Section 6: Miscellaneous Erosion and Sediment Control Design Information

6.1 Guidelines for Erosion Control Blanket Design

General: Use Erosion Control Blanket for Calculated Shear Stresses up to 4 lbs/ft^2 and use Turf Reinforcement Mat for Calculated Shear Stresses of 4 lbs/ft^2 or greater.

Type 1 Erosion Control Blanket

- Typical 3 to 6 month functional longevity (It is estimated it will take 3 to 6 months to establish vegetation.)
- Slopes: N/A (typically used on street boulevards to help establish vegetation)
- Channels: N/A (typically used on street boulevards to help establish vegetation)

Type 2 Erosion Control Blanket

- Typical 6 to 12 month functional longevity (It is estimated it will take 6 to 12 months to establish vegetation.)
- Slopes: 4:1 (H:V) to 3:1 (H:V)
- Channels: Calculated Shear Stresses of 0 lbs/ft^2 to 2 lbs/ft^2 Channels
- Ditch Grade of 2% to 4%

Type 3 Erosion Control Blanket

- Typical 12 to 24 month functional longevity (It is estimated it will take 12 to 24 months to establish vegetation.)
- Slopes: 3:1 (H:V) to 2:1 (H:V)
- Channels: Calculated Shear Stresses of 2 lbs/ft^2 to 3 lbs/ft^2
- Ditch Grade of 4% to 6%

Type 4 Erosion Control Blanket

- Typical 24 to 36 month functional longevity (It is estimated it will take 24 to 36 months to establish vegetation.)
- Slopes: 2:1 (H:V) to 1:1 (H:V)
- Channels: Calculated Shear Stresses of 3 lbs/ft^2 to 4 lbs/ft^2
- Ditch Grade of 6% to 8%

Notes: It will typically take longer to establish vegetation west of the Missouri River in South Dakota than east of east of the Missouri River because of poor soils and low rainfall amounts.

Also look at ditch cross sections, length of slope, soils information and contributing drainage areas in determining locations for erosion control blanket.

6.2 Guidelines for Turf Reinforcement Mat Design

General: Use Erosion Control Blanket for Calculated Shear Stresses up to 4 lbs/ft^2 and use Turf Reinforcement Mat for Calculated Shear Stresses of 4 lbs/ft^2 or greater.

Type 1 Turf Reinforcement Mat

- Channels: Calculated Shear Stresses of 4 lbs/ft^2 to 6 lbs/ft^2

Type 2 Turf Reinforcement Mat

- Channels: Calculated Shear Stresses of 6 lbs/ft^2 to 8 lbs/ft^2

Type 3 Turf Reinforcement Mat

- Channels: Calculated Shear Stresses of 8 lbs/ft^2 to 10 lbs/ft^2

6.3 Seeding vs Sodding Design Decision

The following information can be used when the designer needs to choose between seeding and sodding on projects. Keep in mind that sodding can be used on some parts of the project and seeding can be used on other parts of the project depending on what the designer decides using the following information.

Design Information

- Section B: Grading Plans
- Site visits (Consider how well kept the existing lawn is.)
- Aerial photos
- Contact SDDOT field personnel for their input on whether to use seeding or to use sodding on a project.
- Consider requests from landowners for sodding on their property.
- Look at sodding and seeding Unit Prices on CDBS to consider cost differences. (Sodding is always more expensive than seeding.)

Seeding Considerations

- If seeding is used it must include the following (These are compromises between seeding and sodding.)
    - Seeding plus Fiber Mulch (Commonly referred to as hydro turf)
    - Seeding plus Soil Stabilizer
    - Seeding plus Erosion Control Blanket

-Grass Hay or Straw Mulch will not work well on urban areas because it is hard to get it punched in on small areas and it tends to blow around.

Advantages

- More grass types and varieties to choose from
- Less expensive than sodding
- Stronger root system development initially

Disadvantages

- Initial establishment is longer than sodding.
- For best results, time of seeding is limited mainly to late Summer and early Fall.
- Watering must be available because moisture is critical for the young seedlings.

Sodding Considerations

- If there is an underground lawn sprinkler system in place sodding may be a better choice because of its ease of watering.
- The SDDOT typically considers the use of sodding only on urban projects.

