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Using Compost for Erosion Control & Stormwater Management.

Solving Problems on Tough Sites.

Compost-literacy and Design.

EPA Region 5 Webinar
January 8, 2009.

Dwayne Stenlund, MSc., CPESC, CPRM
Minnesota Department of Transportation
Office of Environmental Services

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- Materials and Specifications
- Solutions
  - Median planters
  - Raingardens/landscape SW interception
  - Bioslopes
  - Bioswales
  - Filter logs
  - Filter berms/diversions
  - Wetland creation/enhancement
  - Rill repair punch-down
- Retrofits

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Standard Specifications for Construction, 2005ed. Details

- 2571 Plant Installation
- 2573 Storm Water Management
- 3890 Compost Material
- 3897 Filter Log, Type Compost
  - *Filter Log, Type Wood Chip*
  - *Filter Log, Type Metal Trap*

- Special Provisions
  - Designer Soils
    - Raingardens (10-20%)
    - Wetlands (100%)
    - Planting cells (33%)
    - Rooting soils (50%)
    - RSS wall fills (variable)
  - Erosion control
    - Blankets
    - Grouts
  - Storm Water Quality
    - Diversion Berms,
    - Filter logs
    - Retrofitting
  - Log/bag Walls

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Engineered Water Quality Soils

- Median Planters
  - 33% existing soil, 33% sand, **33% Compost**
- Rainwater Garden
  - 90% sand (3149), **10% compost** (3890)
  - 80% sand, **20% compost**
  - 70% sand, **30% compost**
  - 50% sand, **50% compost**
  - 33% existing topsoil, 33% sand, **33% Compost**
- Living Slopes, Ditches
  - 50% topsoil borrow, **50% compost**

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(2105) TOPSOIL BORROW - MODIFIED

- *A blend of three products*

S-26 This work consists of placing and cultivating topsoil in accordance the appropriate Mn/DOT Standard Specifications, the Plans, and the following:

S-26.1 Topsoil Borrow-Modified (LV) shall consist of a mixture of **1/3 Premium Topsoil Borrow** adhering to the requirements Mn/DOT 3877.2C and **1/3 Grade 2 Compost** adhering to the requirements of Mn/DOT 3890 and **1/3 Sand** adhering to the requirements of Mn/DOT 3149.2(k), blended on a volume basis. The mixture must be blended before being spread on the worksite. A sample shall be submitted to the Engineer for approval before the material is brought to the worksite.

S-26.2 Unload and store all materials in a manner so as to protect until placed.

S-26.3 Place six inches (6”) of soil and deep cultivate into the existing subgrade to a minimum of 300 mm (12 inches). Operations shall not result in soil compaction due to excessively wet soil conditions (field capacity or wetter) or improper methods. To minimize soil compaction, the Contractor shall use a spading machine to loosen and till the soil.

S-26.4 METHOD OF MEASUREMENT AND BASIS OF PAYMENT

The select topsoil borrow modified will be measured by the Cubic Yard (LV) of soil furnished and installed as specified, and measured by loose volume. Payment will be made under Item 2105.607 (Topsoil Borrow Modified (LV)) at the Contract Bid Price per cubic yard (LV), which will be compensation in full for delivering, placing, and all costs involved.

