AREA ABOVE THE SEDIMENT POOL AS SHOWN IN THE VEGETATION PLAN.

9. SEDIMENT FENCE



(9.) CONSTRUCTION SPECIFICATIONS

1. CONSTRUCT SEDIMENT FENCE ON LOW SIDE OF TOPSOIL STOCKPILE TO PREVENT SEDIMENT FROM BEING WASHED INTO THE DRAINAGE SYSTEM. FENCE TO EXTEND AROUND APPROXIMATELY 70% OF THE PERIMETER OF THE STOCKPILE.

2. LOCATE POSTS DOWNSLOPE OF FABRIC TO HELP SUPPORT FENCING.

3. BURY TOE OF FENCE APPROXIMATELY 8" DEEP TO PREVENT UNDERCUTTING.

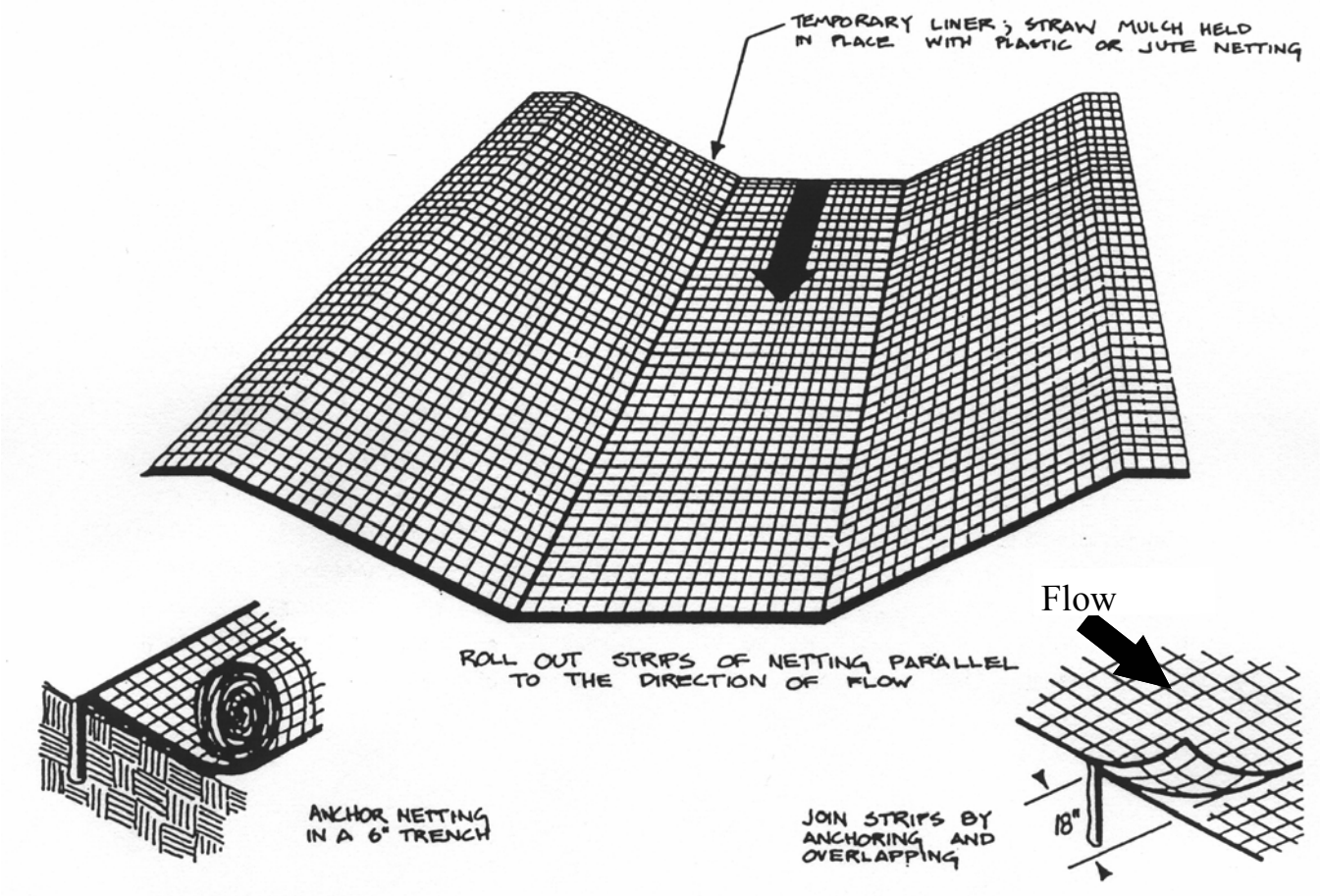
4. WHEN JOINTS ARE NECESSARY, SECURELY FASTEN THE FABRIC AT A SUPPORT POST WITH OVERLAP TO THE NEXT POST.

5. FILTER FABRIC TO BE OF NYLON, POLYESTER, PROPYLENE OR ETHYLENE YARN WITH EXTRA STRENGTH — 50 LB/LIN. IN. (MINIMUM) — AND WITH A FLOW RATE OF AT LEAST 0.3 GAL./FT^2/MINUTE. FABRIC SHOULD CONTAIN ULTRAVIOLET RAY INHIBITORS AND STABILIZERS.

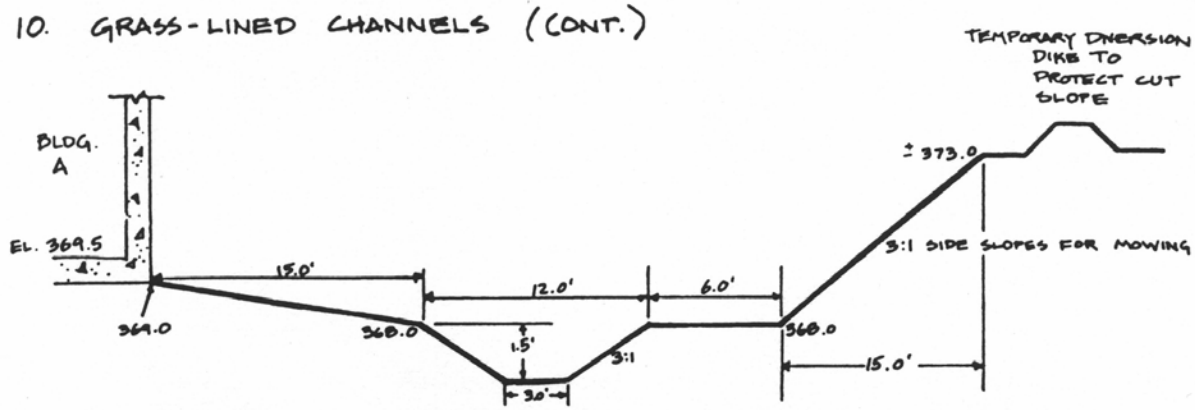
6. POST TO BE 4" DIAMETER PINE WITH A MIMUMUM LENGTH OF 4' FEET.