Advantages

- Immediate protection from erosion thus helping to meet erosion and sediment control and storm water quality requirements
- Can be used as a buffer strip
- Rapid establishment and relatively weed-free in the beginning
- Good for slopes or areas prone to erosion
- Can be laid any time during the growing season as long as watering is available

Disadvantages

- Somewhat expensive
- Less selection as far as species and varieties of grasses
- Availability depending on the time of year

6.4 Erosion and Sediment Control Design Checklist

Date:_____
Project #:_____
County and PCN:_____

INFORMATION RECEIVED FROM OTHER SDDOT OFFICES
(Most of this information can be found in the project directory or in the project file.)

☐Scope Summary Letter (Road Design)
☐Plan and Profile Sheets (Road Design Grading Squad)
☐Crossection Sheets (Road Design Grading Squad)
☐Pipe Section Sheets (Road Design Grading Squad)
☐Right-of-Way Photos (ROW Section of Road Design)
☐Borrow Pit information including Borrow Pit Agreements and Borrow Pit Layouts (Region Materials Engineer)
☐Soils Letter to determine erodibility of soil on the project (Geotechnical Office)
☐Information on special seed mixtures and sodding requested by landowners at Landowner's Meeting (Road Design Grading Squad)
☐Sequence of Operations (Area Office)
☐Drainage Memo showing drainage areas for pipe (Hydraulics Office)
☐Final Draft of Environmental Assessment/Wetland Finding (Environmental Office)
☐404 Permits for Table of Wetland Areas (Hydraulics Office)

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OTHER USEFUL DESIGN INFORMATION

☐Pay attention to "Average Unit Prices from Low Bids" when selecting Erosion and Sediment Control BMPs.
☐Projects Involving Topeka Shiner
☐Rocky or Rock Slopes (Talk to Geotechnical Office if it is a project in the Black Hills Area. This will affect the BMP selection.)
☐Contours (for Drainage Information)
☐Videolog
☐USGS Quad Maps
☐Stream Relocation (A consultant may be hired to do the stream relocation plans.)
☐Black Hills Projects
(Game, Fish and Parks and the National Forest Service need to be corresponded with for permanent seed mixtures etc.)
☐Use of Wildflowers, Trees and Shrubs (Typically wildflowers are only used ob projects in the Black Hills.)
☐Projects Involving Topeka Shiner

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TASKS FOR THE EROSION AND SEDIMENT CONTROL DESIGNER

☐Keep electronic correspondence and other information in the project directory.
☐Keep good documentation.
☐Look through Electronic Project Files for pertinent information.
☐Look through the entire "Grading Design Project File" in file drawer for pertinent information.
☐Communicate with the Grading Designer thoughout the project.
☐Look at the completed set of grading plans before they go out for review to make sure nothing was missed in regard to Erosion and Sediment Control.

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6.5 Erosion and Sediment Control Design Information

TOPSOIL -GRADING AND LANDSCAPING PROJECTS

PLACING TOPSOIL

Topsoil is salvaged from all areas where grading is to occur under the bid item "Unclassified Excavation" in Section B. It is placed back on when grading is finished under the bid item "Placing Topsoil" in Section D. Refer to Section D Notes.

EXAMPLE PLACING TOPSOIL COMPUTATION	
Area of Work Limits measured on Microstation -see U:\rd\Doc\CADD Procedures Manual, E-Erosion Control	284,548 SqFt
Length of Roadway -calculated using the stationing on each plan sheet	30+00 to 60+00 = 3,000 Ft
Area of Roadway -calculated by multiplying the length of the roadway by the width found in Section B Typical Sections.	3,000 Ft x 52 Ft = 156,000 SqFt
Area of Work Limits minus area of Roadway	284,548 SqFt – 156,000 SqFt = 128,548 SqFt
+3% for slopes	128,548 SqFt x 1.03 = 132,404 SqFt
4 inches of topsoil inside Right-of-Way -if the Soils Recommendations Letter from the Geotechnical Office states that more is available, use that quantity instead. -if the Soils Letter states that less than 4 inches is available, "Contractor Furnished Topsoil" will have to be added.	132,404 SqFt x 0.33 Ft (4") = 43,693 CuFt
6 inches on Temporary Easements (outside Right-of-Way) -sum of temporary easement areas shown on each plan sheet	43,693 SqFt x 0.17 Ft (2") = 7,428 CuFt
Total CuFt	43,693 CuFt + 7428 CuFt = 51,121 CuFt
Convert to CuYd -place this number in the table after the appropriate stationing	1,893 CuYd

CONTRACTOR FURNISHED TOPSOIL

If the Soil Recommendations Letter notes that less than 4" of topsoil is available on grading projects, subtract the quantity available from the 4" to get the amount for Contractor Furnished Topsoil. The quantity available will be listed under the "Placing Topsoil" bid item with the quantity needed listed under the "Contractor Furnished Topsoil" bid item. Contractor Furnished Topsoil may also be needed for landscaping projects in areas such as planting beds and medians with the thickness and quantity determined by the Landscape Architect.