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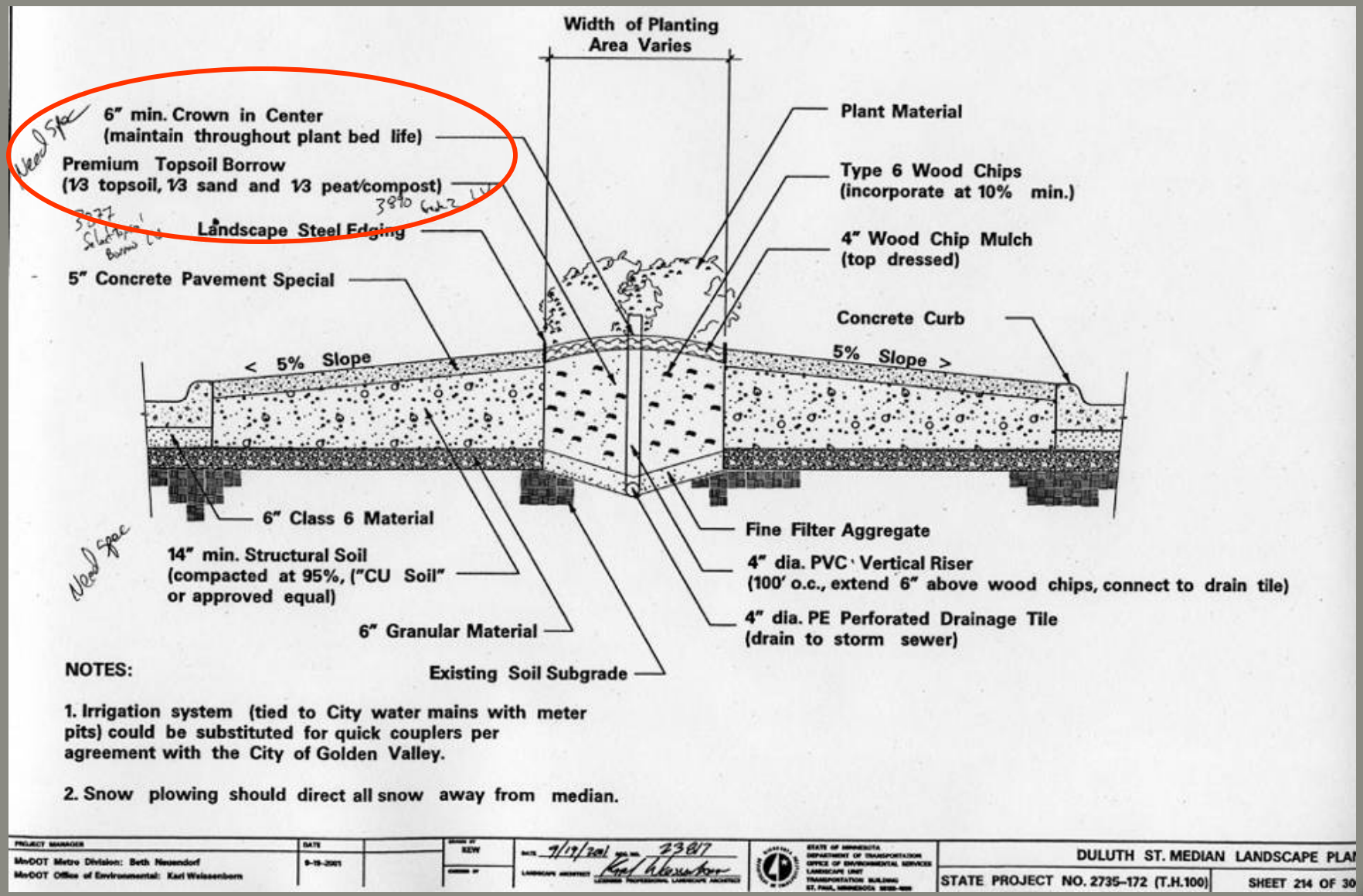
Median Planting Details



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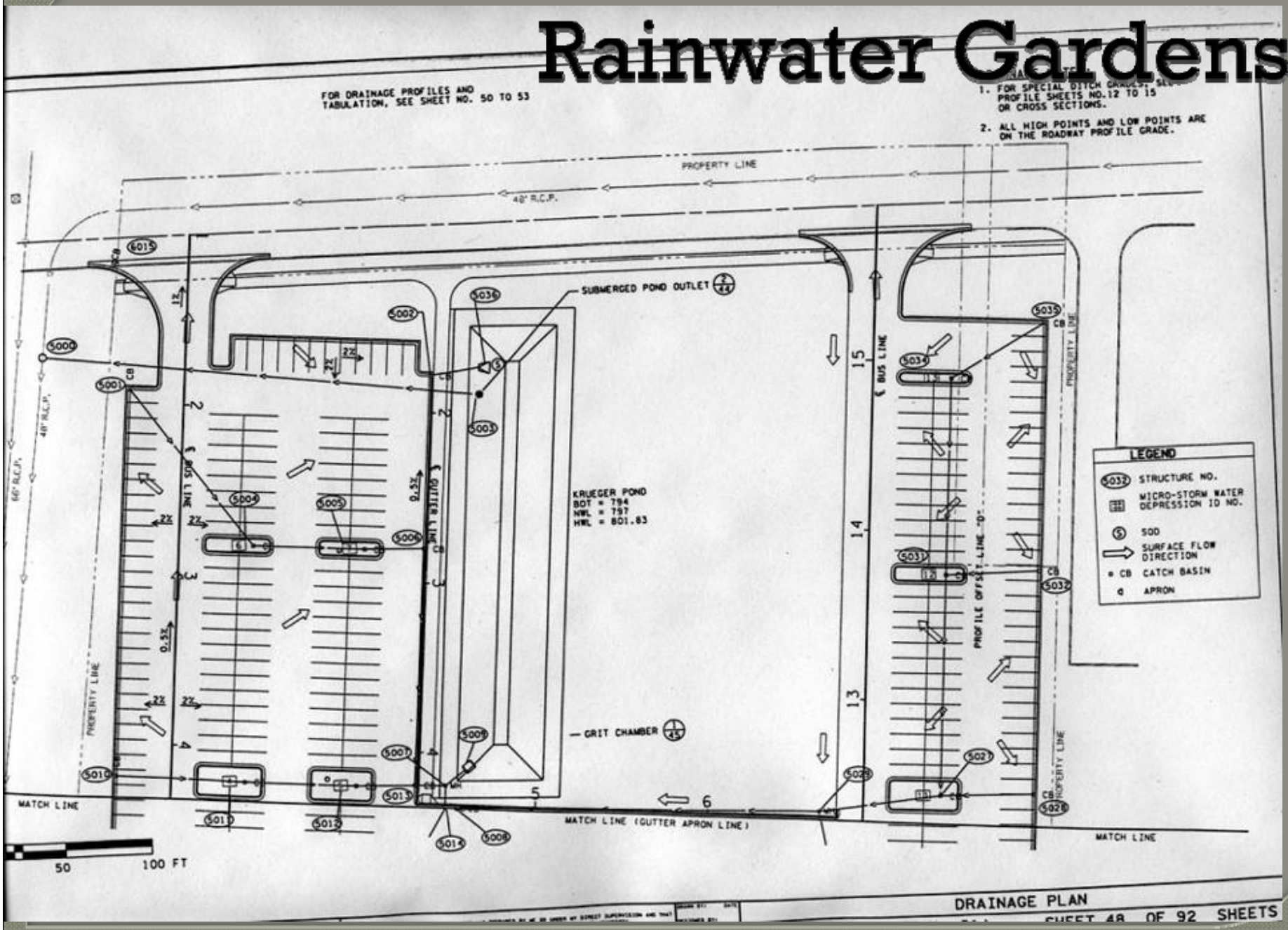
Rainwater Gardens