NOTE: IF HIGH CUT SLOPES ADJOINING CHANNELS 1, 2, AND 3 ARE NOT ADEQUATELY STABILIZED BEFORE CHANNEL IS CONSTRUCTED, A SEDIMENT FENCE SHOULD BE LOCATED ON THE CHANNEL BERM TO PREVENT SEDIMENT FROM ENTERING THE CHANNEL SYSTEM. THE FENCE SHOULD BE INSTALLED AS SHOWN ABOVE ALONG THE ENTIRE UNSTABLE AREA ADJOINING THE CHANNEL.

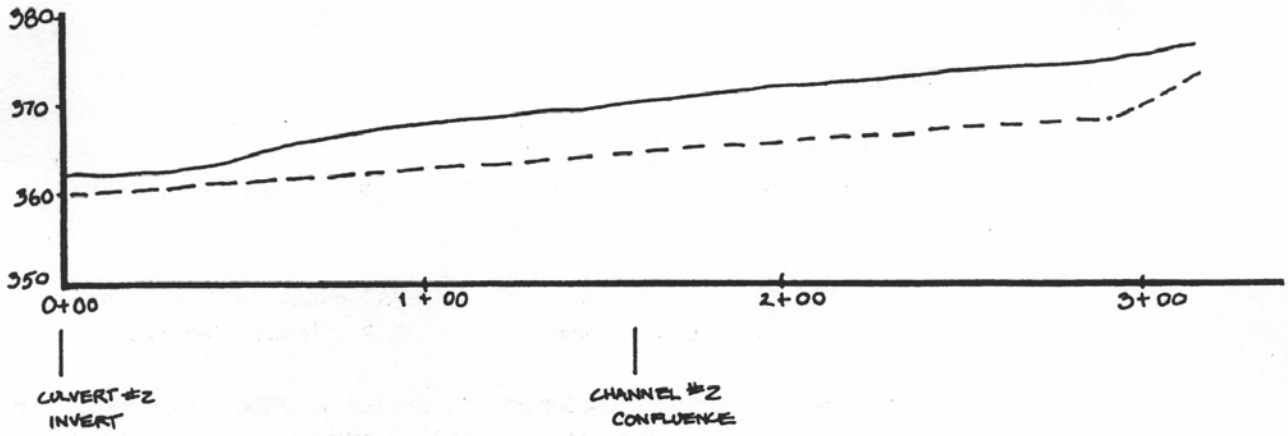
10. GRASS-LINED CHANNELS



10. GRASS-LINED CHANNELS (CONT.)



TYPICAL CROSS SECTION;
ALL CHANNELS (DEPTH AND TOP WIDTH WILL VARY BASED ON GROUND ELEVATION)



PROFILE – CHANNEL #1

CHANNEL #1
- GRADE : 2%
- LENGTH : 360'
- BEGINNING GRADE EL : 359.5
  - AT OUTLET - INVERT OF CULVERT #2

CHANNEL #2
- GRADE : 1.75%
- LENGTH : 230'
- BEGINNING GRADE EL : 362.7
  - AT INTERSECTION W/ CHANNEL #1

CHANNEL #3
- GRADE : 1%
- LENGTH : 450'
- BEGINNING GRADE ELEVATION : 362.0
  - CULVERT INVERT UNDER TERRI ROAD

CHANNEL #4
- GRADE : 1.1%
- LENGTH : 160'
- BEGINNING GRADE EL. : 364.8
  - AT OUTLET - EXISTING STABLE CHANNEL BOTTOM

(10.) CONSTRUCTION SPECIFICATIONS

1. EXCAVATE THE CHANNEL AND SHAPE IT TO AN EVEN CROSS-SECTION AS SHOWN. WHEN STAKING INDICATE A 0.2' OVERCUT AROUND THE CHANNEL PERIMETER FOR SILTING AND BULKING.

2. GRADE SOIL AWAY FROM CHANNEL SO THAT SURFACE WATER MAY ENTER FREELY.

3. APPLY LIME, FERTILIZER AND SEED TO THE CHANNEL AND ADJOINING AREAS IN ACCORDANCE WITH THE VEGETATION PLAN.

4. SPREAD STRAW MULCH AT THE RATE OF 100 LB/1000 FT^2.

5. HOLD MULCH IN PLACE IMMEDIATELY AFTER SPREADING WITH A PLASTIC NETTING INSTALLED AS SHOWN.

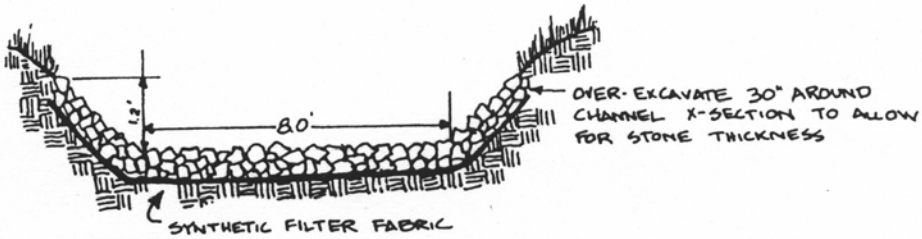
6. START LAYING THE NET FROM THE TOP OF THE UPSTREAM END OF THE CHANNEL AND UNROLL IT DOWN GRADE. DO NOT STRETCH NETTING.

7. BURY THE UPSLOPE END AND STAPLE THE NET EVERY 12" ACROSS THE TOP END, EVERY 3 FT. AROUND THE EDGES AND ACROSS THE NET SO THAT THE STRAW IS HELD CLOSELY AGAINST THE SOIL. HOWEVER, DO NOT STRETCH THE NETTING WHEN STAPLING.

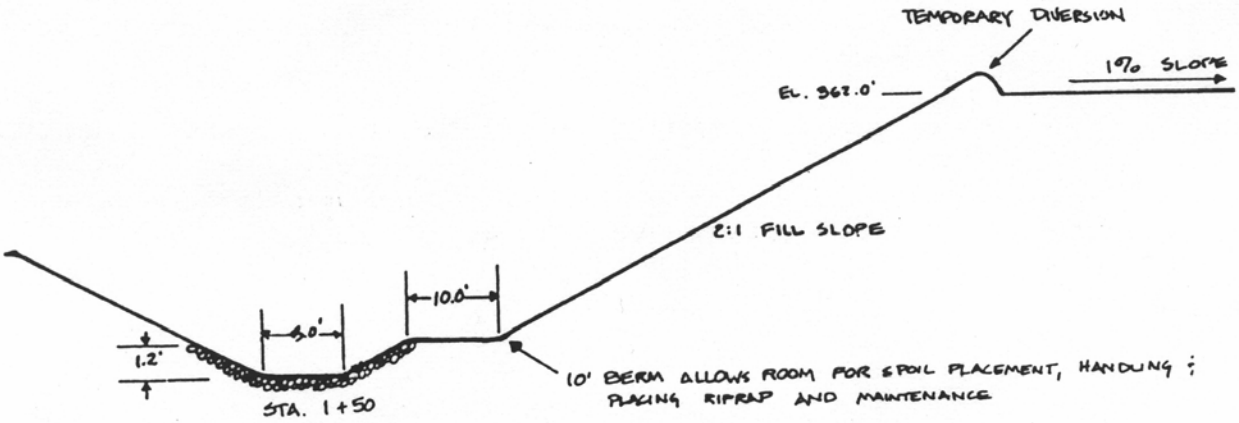
8. NETTING STRIPS SHOULD BE JOINED TOGETHER ALONG THE SIDES WITH A 3" OVERLAP AND STAPLED TOGETHER.