TOPSOIL -RESURFACING PROJECTS

REMOVE AND REPLACE TOPSOIL

The topsoil is bladed down the inslopes prior to resurfacing, then bladed back up the inslope after resurfacing is complete.

EXAMPLE REMOVE AND REPLACE TOPSOIL COMPUTATION	
Length of the Project -typically shown on Section F title sheet	4,017 Ft
One side of a 4-Lane Highway -multiply length of the project by 28' (12' wide strip on inside lane inslope, 16' wide strip on outside lane inslope) **2-Lane Highway** -multiply length of the project by 32' (16' wide strip on each inslope)	4,017 Ft x 32' = 128,458 SqFt
+3% for slopes	128,548 SqFt x 1.03 = 132,404 SqFt
4 inches of topsoil inside Right-of-Way	132,404 SqFt x 0.33 Ft (4") = 43,693 CuFt
Total CuFt	43,693 CuFt + 7428 CuFt = 51,121 CuFt
Convert to CuYd -Create a "Remove and Replace Topsoil" note in the plans by stating how many feet each inslope will be bladed back and how many total CuYd are estimated to be removed and replaced (in this case 1,893 CuYd).	1,893 CuYd

SURFACE ROUGHENING

Surface Roughening is a method of temporary stabilization the may be completed on slopes 3:1 or steeper, in ditch channels greater than 2%, or in areas deemed necessary by the engineer. Surface Roughening is measured to the nearest tenth of an acre.

BORROW PITS

All borrow pit information comes from the Region Materials Offices. Borrow Pit Information Sheets will be available from the Project Engineer if borrow pits are utilized on the project. These sheets show the estimated volume of topsoil and the estimated area disturbed. Add the estimated volume of topsoil to the Borrow Pit section of the "Placing Topsoil" table. Use the estimated area disturbed to calculate seed and mulch quantities.

Borrow Pit Agreements indicate what type of seed the landowner requested. Landowner requests are usually honored. If the borrow pit area will be restored for use as cropland, permanent seed and mulch will not be needed. If Borrow Pit Agreements are not available, assume the pit will be seeded with the same seed mixture as the rest of the project and mulched unless otherwise informed.

If the project utilizes Contractor Furnished Borrow, quantities for Placing Topsoil, Permanent Seeding, and Mulching will not need to be included in the Section D Estimate of Quantities because these are taken care of by the Contractor.

COVER CROP SEEDING

The area to be seeded with Cover Crop Seeding is typically computed as 25% of the total area to be Permanent Seeded. The application rate is 2 Bu/Acre. Cover Crop Seeding may not be necessary on projects that use Type F or G Permanent Seed Mixture as these already have a cover crop included.

PERMANENT SEEDING

The area to be Permanent Seeded is the sum of the disturbed areas after adding 3% for slopes in the Topsoil Calculations (shown on page 52). Other areas that also need to be Permanent Seeded include the following:

- Temporary Easements
- Borrow Pits and Haul Roads
- Waste Disposal Sites (if Waste Disposal Sites are not furnished by the Contractor)
- Areas of Old Road Obliteration
- Other areas that vary by project

HYDROSEEDING

The Hydroseeding bid item may be used at the discretion of the Landscape Architect. The equipment used for hydroseeding shall be a mechanical agitation hydroseeding machine. All costs for hydroseeding including equipment, labor, and materials shall be incidental to the contract unit price per square yard for "Hydroseeding." Although Permanent Seed and Fertilizer are part of Hydroseeding, they are separate bid items.

SODDING

Sod is measured to the nearest square yard. Water for Vegetation should also be included in the Estimate of Quantities (refer to Sodding in Spec. Book). Because of its relatively high price, sod should only be used under the following circumstances:

- When requested by a landowner on an urban project
- On urban projects where underground irrigation is in place
- For instant cover and stabilization on steep slopes or areas of high erosion
- When it is too late or early in the growing season to seed, stabilization is critical, and water and sod are available.

FERTILIZING

Areas to be seeded with Type A, B, C, E, F, or G Permanent Seed Mixture do not require fertilizer.
Areas to be seeded with Type D Permanent Seed Mixture or areas to be sodded: apply at the rate of 100 Lb/Acre or 3 Lb/1000 SqFt.
Areas to be seeded with a seed mixture of predominately non-native cool season grasses: apply at the rate of 100 Lb/Acre.