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Landscape Compost

- Deep ripping
- 2 to 6 inches surface applied, incorporated into12 inch original soil depth, minimum 6 ft diameter for trees, whole bed for shrubs
- Spading Machine required for incorporation

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Stormwater Landscaping

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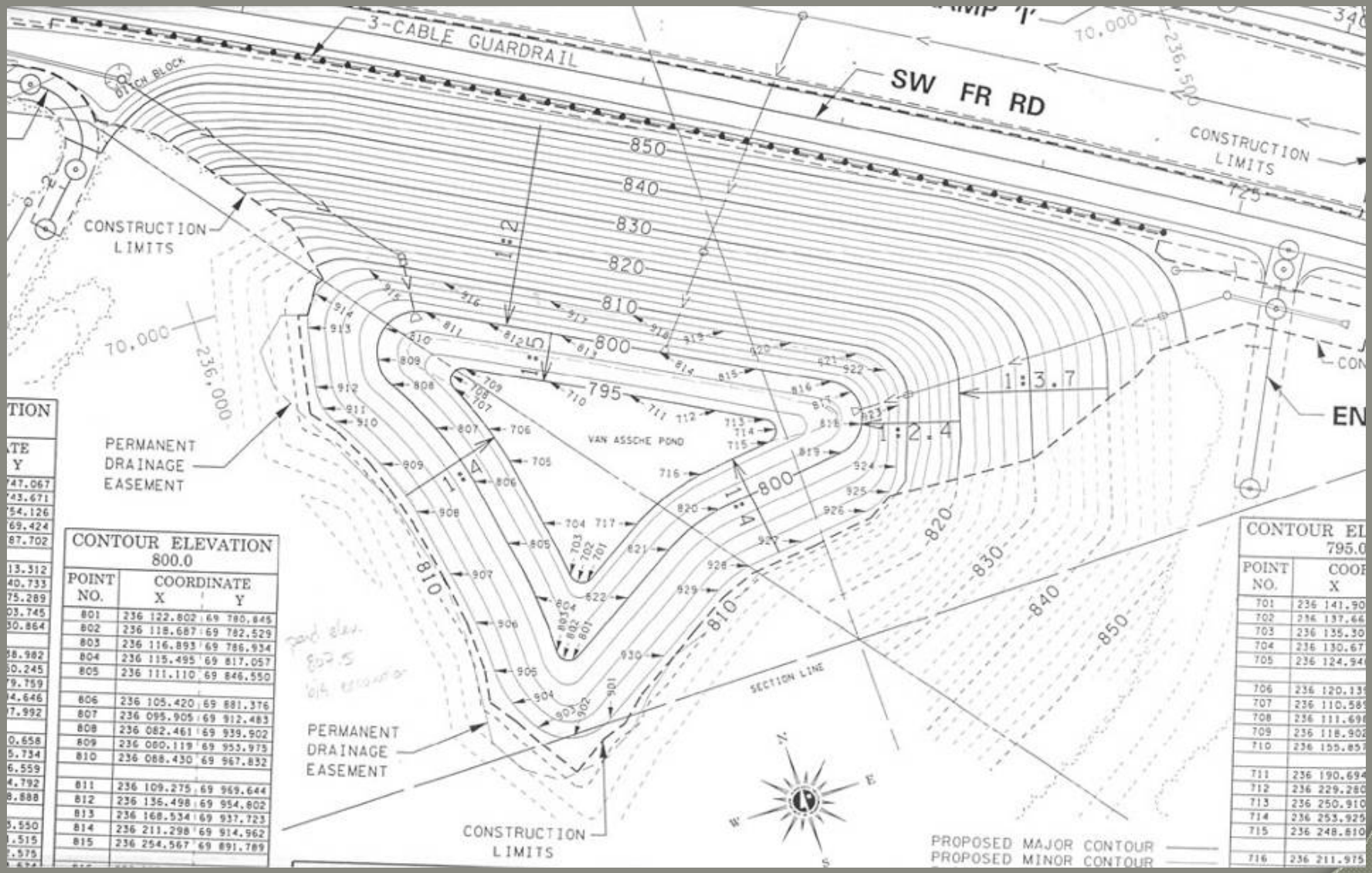
TH55/3, and more steep slopes



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50/50 Blend Topsoil/compost

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I35E Lexington Ave Bridge

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US EPA ARCHIVE DOCUMENT

TH494 Bailey Avenue Bridge

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Compost Blanket Specification

C. Application

Application rates should be between 2 to 3 inches in depth (270 to 405 cubic yards per acre) with greater depths for steeper slopes.