9. TO JOIN ENDS OF STRIPS, INSERT THE NEW ROLL OF NET IN A TRENCH AS WITH UPSLOPE END AND OVERLAP IT 18" WITH THE PREVIOUSLY LAID UPPER ROLL. TURN UNDER 6" OF THE 18" OVERLAP AND STAPLE EVERY 12" ACROSS THE END.

11. RIPRAP CHANNEL

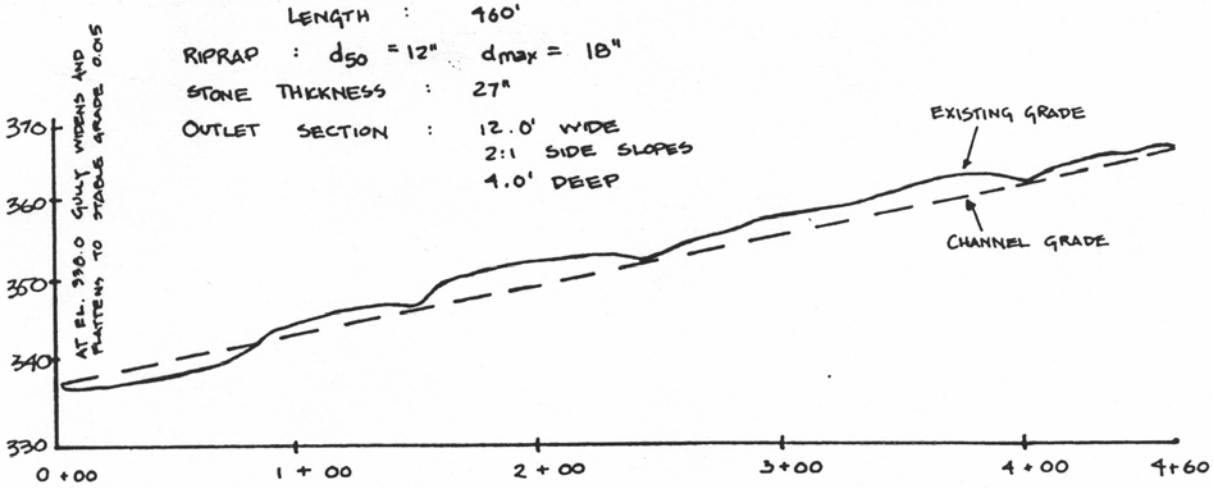


TYPICAL CROSS SECTION



TYPICAL CROSS SECTION

CHANNEL GRADE : 0.060
LENGTH : 460'
RIPRAP : d_{50} = 12" d_{max} = 18"
STONE THICKNESS : 27"
OUTLET SECTION : 12.0' WIDE
2:1 SIDE SLOPES
4.0' DEEP



CHANNEL PROFILE

(11.) CONSTRUCTION SPECIFICATIONS

(1). CLEAR THE FOUNDATION OF ALL TREES, STUMPS, AND ROOTS.

2. EXCAVATE THE BOTTOM AND SIDES OF THE CHANNEL 30" BELOW GRADE AT ALL POINTS TO ALLOW FOR THE PLACEMENT OF RIPRAP AS SHOWN IN THE TYPICAL X-SECTION.

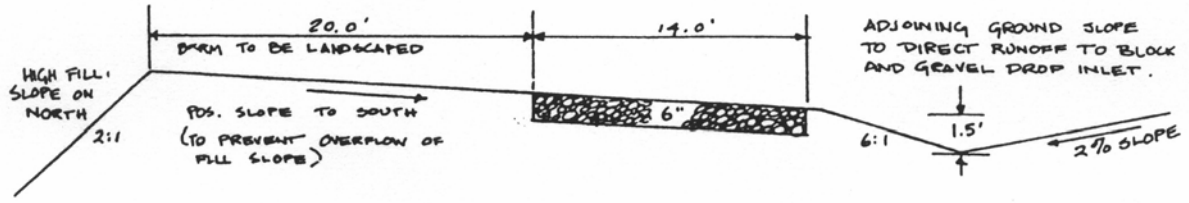
3. INSTALL EXTRA STRENGTH FILTER FABRIC ON THE BOTTOM AND SIDES OF THE CHANNEL FOUNDATION, PLACING THE UPSTREAM FABRIC OVER THE DOWNSTREAM FABRIC WITH AT LEAST A 1.0' OVERLAP ON ALL JOINTS. THE FABRIC IS TO BE SECURELY HELD IN PLACE WITH METAL PINS.

4. PLACE RIPRAP EVENLY TO THE LINES AND GRADES SHOWN ON THE DRAWINGS AND STAKED IN THE FIELD. RIPRAP TO BE PLACED IMMEDIATELY FOLLOWING THE INSTALLATION OF THE FILTER FABRIC.

5. RIPRAP TO MEET SPECIFICATION FOR D.O.T. CLASS 2 RIPRAP.

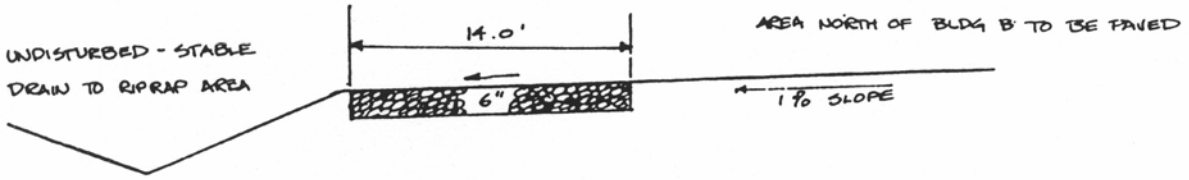
6. VEGETATE ALL DISTURBED AREAS FOLLOWING SPECIFICATIONS SHOWN IN THE VEGETATIVE PLAN.