GRASS HAY OR STRAW MULCH

Grass Hay or Straw Mulch is applied at a rate of 2 Ton/Acre to areas to be permanent seeded on rural projects. An additional 25% is added for temporary stabilization. Steep slopes may require 4 Ton/Acre.

FIBER MULCHING

Fiber Mulching is applied at a rate of 2000 Lb/Acre to areas to be permanent seeded on urban projects. Fiber Mulching is also used on steep slopes and bridge berms where conventional equipment such as a drill and straw crimper cannot be operated. Additional quantities may be added for temporary stabilization. Fiber Mulching is applied in a separate application after hydroseeding.

SOIL STABILIZER

Soil Stabilizer is applied at a rate of 1500 Lb/Acre. Soil Stabilizer can be used interchangeably with Fiber Mulching. One benefit of Soil Stabilizer is that it can be broadcasted (applied as dry pellets) or hydraulically blown.

BONDED FIBER MATRIX

Use Bonded Fiber Matrix on slopes 2:1 and steeper where there is enough soil to get some grass to grow. The rate of application for Bonded Fiber Matrix will vary according to the Manufacturer's recommendations. It is usually calculated at 3,900 Lb/Acre.

SILT FENCE

Do not use silt fence in streams or channels. Use sandbags/snake bags in places where soil is too rocky to be dug so that the silt fence material can be held to the ground for proper functioning.

HIGH FLOW SILT FENCE

Use high flow silt fence where there is concentrated water such as at pipe inlets. 25% of total may be added for additional temporary sediment control. Refer to Standard Plate 734.05 for more information.

APPROACH PIPES	
Pipe 24" or less	use 18 Ft in a U shape
Pipe larger than 24"	use 30 Ft across ditch

MAINLINE PIPES	
Pipe 24" or less	use 18 Ft in a U shape
Pipe larger than 24"	use 30 Ft across ditch
Pipe with drainage area 50-100 acres	use 60 Ft at each end of pipe
Pipe with drainage area 100+ acres	use 100 Ft at each end of pipe

LOW FLOW SILT FENCE

Use low flow silt fence to keep sediment from entering wetlands, streams, box culverts, and adjacent properties. 25% of total may be added for additional temporary sediment control. Refer to Standard Plate 734.04 for more information.

BOX CULVERTS	
End without Detour	200 Ft
End with Detour	400 Ft

BRIDGES	
Berms	300 Ft

REPAIR SILT FENCE

Only 25% of the total length of high and low flow silt fence installed is used based on a review of past projects and the quantity actually repaired.

REMOVE SILT FENCE

Only 25% of the total length of high and low flow silt fence installed is used based on a review of past projects and the quantity actually removed.

MUCKING SILT FENCE

Only 25% of the total length of high and low flow silt fence installed is used based on a review of past projects and the quantity actually mucked.

EROSION BALES

Erosion Bales are used interchangeably with Erosion Control Wattles. They are typically placed 12 bales wide across the ditch perpendicular to the highway. The ditch installation recommendations are the same as those for Erosion Control Wattles (shown below). Erosion Control Wattles are typically used rather than Erosion Bales. Erosion Bales are probably better suited as a substitute for Silt Fence as perimeter protection near sloughs and wetlands. Refer to Standard Plate 734.02 for more information.

EROSION CONTROL WATTLES

Use Erosion Control Wattles perpendicular to the highway in ditch channels to decrease the velocity of flowing water and to trap sediment. Erosion Control Wattles also work well on slopes, for perimeter protection, and with Erosion Control Blanket. Look at cross sections and ditch grades to determine placement. Wattles come in 6", 9", 12" and 20" diameters. Refer to Standard Plate 734.06 for more information. The following guidelines are for 12" diameter wattles:

DITCH INSTALLATION	SPACING
2%	150 Ft
3%	100 Ft
4%	Use erosion control blanket.

SLOPE INSTALLATION	SPACING
1:1	10 Ft
2:1	20 Ft
3:1	30 Ft
4:1	40 Ft

EROSION CONTROL BLANKET

Use in areas where Straw Mulch, Fiber Mulch, or Erosion Control Wattles are not sufficient for holding soil in place. Erosion Control Blanket is typically placed 16 or 20 Ft wide in highway ditch channels. See recommendations on page 49. Refer to Standard Plate 734.01 for more information.