Table 1: Compost blanket thickness on slopes

Slope	Compost Thickness
2:1 (see comments below)	4”
3:1	3”
4:1	2”

Compost blankets may be used to stabilize steep slopes (up to 2:1) if additional measures are provided. For these severe applications, the slope length should be reduced through the installation of silt fence, filter berms or filter socks. A maximum spacing of 25 feet between slope reduction practices should be provided. In addition, lightweight mulch control netting should be placed under the compost and anchored into place. These additional practices help stabilize the blanket and prevent the material from sliding down steep grades.

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TH41 Bridge Reconstruction

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S-xxx (2575) Compost Grouting

This work shall consist of **furnishing and injecting** a water permeable compost erosion control system into riprap to remove soil particles from water moving off site into adjacent waterways or storm water drainage systems and to facilitate the establishment of vegetative cover in accordance with the applicable Mn/DOT Standard Specifications and the following:

S-xxx.2 INSTALLATION

Compost used for grouting shall be pneumatically applied with blower equipment in a non-compacted layer to fill voids of riprap, fractured bedrock or other hard armor to a minimum of 2 inches depth, or as directed by the Project Engineer.

Compost Grout application for erosion control will be integrated with a sediment control program, and may be applied in concert with Compost Logs or other sediment control methods shown in the plan. The Compost Grout may be used to blend in the riprap or compost log edges to the existing slope grade. Approximately three quarters of the riprap void depth shall have the fertilizer application, with the remaining one-forth topdress lift to have the seed, at rates per acre indicated in the plan.

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Compost Grout Cont.

Contractor will supply ample evidence showing this amount of material has been effectively placed (i.e., truck load tickets).

Contractor is required to be a certified Filtrexx Installer as determined by Filtrexx International, LLC (440-926-8041). Certification shall be considered current if appropriate identification is shown during time of bid or at time of application.

The following contractors are considered certified installers:
Windscapes Express blower Service, Dave Johnson 651-455-3993
Valley Creek, Wendi Bertelson 651-458-0778
Quickscapes, Pete Ven Housen 262-742-2006
MnLand, Mark Jefferies 952-446-1740

S-xxx.3 MEASUREMENT AND PAYMENT

Compost Grouting will be measured by the area furnished and acceptably installed. Payment will be made under Item 2575.604 (Compost Grouting) at the Contract bid price per square meter [**square yard**], which shall be compensation in full for all labor, materials, equipment and other incidentals necessary to complete the work as specified, including the cost of maintenance if specified in the plan. The provisions of Mn/DOT 1903 are modified to the extent that the **Department will not make a price adjustment in the event of increased or decreased quantities**.

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Storm water compost gabion living wall system