12. CONSTRUCTION ROAD STABILIZATION



TYPICAL X-SECTION ENTRANCE ROAD

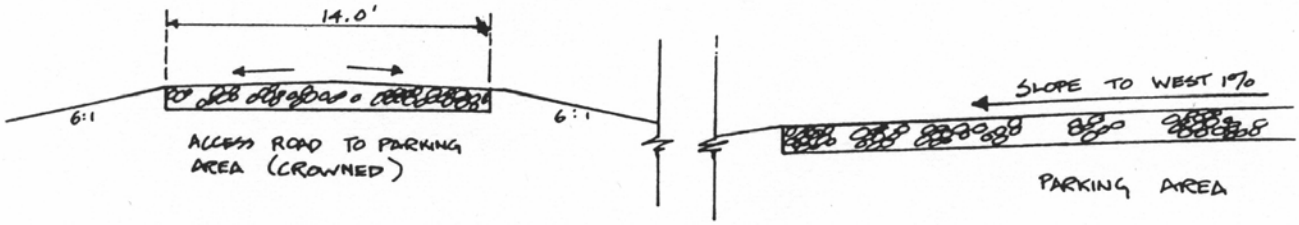
(TERRI RD. EAST TO CHANNEL #1)



TYPICAL X-SECTION ENTRANCE ROAD

(FROM CHANNEL #1 EAST TO EAST END OF BLDG. B)

12. CONT. RD. STABILIZATION (CONT.)



TYPICAL CROSS-SECTION ACCESS ROAD

(12.) CONSTRUCTION SPECIFICATIONS

1. CLEAR ROAD BED AND PARKING AREAS OF ALL VEGETATION, ROOTS AND OTHER OBJECTIONABLE MATERIAL.

2. PROVIDE SURFACE DRAINAGE AS SHOWN.

3. SPREAD 6" COURSE OF D.O.T. "ABC" CRUSHED STONE EVENLY OVER THE FULL WIDTH OF ROAD AND PARKING AREA AND SMOOTH TO AVOID DEPRESSIONS.

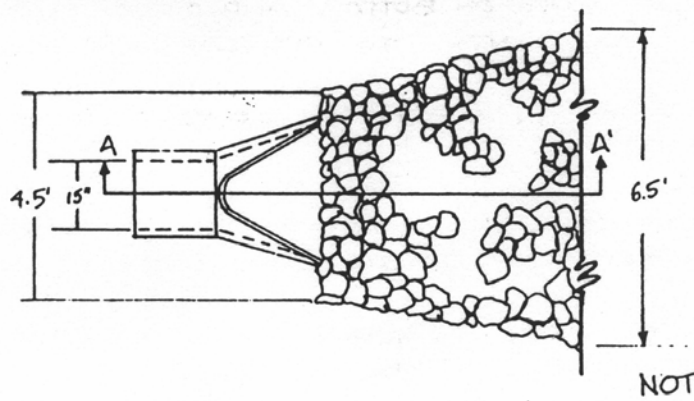
4. VEGETATE ALL DISTURBED AREAS ADJOINING ROADS AND PARKING AS SOON AS GRADING IS COMPLETE IN ACCORDANCE WITH THE VEGETATION PLAN.

13. OUTLET STABILIZATION STRUCTURES

OUTLET PROTECTION FOR CULVERT #1

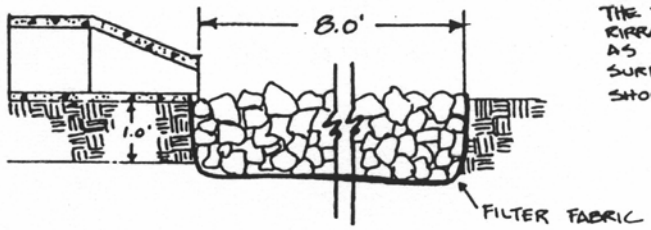
(FOR RIPRAP PROTECTION USE CLASS A OR CLASS B EROSION CONTROL STONE)

PLAN



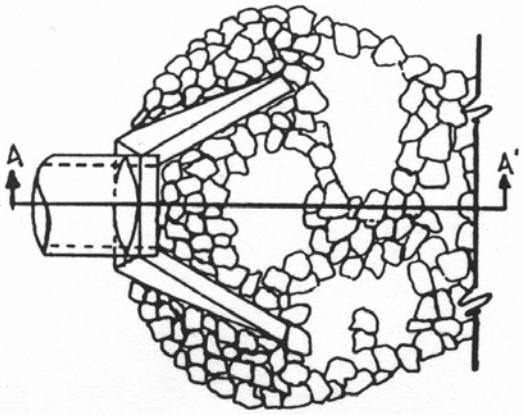
NOTE: APRON TO BE PLACED LEVEL WITH THE TOP SURFACE OF RIPRAP AT SAME LEVEL AS SURROUNDING LAND SURFACE — NO OVERFALL SHOULD EXIST.

SECTION A-A'

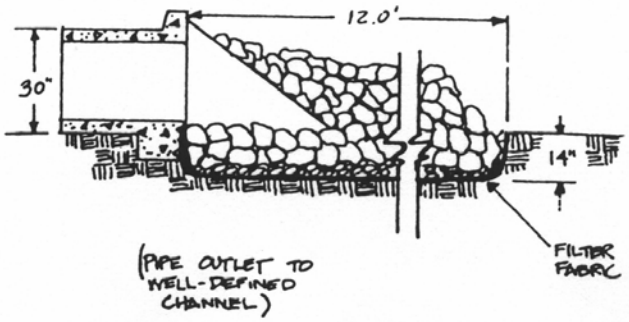


OUTLET PROTECTION FOR CULVERT #2

(LINE CHANNEL TO TOP OF BANKS FOR A DISTANCE OF 12.0' DOWNSTREAM. USE CLASS B EROSION CONTROL STONE.)



PLAN



SECTION A-A'

NOTE: APRON TO BE PLACED LEVEL WITH THE TOP SURFACE OF RIPRAP AT SAME ELEVATION AS SIDES AND BOTTOM OF CHANNEL. NO CHANNEL OVERFALL OR RESTRICTION IN CHANNEL CROSS-SECTION SHOULD EXIST.

(13.) CONSTRUCTION SPECIFICATIONS

1. EXCAVATE BELOW CHANNEL OUTLET AND WIDEN CHANNEL TO THE REQUIRED RIPRAP THICKNESS FOR EACH APRON. FOUNDATION TO BE CUT TO ZERO GRADE AND SMOOTHED.