SHAPING FOR EROSION CONTROL BLANKET

Shaping for Erosion Control Blanket is calculated when Erosion Control Blankets are used in ditch channels. Shaping equals the length in feet of ditch channel that the blanket covers at 16 or 20 Ft wide.

TURF REINFORCEMENT MAT

Use in areas where Erosion Control Blanket is not sufficient for holding soil in place. Turf Reinforcement Mat is typically placed 16 or 20 Ft wide in highway ditch channels. See recommendations on page 50.

ROCK CHECK DAMS and RIPRAP

The drainage area, slope, and necessary cross sections shall be provided to the Hydraulics Section in the Office of Bridge Design for determining rock size. Refer to Standard Plate 734.03 for more information.

STABLIZED CONSTRUCTION ENTRANCES

Add as many Stabilized Construction Entrances as there are Borrow Pits on the project. During review, the Region and/or Area Engineer will advise to how many they think are actually necessary.

6.6 Erosion and Sediment Control Design Computation Worksheets

Section D Calculations.xls can be used as an alternative to the following sheets. Save the spreadsheet under the documents folder in the project folder in which you are working on.

Date:_____
Project #:_____
County and PCN:_____

PLACING TOPSOIL

AREA OF ROADWAY

The Area of Roadway is computed by multiplying the Length of the Project by the Roadway Width. See Typical Grading Sections in Section B for Roadway Width.

End Sta_____Minus Begin Sta_____=_____Ft (Length of Project)
_____Ft (Length of Project) x _____Ft (Roadway Width) =_____SqFt or_____Acres

Use the following if the Roadway Width varies throughout the project. (See Typical Grading Sections in Section B.)

Sta_____to Sta_____=_____Ft
_____Ft (Length) x _____Ft (Roadway Width) =_____SqFt or_____Acres

Sta_____to Sta_____=_____Ft
_____Ft (Length) x _____Ft (Roadway Width) =_____SqFt or_____Acres

Sta_____to Sta_____=_____Ft
_____Ft (Length) x _____Ft (Roadway Width) =_____SqFt or_____Acres

Sta_____to Sta_____=_____Ft
_____Ft (Length) x _____Ft (Roadway Width) =_____SqFt or_____Acres

Sta_____to Sta_____=_____Ft
_____Ft (Length) x _____Ft (Roadway Width) =_____SqFt or_____Acres

Total Area of Roadway =_____Acres

CUBIC YARDS OF TOPSOIL FROM BORROW PITS AND HAUL ROADS

Borrow Pit #	Borrow Pits and Haul Roads (CuYd)
Total CuYd:	

PROJECT TOPSOIL COMPUTATION WORKSHEET	
to (Begin)	to
SqFt	SqFt
Ft x Ft = SqFt	Ft x Ft = SqFt
SqFt - SqFt = SqFt	SqFt - SqFt = SqFt
SqFt x 1.03 = SqFt	SqFt x 1.03 = SqFt
SqFt x 0.33Ft (4”) = CuFt	SqFt x 0.33Ft (4”) = CuFt
SqFt x 0.17Ft (2”) = CuFt	SqFt x 0.17Ft (2”) = CuFt
CuFt + CuFt = CuFt	CuFt + CuFt = CuFt
CuYd	CuYd
to	to
SqFt	SqFt
Ft x Ft = SqFt	Ft x Ft = SqFt
SqFt - SqFt = SqFt	SqFt - SqFt = SqFt
SqFt x 1.03 = SqFt	SqFt x 1.03 = SqFt
SqFt x 0.33Ft (4”) = CuFt	SqFt x 0.33Ft (4”) = CuFt
SqFt x 0.17Ft (2”) = CuFt	SqFt x 0.17Ft (2”) = CuFt
CuFt + CuFt = CuFt	CuFt + CuFt = CuFt
CuYd	CuYd
to	to
SqFt	SqFt
Ft x Ft = SqFt	Ft x Ft = SqFt
SqFt - SqFt = SqFt	SqFt - SqFt = SqFt
SqFt x 1.03 = SqFt	SqFt x 1.03 = SqFt
SqFt x 0.33Ft (4”) = CuFt	SqFt x 0.33Ft (4”) = CuFt
SqFt x 0.17Ft (2”) = CuFt	SqFt x 0.17Ft (2”) = CuFt
CuFt + CuFt = CuFt	CuFt + CuFt = CuFt
CuYd	CuYd
to	to
SqFt	SqFt
Ft x Ft = SqFt	Ft x Ft = SqFt
SqFt - SqFt = SqFt	SqFt - SqFt = SqFt
SqFt x 1.03 = SqFt	SqFt x 1.03 = SqFt
SqFt x 0.33Ft (4”) = CuFt	SqFt x 0.33Ft (4”) = CuFt
SqFt x 0.17Ft (2”) = CuFt	SqFt x 0.17Ft (2”) = CuFt
CuFt + CuFt = CuFt	CuFt + CuFt = CuFt
CuYd	CuYd
to	to
SqFt	SqFt
Ft x Ft = SqFt	Ft x Ft = SqFt
SqFt - SqFt = SqFt	SqFt - SqFt = SqFt
SqFt x 1.03 = SqFt	SqFt x 1.03 = SqFt
SqFt x 0.33Ft (4”) = CuFt	SqFt x 0.33Ft (4”) = CuFt
SqFt x 0.17Ft (2”) = CuFt	SqFt x 0.17Ft (2”) = CuFt
CuFt + CuFt = CuFt	CuFt + CuFt = CuFt
CuYd	CuYd
to	to
SqFt	SqFt
Ft x Ft = SqFt	Ft x Ft = SqFt
SqFt - SqFt = SqFt	SqFt - SqFt = SqFt
SqFt x 1.03 = SqFt	SqFt x 1.03 = SqFt
SqFt x 0.33Ft (4”) = CuFt	SqFt x 0.33Ft (4”) = CuFt
SqFt x 0.17Ft (2”) = CuFt	SqFt x 0.17Ft (2”) = CuFt
CuFt + CuFt = CuFt	CuFt + CuFt = CuFt
CuYd	CuYd