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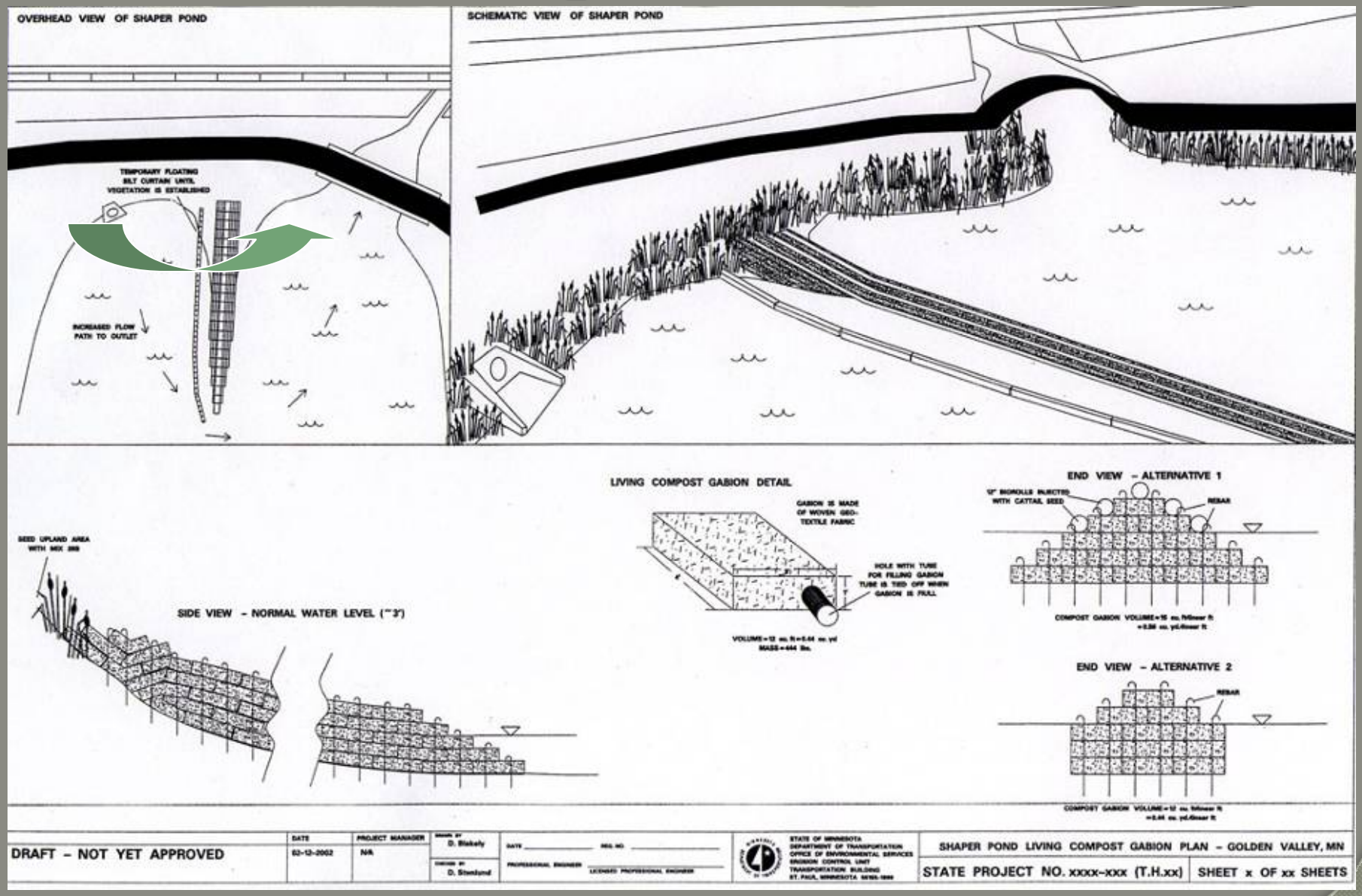
Compost Gabion System



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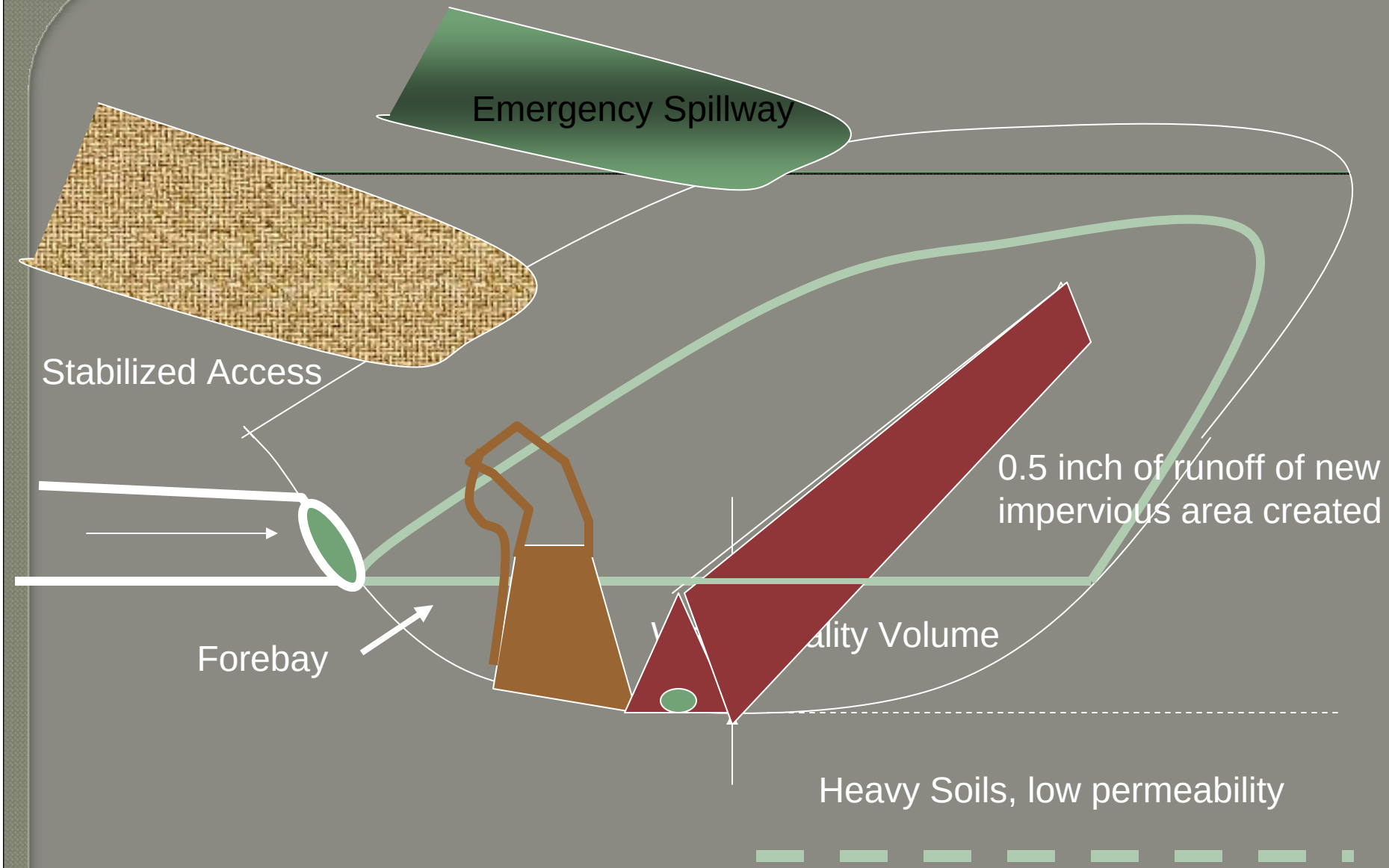