2. PLACE FILTER CLOTH ON BOTTOM AND SIDES OF PREPARED FOUNDATION. ALL JOINTS TO OVERLAP A MINIMUM OF 1.0'.

3. EXERCISE CARE IN RIPRAP PLACEMENT TO AVOID DAMAGE TO FILTER FABRIC.

4. PLACE RIPRAP ON ZERO GRADE — TOP OF RIPRAP TO BE LEVEL WITH EXISTING OUTLET — NO OVERFALL AT ENDS.

5. RIPRAP TO BE HARD, ANGULAR, WELL GRADED CLASS B EROSION CONTROL STONE.

6. IMMEDIATELY AFTER CONSTRUCTION STABILIZE ALL DISTURBED AREAS WITH VEGETATION AS SHOWN IN VEGETATIVE PLAN.

14. SURFACE ROUGHENING

A. — 2:1 FILL SLOPE

1. PLACE FILL IN LIFTS NOT TO EXCEED 9" AND COMPACT.
2. LEAVE FACE OF FILL SLOPE LOOSE AND UNCOMPACTED — 4-6" DEEP — DO NOT BACK BLADE IN FINAL GRADING.
3. GROOVE ON CONTOUR — GROOVES APPROX. 3" DEEP + 12" APART.
4. VEGETATE IMMEDIATELY AFTER GROOVING.

B. — 3:1 CUT SLOPE

1. GROOVE BY DISCING TO EVEN SURFACE FOR MAINTENANCE BY MOWING.
2. GROOVES APPROX. 1" - 2" DEEP AND 10" APART.
3. VEGETATE IMMEDIATELY AFTER DISCING. SEE VEGETATIVE PLAN.

VEGETATIVE PLAN

Seedbed Preparation (SP)

SP-1 Fill slopes 3:1 or steeper to be seeded with a hydraulic seeder (permanent seedings)

1) Leave the last 4-6 inches of fill loose and uncompacted, allowing rocks, roots, large clods and other debris to remain on the slope.

2) Roughen slope faces by making grooves 2-3 inches deep, perpendicular to the slope.

3) Spread lime evenly over slopes at rates recommended by soil tests.

SP-2 Fill slopes 3:1 or steeper (temporary seedings)

1) Leave a loose, uncompacted surface. Remove large clods, rocks, and debris which might hold netting above the surface.

2) Spread lime and fertilizer evenly at rates recommended by soil tests.

3) Incorporate amendments by roughening or grooving soil surface on the contour.

SP-3 High-maintenance turf

1) Remove rocks and debris that could interfere with tillage and the production of a uniform seedbed.

2) Apply lime and fertilizer at rates recommended by soil tests; spread evenly and incorporate to a depth of 2-4" with a farm disk or chisel plow.

3) Loosen the subgrade immediately prior to spreading topsoil by disking or scarifying to a depth of at least 2 inches.

4) Spread topsoil to a depth of 2-4 inches and cultipack.

5) Disk or harrow and rake to produce a uniform and well-pulverized surface.

6) Loosen surface just prior to applying seed.

SP-4 Gentle or flat slopes where topsoil is not used.

1) Remove rocks and debris.

2) Apply lime and fertilizer at rates recommended by soil tests; spread evenly and incorporate into the top 6" with a disk, chisel plow, or rotary tiller.

3) Break up large clods and rake into a loose, uniform seedbed.

4) Rake to loosen surface just prior to applying seed.

Seeding Methods (SM)

SM-1 Fill slopes steeper than 3:1 (permanent seedings)

Use hydraulic seeding equipment to apply seed and fertilizer, a wood fiber mulch at 45 lb/1,000 ft^2, and mulch tackifer.

SM-2 Gentle to flat slopes or temporary seedings

1) Broadcast seed at the recommended rate with a rotary seeder, drop spreader, or cultipacker seeder.

2) Rake seed into the soil and lightly pack to establish good contact.

Mulch (MU)

MU-1 Steep slopes (3:1 or greater)

In mid-summer, late fall or winter, apply 100 lb/1,000 ft^2 grain straw, cover with netting and staple to the slope. In spring or early fall use 45 lb/1,000 ft^2 wood fiber in a hydroseeder slurry.

MU-2 High-maintenance vegetation and temporary seedings

Apply 90 lb/1,000 ft^2 (4000 lb/acre) grain straw and tack with 0.1 gal/yd^2 asphalt (11 gal/1,000 ft^2).

MU-3 Grass-lined channels

Install excelsior mat in the channel, extend up the channel banks to the highest calculated depth of flow, and secure according to manufacturer's specifications.

On channel shoulders, apply 100 lb/1,000 ft^2 grain straw.

Maintenance (MA)

MA-1 Refertilize in early spring the following year. Mow as desired.

MA-2 Keep mowed to a height of 2-4 inches. Fertilize with 40 lb/acre (1 lb/1,000 ft^2) nitrogen in winter and again the following fall.

MA-3 Inspect and repair mulch and lining. Refertilize in late winter of the following year with 150 lb/acre 10-10-10 (3.5 lb/1,000 ft^2). Mow regularly to a height of 3-4 inches.

MA-4 Topdress with 10-10-10 fertilizer if growth is not fully adequate.

MA-5 Topdress with 50 lb/acre (1 lb/ 1,000 ft^2) nitrogen in March. If cover is needed through the following summer, overseed with 50 lb/acre Kobe lespedeza.

TABLE 1: VEGETATIVE PLAN[1]

Area No.[2]	Description	Season[3]	Seeding Mixture: Permanent (lb/ac)	Seeding Mixture: Temporary (lb/ac)	Seedbed Preparation	Seeding Method	Mulch	Maintenance	Notes
1	Steep slopes (3:1); low maintenance	Spring or fall	Tall fescue 100 Kobe lespedeza 10 Bahiagrass 25 Rye grain 40		SP-1	SM-1	MU-1	MA-1	Permanent mixture also used for low-maint. areas (4). Overseed winter plantings of rye with Kobe lespedeza in March if grading is not complete.
		Summer		German millet 40	SP-2	SM-2		MA-5	
		Winter		Rye grain 120					
2	High-maintenance turf	Spring		Rye grain 120 Kobe lespedeza 50	SP-3	SM-2	MU-2	MA-4	Tall fescue can be seeded in spring - increase rate to 250 lb/ac. Temp. seeding for fall is the same as for winter.
		Summer		German millet 40					
		Fall	Tall fescue blend 200					MA-2	
		Winter		Rye grain 120				MA-5	
3	Grassed channels with side slopes 3:1	Fall – Spring	Tall fescue 200 Rye grain 40		SP-4	SM-2	MU-3	MA-3	
		Summer	Tall fescue 200 German millet 10						
4	Low-maintenance areas	Spring or Fall	Tall fescue 100 Kobe lespedeza 10 Bahiagrass 25 Rye grain 40		SP-4	SM-2	MU-2	MA-1	For temporary seeding in spring or fall see 5 below. Use these specs for temporary diversions
		Summer	Tall fescue 100 Kobe lespedeza 10 Bermudagrass 15 German millet 10					MA-5	
		Winter		Rye grain 120					
5	Areas requiring cover for less than 1 year	Spring		Rye grain 120 Kobe lespedeza 50	SP-4	SM-2	MU-2	MA-4	Treat temporary diversion as low-maintenance, permanent (area 4) Include topsoil stockpiles here
		Summer		German millet 40					
		Fall & Winter		Rye grain 120 Kobe lespedeza 50				MA-5	

[1] Column entries for seedbed preparation, seeding method, mulch, and maintenance refer to Attachment 1.
[2] Area numbers are designated on map.
[3] Spring (Feb. 1 - Apr. 15), Summer (Apr. 15 - Aug. 20), Fall (Aug. 20 - Oct. 25), Winter (Oct. 25 - Jan.).