PROJECT TOPSOIL COMPUTATION WORKSHEET	
to (Begin)	to
SqFt	SqFt
Ft x Ft = SqFt	Ft x Ft = SqFt
SqFt - SqFt = SqFt	SqFt - SqFt = SqFt
SqFt x 1.03 = SqFt	SqFt x 1.03 = SqFt
SqFt x 0.33Ft (4”) = CuFt	SqFt x 0.33Ft (4”) = CuFt
SqFt x 0.17Ft (2”) = CuFt	SqFt x 0.17Ft (2”) = CuFt
CuFt + CuFt = CuFt	CuFt + CuFt = CuFt
CuYd	CuYd
to	to
SqFt	SqFt
Ft x Ft = SqFt	Ft x Ft = SqFt
SqFt - SqFt = SqFt	SqFt - SqFt = SqFt
SqFt x 1.03 = SqFt	SqFt x 1.03 = SqFt
SqFt x 0.33Ft (4”) = CuFt	SqFt x 0.33Ft (4”) = CuFt
SqFt x 0.17Ft (2”) = CuFt	SqFt x 0.17Ft (2”) = CuFt
CuFt + CuFt = CuFt	CuFt + CuFt = CuFt
CuYd	CuYd
to	to
SqFt	SqFt
Ft x Ft = SqFt	Ft x Ft = SqFt
SqFt - SqFt = SqFt	SqFt - SqFt = SqFt
SqFt x 1.03 = SqFt	SqFt x 1.03 = SqFt
SqFt x 0.33Ft (4”) = CuFt	SqFt x 0.33Ft (4”) = CuFt
SqFt x 0.17Ft (2”) = CuFt	SqFt x 0.17Ft (2”) = CuFt
CuFt + CuFt = CuFt	CuFt + CuFt = CuFt
CuYd	CuYd
to	to
SqFt	SqFt
Ft x Ft = SqFt	Ft x Ft = SqFt
SqFt - SqFt = SqFt	SqFt - SqFt = SqFt
SqFt x 1.03 = SqFt	SqFt x 1.03 = SqFt
SqFt x 0.33Ft (4”) = CuFt	SqFt x 0.33Ft (4”) = CuFt
SqFt x 0.17Ft (2”) = CuFt	SqFt x 0.17Ft (2”) = CuFt
CuFt + CuFt = CuFt	CuFt + CuFt = CuFt
CuYd	CuYd
to	to
SqFt	SqFt
Ft x Ft = SqFt	Ft x Ft = SqFt
SqFt - SqFt = SqFt	SqFt - SqFt = SqFt
SqFt x 1.03 = SqFt	SqFt x 1.03 = SqFt
SqFt x 0.33Ft (4”) = CuFt	SqFt x 0.33Ft (4”) = CuFt
SqFt x 0.17Ft (2”) = CuFt	SqFt x 0.17Ft (2”) = CuFt
CuFt + CuFt = CuFt	CuFt + CuFt = CuFt
CuYd	CuYd
to	to
SqFt	SqFt
Ft x Ft = SqFt	Ft x Ft = SqFt
SqFt - SqFt = SqFt	SqFt - SqFt = SqFt
SqFt x 1.03 = SqFt	SqFt x 1.03 = SqFt
SqFt x 0.33Ft (4”) = CuFt	SqFt x 0.33Ft (4”) = CuFt
SqFt x 0.17Ft (2”) = CuFt	SqFt x 0.17Ft (2”) = CuFt
CuFt + CuFt = CuFt	CuFt + CuFt = CuFt
CuYd	CuYd