2c. Filter-berm Basins

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Temporary or Permanent Sediment Basin

- Build first or concurrent to upgradient drainage discharge
- Prepare basin between rain events
  - Clean out when ½ full
  - Gravity dewater filtration

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TH36 Bayport Wetland Construction

- Weed free start
- Five year maintenance plan
- No funding
- Must meet function and value

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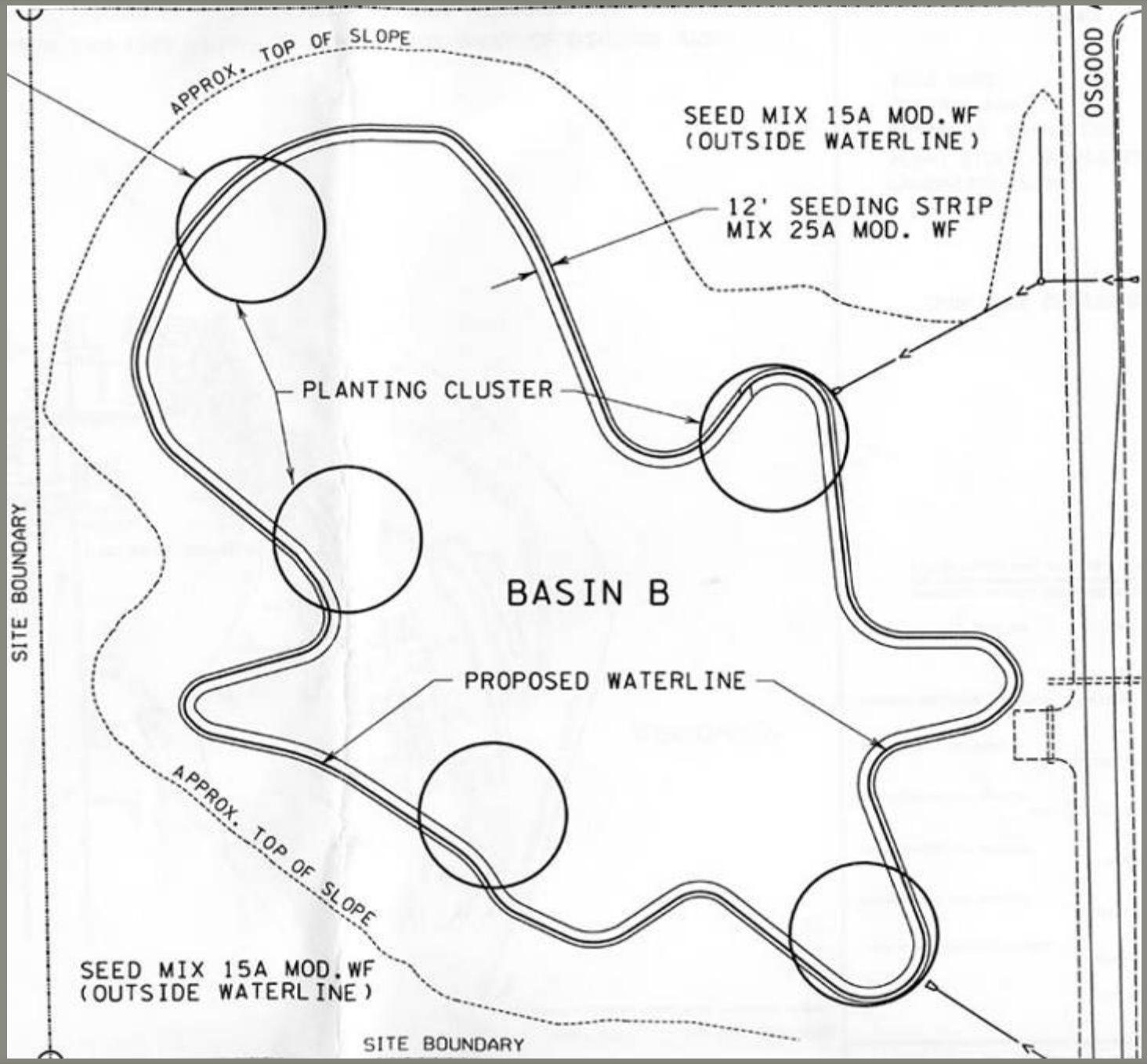

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Facility Inspection, Transport issues

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3897 Filter Logs

3897.1 SCOPE

This specification covers filter logs used for slowing and filtering storm water runoff, and other water encountered on the Project.