APPENDIX G
EROSION AND SEDIMENT CONTROL
PLAN REVIEW CHECKLIST

Project Name _____ Site Location _____

Applicant's Name & Address _____
_____

General

A narrative statement shall be provided that describes the proposed project nature and purpose; the existing site conditions including topography, vegetation and drainage; adjacent and off-site areas affected by the project; description of the soils on the site and key properties; notations of critical areas such as steep slopes, channels or wetlands; the overall phasing, sequencing and stabilization plan; total disturbed area and those not to be disturbed.

I. Construction Drawings

Are the following items shown on the construction drawings:	Yes	No
1. Vicinity Map with scale and north arrow	____	____
2. Legend, scales, N arrow on plan view	____	____
3. Existing and proposed topography shown with contours labeled with spots elevations in critical areas	____	____
4. Scope of the plan noted in the Title Block	____	____
5. Limits of clearing and grading shown	____	____
6. Existing vegetation delineated	____	____
7. Soil boundaries shown on the plan view	____	____
8. Existing drainage patterns, 100 year floodplain and sub-areas shown	____	____
9. Existing and proposed development facilities/ improvements shown	____	____
10. Location of Erosion and Sediment control practices as phased with construction	____	____
11. Phasing plan with 5 acre threshold limits shown	____	____
12. Stockpile locations, staging areas and access points clearly defined	____	____
13. Street profiles, utility locations, property boundaries and, easement delineations shown	____	____

II. Construction Notes & Details

	Yes	No
1. Specific sequence of operation given for each phase	____	____
2. Inspection and maintenance schedule shown for the specific practices	____	____
3. Design details show all dimensions and installation details necessary for construction	____	____
4. Implementation schedule for E&S practices is provided with removal criteria stated	____	____
5. Construction waste management plan incorporated in the notes	____	____
6. Site Inspections during construction are noted on the drawings and is in accordance with the General Permit for Stormwater Discharges from Construction Activities	____	____

III. Erosion & Sediment Control Practices

A. General

	Yes	No
1. Practice meets purpose and design criteria	____	____
2. Standard details and construction notes are provided	____	____
3. Special timing of practice noted if applicable	____	____
4. Provisions for traffic crossings shown on the drawings where necessary	____	____

B. Practices Controlling Runoff

	Yes	No
1. Positive drainage is maintained with contributing drainage area shown	____	____
2. Flow grades properly stabilized	____	____
3. Adequate outlet or discharge condition stabilized	____	____
4. Necessary dimensions, gradations, calculations, and materials shown	____	____

C. Practices Stabilizing Soil

	Yes	No
1. Seeding rates and areas properly shown on the drawings	____	____
2. Mulch materials and rates specified on the drawings	____	____
3. Sequencing and timing provisions limit soil exposure to 14 days	____	____

C. Practices Stabilizing Soil (cont'd)	Yes	No
4. Rolled Erosion Control Products (RECP's) used are specified to location and appropriate weight/tie down	____	____
5. All soil seed bed preparation and amendments are specified on the drawings or in the specifications	____	____
6. The seeding dates are specified to cover the entire year for both temporary and permanent seedings	____	____
7. Maximum created slope is no steeper than 2 foot horizontal to 1 foot vertical with Cut and Fill slopes shown	____	____

D. Practices Controlling Sediment	Yes	No
1. Sediment traps/basins are sized in accordance with criteria	____	____
2. The contributing drainage area is shown on the grading plan	____	____
3. All scaled dimensions and volumes are shown on the plan	____	____
4. Maintenance requirements and clean out elevations established for all sediment control practices (50% capacity)	____	____
5. All access points of the project are shown to be stabilized	____	____
6. Storm drain inlets adequately protected	____	____
7. Silt fences are shown on the contour lines with no more than one quarter acre per 100 foot drainage to it	____	____
8. Temporary sediment traps being used at locations of future stormwater infiltration facilities	____	____

Additional Comments

Plan Reviewed By: _____ Date: _____

APPENDIX H

STATE POLLUTANT DISCHARGE ELIMINATION SYSTEM FOR CONSTRUCTION ACTIVITIES

CONSTRUCTION SITE LOG BOOK

Table of Contents

I. Pre-Construction Meeting Documents
   a. Preamble to Site Assessment and Inspections
   b. Operator's Certification
   c. Qualified Professional's Credentials & Certification
   d. Pre-Construction Site Assessment Checklist

II. Construction Duration Inspections
   a. Directions
   b. Modification to the SWPPP

III. Monthly Summary Reports

IV. Monitoring, Reporting, and Three-Month Status Reports
   a. Operator's Compliance Response Form

Properly completing forms such as those contained in Appendix H meet the inspection requirement of NYS-DEC SPDES GP for Construction Activities. Completed forms shall be kept on site at all times and made available to authorities upon request.

I. PRE-CONSTRUCTION MEETING DOCUMENTS
Project Name _____
Permit No. _____ **Date of Authorization** _____
Name of Operator _____
Prime Contractor _____

a. Preamble to Site Assessment and Inspections
The Following Information To Be Read By All Person's Involved in The Construction of Stormwater Related Activities:

The Operator agrees to have a qualified professional[1] conduct an assessment of the site prior to the commencement of construction[2] and certify in this inspection report that the appropriate erosion and sediment controls described in the SWPPP have been adequately installed or implemented to ensure overall preparedness of the site for the commencement of construction.

Prior to the commencement of construction, the Operator shall certify in this site logbook that the SWPPP has been prepared in accordance with the State's standards and meets all Federal, State and local erosion and sediment control requirements.

When construction starts, site inspections shall be conducted by the qualified professional at least every 7 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater (Construction Duration Inspections). The Operator shall maintain a record of all inspection reports in this site logbook. The site logbook shall be maintained on site and be made available to the permitting authorities upon request. The Operator shall post at the site, in a publicly accessible location, a summary of the site inspection activities on a monthly basis (Monthly Summary Report).

The operator shall also prepare a written summary of compliance with this general permit at a minimum frequency of every three months (Operator's Compliance Response Form), while coverage exists. The summary should address the status of achieving each component of the SWPPP.