to	to
SqFt	SqFt
Ft x Ft = SqFt	Ft x Ft = SqFt
SqFt - SqFt = SqFt	SqFt - SqFt = SqFt
SqFt x 1.03 = SqFt	SqFt x 1.03 = SqFt
SqFt x 0.33Ft (4”) = CuFt	SqFt x 0.33Ft (4”) = CuFt
SqFt x 0.17Ft (2”) = CuFt	SqFt x 0.17Ft (2”) = CuFt
CuFt + CuFt = CuFt	CuFt + CuFt = CuFt
CuYd	CuYd
to	to
SqFt	SqFt
Ft x Ft = SqFt	Ft x Ft = SqFt
SqFt - SqFt = SqFt	SqFt - SqFt = SqFt
SqFt x 1.03 = SqFt	SqFt x 1.03 = SqFt
SqFt x 0.33Ft (4”) = CuFt	SqFt x 0.33Ft (4”) = CuFt
SqFt x 0.17Ft (2”) = CuFt	SqFt x 0.17Ft (2”) = CuFt
CuFt + CuFt = CuFt	CuFt + CuFt = CuFt
CuYd	CuYd
to	to
SqFt	SqFt
Ft x Ft = SqFt	Ft x Ft = SqFt
SqFt - SqFt = SqFt	SqFt - SqFt = SqFt
SqFt x 1.03 = SqFt	SqFt x 1.03 = SqFt
SqFt x 0.33Ft (4”) = CuFt	SqFt x 0.33Ft (4”) = CuFt
SqFt x 0.17Ft (2”) = CuFt	SqFt x 0.17Ft (2”) = CuFt
CuFt + CuFt = CuFt	CuFt + CuFt = CuFt
CuYd	CuYd
to	to
SqFt	SqFt
Ft x Ft = SqFt	Ft x Ft = SqFt
SqFt - SqFt = SqFt	SqFt - SqFt = SqFt
SqFt x 1.03 = SqFt	SqFt x 1.03 = SqFt
SqFt x 0.33Ft (4”) = CuFt	SqFt x 0.33Ft (4”) = CuFt
SqFt x 0.17Ft (2”) = CuFt	SqFt x 0.17Ft (2”) = CuFt
CuFt + CuFt = CuFt	CuFt + CuFt = CuFt
CuYd	CuYd
to	to
SqFt	SqFt
Ft x Ft = SqFt	Ft x Ft = SqFt
SqFt - SqFt = SqFt	SqFt - SqFt = SqFt
SqFt x 1.03 = SqFt	SqFt x 1.03 = SqFt
SqFt x 0.33Ft (4”) = CuFt	SqFt x 0.33Ft (4”) = CuFt
SqFt x 0.17Ft (2”) = CuFt	SqFt x 0.17Ft (2”) = CuFt
CuFt + CuFt = CuFt	CuFt + CuFt = CuFt
CuYd	CuYd

PERMANENT SEEDING

OTHER AREAS THAT NEED TO BE PERMANENT SEEDED

	(Acres)
Area of Borrow Pits and Haul Roads	
Area of Temporary Easements (from Section B Plan Sheets)	
Area of Waste Disposal Site (if Waste Disposal Site is not furnished by the Contractor)	
Areas of Old Road Obliteration	
Other areas that need to be permanent seeded that vary by project	
Total Area to be Permanent Seeded:	

PERMANENT SEEDING ON GRADING PROJECTS

_____Acres (area within Work Limits minus area of Roadway) plus _____Acres (other areas that need to be Permanent Seeded) =_____Acres (total acres that are to be Permanent Seeded)

_____Acres x _____ Lb/Acre (Permanent Seeding Rate) =_____Lb

PERMANENT SEEDING ON SURFACING PROJECTS

_____Acres (area where topsoil is to be stripped) plus _____Acres (other areas that need to be Permanent Seeded) =_____Acres (total acres that are to be Permanent Seeded)

_____Acres x _____Lb/Acre (Permanent Seeding Rate) = _____Lb

COVER CROP SEEDING

Cover Crop Seeding as a Temporary Erosion Control Measure

The area to be seeded with Cover Crop Seed is typically computed as 25% of the total area to be Permanent Seeded.