3897.2 REQUIREMENTS

Filter logs shall conform to the requirements of the following types, as specified in the Contract.

C Type Compost Log

Compost Log shall consist of a blend of 30-40% weed free compost as per 3890 Grade 2 and 60-70% partially decomposed wood chips. The compost/wood blend material shall pass a 51 mm (**2 inches**) sieve with a minimum of 70% retained on the 10 mm (**3/8 inch**) sieve, in accordance with TMECC 02.02-B, "Sample Sieving for Aggregate Size Classification". The compost/wood chip blend shall be pneumatically shot into a geotextile cylindrical bag. The geotextile bag shall consist of a knitted material with openings of 10 mm (**3/8 inches**) and contain the compost/wood chip material while not limiting water infiltration. The encased compost shall form a cylindrical log that is a maximum of 55 m **(180 feet)** and approximately 200 mm **(8 inches)** in diameter.

2573.540 Filter Log, Type (1) *meter (**linear foot**)*

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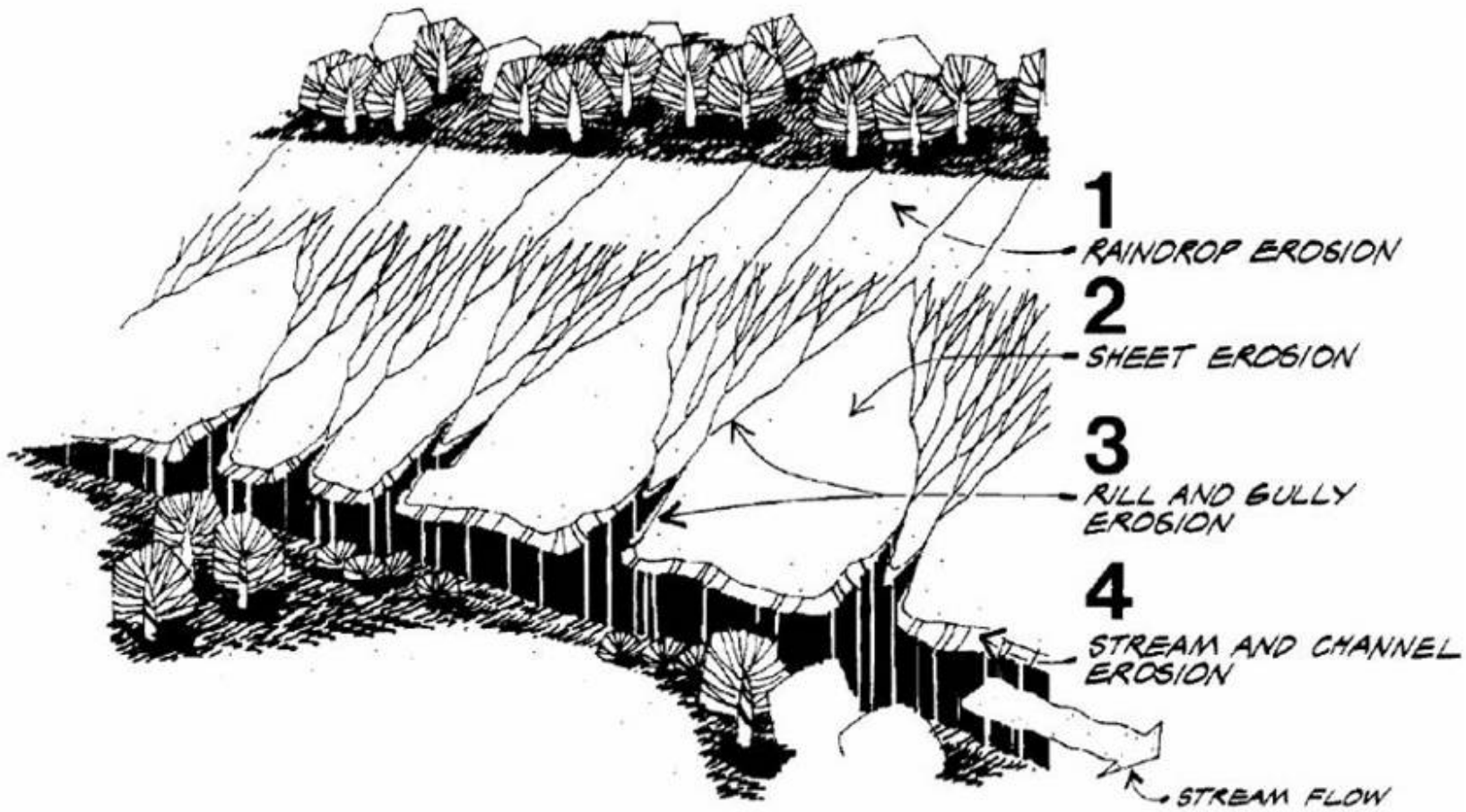
Compost Methods must fit the Erosion Type

Figure 1: Types of soil erosion by water



Source: USDA NRCS, 2002.