Prior to filing the Notice of Termination or the end of permit term, the Operator shall have a qualified professional perform a final site inspection. The qualified professional shall certify that the site has undergone final stabilization[3] using either vegetative or structural stabilization methods and that all temporary erosion and sediment controls (such as silt fencing) not needed for long-term erosion control have been removed. In addition, the Operator must identify and certify that all permanent structures described in the SWPPP have been constructed and provide the owner(s) with an operation and maintenance plan that ensures the structure(s) continuously functions as designed.

1 "Qualified Professional means a person knowledgeable in the principles and practice of erosion and sediment controls, such as a Certified Professional in Erosion and Sediment Control (CPESC), soil scientist, licensed engineer or someone working under the direction and supervision of a licensed engineer (person must have experience in the principles and practices of erosion and sediment control).
2 "Commencement of construction" means the initial removal of vegetation and disturbance of soils associated with clearing, grading or excavating activities or other construction activities.
3 "Final stabilization" means that all soil-disturbing activities at the site have been completed and a uniform, perennial vegetative cover with a density of eighty (80) percent has been established or equivalent stabilization measures (such as the use of mulches or geotextiles) have been employed on all unpaved areas and areas not covered by permanent structures.

b. Operators Certification

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. Further, I hereby certify that the SWPPP meets all Federal, State, and local erosion and sediment control requirements. I am aware that false statements made herein are punishable as a class A misdemeanor pursuant to Section 210.45 of the Penal Law.

Name (please print): _____

Title _____ **Date:** _____

Address: _____

Phone: _____ **Email:** _____

Signature: _____

c. Qualified Professional's Credentials & Certification

"I hereby certify that I meet the criteria set forth in the General Permit to conduct site inspections for this project and that the appropriate erosion and sediment controls described in the SWPPP and as described in the following Pre-construction Site Assessment Checklist have been adequately installed or implemented, ensuring the overall preparedness of this site for the commencement of construction."

Name (please print): _____

Title _____ **Date:**_____

Address: _____

Phone: _____ **Email:** _____

Signature: _____

d. Pre-construction Site Assessment Checklist
(NOTE: Provide comments below as necessary)

1. Notice of Intent, SWPPP, and Contractors Certification:

Yes No NA

[ ] [ ] [ ] Has a Notice of Intent been filed with the NYS Department of Conservation?
[ ] [ ] [ ] Is the SWPPP on-site? Where?_____
[ ] [ ] [ ] Is the Plan current? What is the latest revision date?_____
[ ] [ ] [ ] Is a copy of the NOI (with brief description) onsite? Where?_____
[ ] [ ] [ ] Have all contractors involved with stormwater related activities signed a contractor's certification?

2. Resource Protection

Yes No NA

[ ] [ ] [ ] Are construction limits clearly flagged or fenced?
[ ] [ ] [ ] Important trees and associated rooting zones, on-site septic system absorption fields, existing vegetated areas suitable for filter strips, especially in perimeter areas, have been flagged for protection.
[ ] [ ] [ ] Creek crossings installed prior to land-disturbing activity, including clearing and blasting.

3. Surface Water Protection

Yes No NA

[ ] [ ] [ ] Clean stormwater runoff has been diverted from areas to be disturbed.
[ ] [ ] [ ] Bodies of water located either on site or in the vicinity of the site have been identified and protected.
[ ] [ ] [ ] Appropriate practices to protect on-site or downstream surface water are installed.
[ ] [ ] [ ] Are clearing and grading operations divided into areas <5 acres?

4. Stabilized Construction Entrance

Yes No NA

[ ] [ ] [ ] A temporary construction entrance to capture mud and debris from construction vehicles before they enter the public highway has been installed.
[ ] [ ] [ ] Other access areas (entrances, construction routes, equipment parking areas) are stabilized immediately as work takes place with gravel or other cover.
[ ] [ ] [ ] Sediment tracked onto public streets is removed or cleaned on a regular basis.

5. Perimeter Sediment Controls

Yes No NA

[ ] [ ] [ ] Silt fence material and installation comply with the standard drawing and specifications.
[ ] [ ] [ ] Silt fences are installed at appropriate spacing intervals
[ ] [ ] [ ] Sediment/detention basin was installed as first land disturbing activity.
[ ] [ ] [ ] Sediment traps and barriers are installed.

6. Pollution Prevention for Waste and Hazardous Materials

Yes No NA

[ ] [ ] [ ] The Operator or designated representative has been assigned to implement the spill prevention avoidance and response plan.
[ ] [ ] [ ] The plan is contained in the SWPPP on page _____
[ ] [ ] [ ] Appropriate materials to control spills are onsite. Where? _____

II. CONSTRUCTION DURATION INSPECTIONS

a. Directions:
Inspection Forms will be filled out during the entire construction phase of the project.
Required Elements:

(1) On a site map, indicate the extent of all disturbed site areas and drainage pathways. Indicate site areas that are expected to undergo initial disturbance or significant site work within the next 14-day period;

(2) Indicate on a site map all areas of the site that have undergone temporary or permanent stabilization;

(3) Indicate all disturbed site areas that have not undergone active site work during the previous 14-day period;

(4) Inspect all sediment control practices and record the approximate degree of sediment accumulation as a percentage of sediment storage volume (for example, 10 percent, 20 percent, 50 percent);

(5) Inspect all erosion and sediment control practices and record all maintenance requirements such as verifying the integrity of barrier or diversion systems (earthen berms or silt fencing) and containment systems (sediment basins and sediment traps). Identify any evidence of rill or gully erosion occurring on slopes and any loss of stabilizing vegetation or seeding/mulching. Document any excessive deposition of sediment or ponding water along barrier or diversion systems. Record the depth of sediment within containment structures, any erosion near outlet and overflow structures, and verify the ability of rock filters around perforated riser pipes to pass water; and

(6) Immediately report to the Operator any deficiencies that are identified with the implementation of the SWPPP.

SITE PLAN/SKETCH

_____	_____
Inspector (print name)	**Date of Inspection**
_____	_____
Qualified Professional (print name)	**Qualified Professional Signature**

The above signed acknowledges that, to the best of his/her knowledge, all information provided on the forms is accurate and complete.

Maintaining Water Quality

Yes No NA
[ ] [ ] [ ] Is there an increase in turbidity causing a substantial visible contrast to natural conditions?
[ ] [ ] [ ] Is there residue from oil and floating substances, visible oil film, or globules or grease?
[ ] [ ] [ ] All disturbance is within the limits of the approved plans.
[ ] [ ] [ ] Have receiving lake/bay, stream, and/or wetland been impacted by silt from project?