_____Acres x 0.25 (25%) = _____Acres

_____Acres x 2 Bu/Acre = _____Bu

FERTILIZING

_____Acres x 100 Lb/Acre = _____ Lb or _____Ton (for areas that are seeded with Special Seed Mixtures that contain predominately non-native cool season grasses)

_____x 3 Lb/1000 SqFt = _____Lb or_____Ton (for Sodded areas and areas that are seeded with Special Seed Mixtures that contain predominately non-native cool season grasses)

GRASS HAY OR STRAW MULCH

_____Acres (Acres that were Permanent Seeded) x 2 Ton/Acre = _____Ton +_____Ton (25% of the total acres that were Permanent Seeded) for Temporary Erosion Control= _____Ton

In addition a quantity of Grass Hay or Straw Mulch is computed based on 25% of the total acres to be Permanent Seeded and added to the Estimate of Quantities for Temporary Erosion Control.

Note: Some areas of a project (such as steep slopes) may have 4 Ton/Acre of Grass Hay or Straw Mulch applied.

FIBER MULCHING

_____Acres x (2000 Lb/Acre) = _____Ton
(The rate of application for Fiber Mulching will vary according to the Manufacturer's recommendations.)

BONDED FIBER MATRIX

_____Acres x (3900 Lb/Acre) = _____Ton
(The rate of application for Bonded Fiber Matrix will vary according to the Manufacturer's recommendations.)

EROSION BALES

_____Locations x 12 Erosion Bales/Location = _____

ROCK CHECK DAMS

The drainage area, slope, and necessary cross sections shall be provided to the Hydraulics Section in the Office of Bridge Design for determining rock size. See Standard Plate 734.03.

REPAIR SILT FENCE

Only 25% of the total is used based on a review of past projects and how much quantity was actually used.

_____Ft (Total Length of Silt Fence on the project including both Low Flow Silt Fence and High Flow Silt fence) x 0.25 (25%) =_____Ft

REMOVE SILT FENCE

Only 25% of the total is used based on a review of past projects and how much quantity was actually used.

_____Ft (Total Length of Silt Fence on the project including both Low Flow Silt Fence and High Flow Silt fence) x 0.25 (25%) =_____Ft

MUCKING SILT FENCE

Note: Mucking Silt Fence is calculated as the volume in the shape in the shape of a triangular prism that accumulates behind the silt fence. Only 25% of the total is used based on a review of past projects and how much quantity was actually used.

_____Ft (Total length of Silt Fence on the project including both Low Flow Silt Fence and High Flow Silt Fence)x 1/2 x 1Ft x 15 Ft divided by 27 = _____CuYd x 0.25 (25%) = _____CuYd

EROSION CONTROL BLANKET

Sta_____to Sta_____

_____ Ft (Length) x _____ Ft (Width) (typically 16 Ft or 20 Ft Width in Highway Ditch Channel) = _____SqYd

TURF REINFORCEMENT MAT

Sta_____to Sta_____

_____ Ft (Length) x _____ Ft (Width) (typically 16 Ft or 20 Ft Width in Highway Ditch Channel) = _____SqYd

CONSTRUCTION ENTRANCE

PIT RUN MATERIAL

15 Ft x 50 Ft x 1 Ft = 750 CuFt or 28 CuYd

½(10 x10) = 50 SqFt, 50 SqFt x 1 Ft = 50 CuFt or 1.9 CuYd

1.9 CuYd x 2 = 3.8 CuYd

28 CuYd + 3.8 CuYd = 31.8 CuYd

31.8 CuYd x 1.89 Ton/CuYd (Conversion Factor) = 60 Ton

GRANULAR MATERIAL FOR CONSTRUCTION ENTRANCE

31.8 CuYd x 1.89 Ton/CuYd (Conversion Factor) = 60 Ton

MSE GEOTEXTILE FABRIC

Ft x 50 Ft =750 SqFt

½(10 x10) = 50 SqFt, 50 SqFt x 2 = 100 SqFt

750 SqFt + 100 SqFt = 850 SqFt or 94 SqYd use 95 SqYd for Estimate of Quantities