Housekeeping

1. General Site Conditions
Yes No NA
[ ] [ ] [ ] Is construction site litter and debris appropriately managed?
[ ] [ ] [ ] Are facilities and equipment necessary for implementation of erosion and sediment control in working order and/or properly maintained?
[ ] [ ] [ ] Is construction impacting the adjacent property?
[ ] [ ] [ ] Is dust adequately controlled?

2. Temporary Stream Crossing
Yes No NA
[ ] [ ] [ ] Maximum diameter pipes necessary to span creek without dredging are installed.
[ ] [ ] [ ] Installed non-woven geotextile fabric beneath approaches.
[ ] [ ] [ ] Is fill composed of aggregate (no earth or soil)?
[ ] [ ] [ ] Rock on approaches is clean enough to remove mud from vehicles & prevent sediment from entering stream during high flow.

Runoff Control Practices

1. Excavation Dewatering
Yes No NA
[ ] [ ] [ ] Upstream and downstream berms (sandbags, inflatable dams, etc.) are installed per plan.
[ ] [ ] [ ] Clean water from upstream pool is being pumped to the downstream pool.
[ ] [ ] [ ] Sediment laden water from work area is being discharged to a silt-trapping device.
[ ] [ ] [ ] Constructed upstream berm with one-foot minimum freeboard.

2. Level Spreader
Yes No NA
[ ] [ ] [ ] Installed per plan.
[ ] [ ] [ ] Constructed on undisturbed soil, not on fill, receiving only clear, non-sediment laden flow.
[ ] [ ] [ ] Flow sheets out of level spreader without erosion on downstream edge.

3. Interceptor Dikes and Swales
Yes No NA
[ ] [ ] [ ] Installed per plan with minimum side slopes 2H:1V or flatter.
[ ] [ ] [ ] Stabilized by geotextile fabric, seed, or mulch with no erosion occurring.
[ ] [ ] [ ] Sediment-laden runoff directed to sediment trapping structure

Runoff Control Practices (continued)

4. Stone Check Dam

Yes No NA

[ ] [ ] [ ] Is channel stable? (flow is not eroding soil underneath or around the structure).
[ ] [ ] [ ] Check is in good condition (rocks in place and no permanent pools behind the structure).
[ ] [ ] [ ] Has accumulated sediment been removed?.

5. Rock Outlet Protection

Yes No NA

[ ] [ ] [ ] Installed per plan.
[ ] [ ] [ ] Installed concurrently with pipe installation.

Soil Stabilization

1. Topsoil and Spoil Stockpiles

Yes No NA

[ ] [ ] [ ] Stockpiles are stabilized with vegetation and/or mulch.
[ ] [ ] [ ] Sediment control is installed at the toe of the slope.

2. Revegetation

Yes No NA

[ ] [ ] [ ] Temporary seedings and mulch have been applied to idle areas.
[ ] [ ] [ ] 4 inches minimum of topsoil has been applied under permanent seedings

Sediment Control Practices

1. Stabilized Construction Entrance

Yes No NA

[ ] [ ] [ ] Stone is clean enough to effectively remove mud from vehicles.
[ ] [ ] [ ] Installed per standards and specifications?
[ ] [ ] [ ] Does all traffic use the stabilized entrance to enter and leave site?
[ ] [ ] [ ] Is adequate drainage provided to prevent ponding at entrance?

2. Silt Fence

Yes No NA

[ ] [ ] [ ] Installed on Contour, 10 feet from toe of slope (not across conveyance channels).
[ ] [ ] [ ] Joints constructed by wrapping the two ends together for continuous support.
[ ] [ ] [ ] Fabric buried 6 inches minimum.
[ ] [ ] [ ] Posts are stable, fabric is tight and without rips or frayed areas.
Sediment accumulation is ___% of design capacity.

Sediment Control Practices (continued)

3. Storm Drain Inlet Protection (Use for Stone & Block; Filter Fabric; Curb; or, Excavated practices)

Yes No NA

[ ] [ ] [ ] Installed concrete blocks lengthwise so open ends face outward, not upward.
[ ] [ ] [ ] Placed wire screen between No. 3 crushed stone and concrete blocks.
[ ] [ ] [ ] Drainage area is 1acre or less.
[ ] [ ] [ ] Excavated area is 900 cubic feet.
[ ] [ ] [ ] Excavated side slopes should be 2:1.
[ ] [ ] [ ] 2" x 4" frame is constructed and structurally sound.
[ ] [ ] [ ] Posts 3-foot maximum spacing between posts.
[ ] [ ] [ ] Fabric is embedded 1 to 1.5 feet below ground and secured to frame/posts with staples at max 8-inch spacing.
[ ] [ ] [ ] Posts are stable, fabric is tight and without rips or frayed areas.

Sediment accumulation ___% of design capacity.

4. Temporary Sediment Trap

Yes No NA

[ ] [ ] [ ] Outlet structure is constructed per the approved plan or drawing.
[ ] [ ] [ ] Geotextile fabric has been placed beneath rock fill.

Sediment accumulation is ___% of design capacity.

5. Temporary Sediment Basin

Yes No NA

[ ] [ ] [ ] Basin and outlet structure constructed per the approved plan.
[ ] [ ] [ ] Basin side slopes are stabilized with seed/mulch.
[ ] [ ] [ ] Drainage structure flushed and basin surface restored upon removal of sediment basin facility.

Sediment accumulation is ___% of design capacity.

Note: Not all erosion and sediment control practices are included in this listing. Add additional pages to this list as required by site specific design.
Construction inspection checklists for post-development stormwater management practices can be found in Appendix F of the New York Stormwater Management Design Manual.

CONSTRUCTION DURATION INSPECTIONS

b. Modifications to the SWPPP (To be completed as described below)

The Operator shall amend the SWPPP whenever:

1. There is a significant change in design, construction, operation, or maintenance which may have a significant effect on the potential for the discharge of pollutants to the waters of the United States and which has not otherwise been addressed in the SWPPP; or
2. The SWPPP proves to be ineffective in:
   a. Eliminating or significantly minimizing pollutants from sources identified in the SWPPP and as required by this permit; or
   b. Achieving the general objectives of controlling pollutants in stormwater discharges from permitted construction activity; and
3. Additionally, the SWPPP shall be amended to identify any new contractor or subcontractor that will implement any measure of the SWPPP.

Modification & Reason:

III. Monthly Summary of Site Inspection Activities

Name of Permitted Facility:	**Today's Date:**	**Reporting Month:**
Location:	**Permit Identification #:**	
Name and Telephone Number of Site Inspector:		

Date of Inspection	Regular / Rainfall based Inspection	Name of Inspector	Items of Concern

Owner/Operator Certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that false statements made herein are punishable as a class A misdemeanor pursuant to Section 210.45 of the Penal Law."

Signature of Permittee or Duly Authorized Representative

Name of Permittee or Duly Authorized Representative Date

Duly authorized representatives must have written authorization, submitted to DEC, to sign any permit documents.