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3897 Filter Log, Type Compost

- Perimeter control
- Sediment trap filter walls
- Slope checks
- Inlet protection
- Culvert filters
- Concrete washout, slurry filtration

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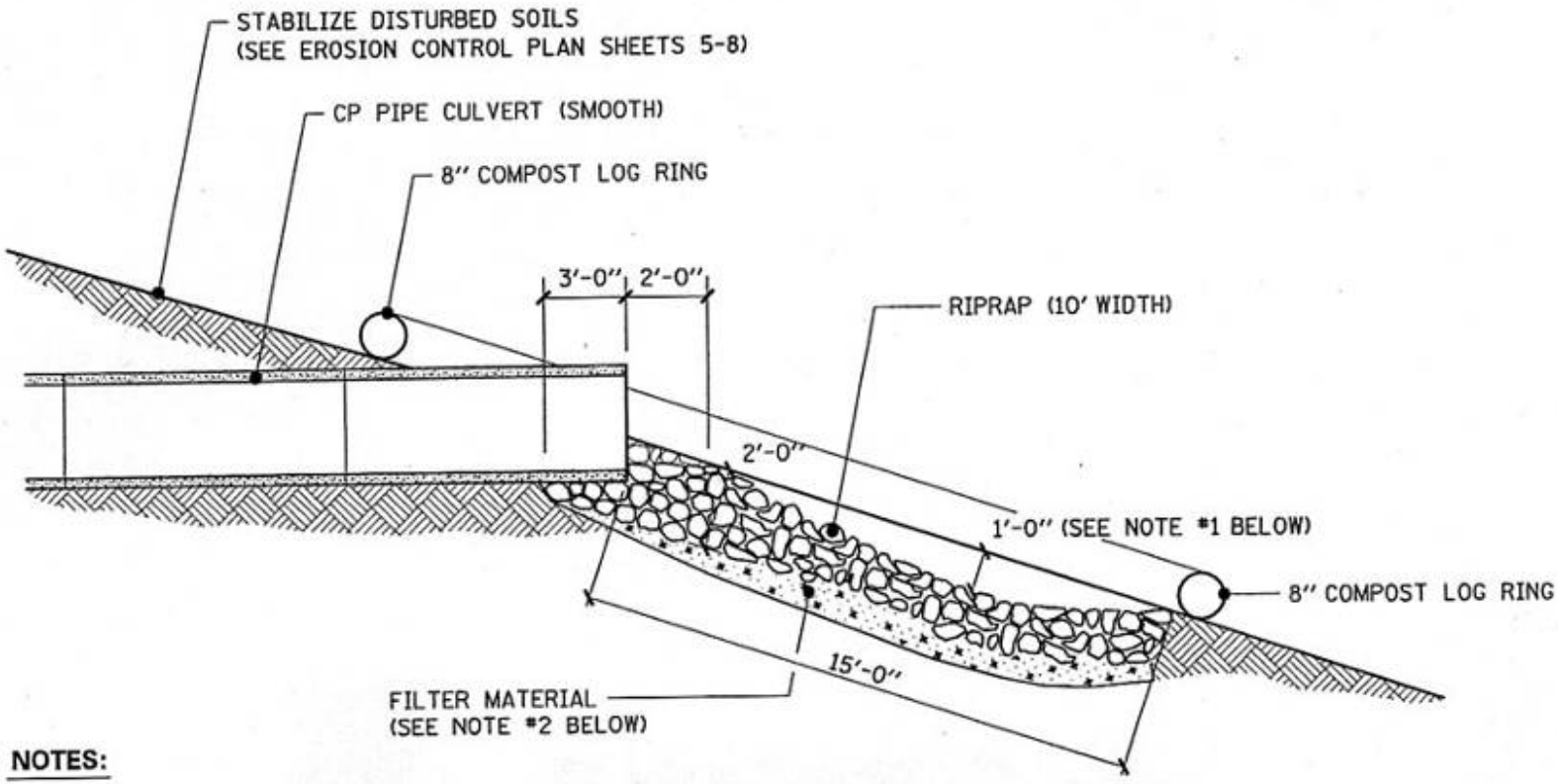
Culvert End Protection



NOTES:

1. IF GEOTEXTILE FABRIC IS USED, IT SHOULD COVER THE AREA OF THE RIPRAP AND EXTEND UNDER THE CULVERT BY 3 FEET.
2. FOR TOP VIEW OF THE PLAN, SEE STANDARD PLATE NO. 3133.

1/30 **RIPRAP (AT CP OUTLET)** (THIS DETAIL REPLACES STANDARD PLATE NO. 3133 SECTION A-A.)

0 2' 4' 8'

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Concrete Slurry Management

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Water Quality Compost Systems

- Building Walls, rooting logs and bags
- Pond dividers, fore bays, pretreatment cells
- Creating diversion Berms

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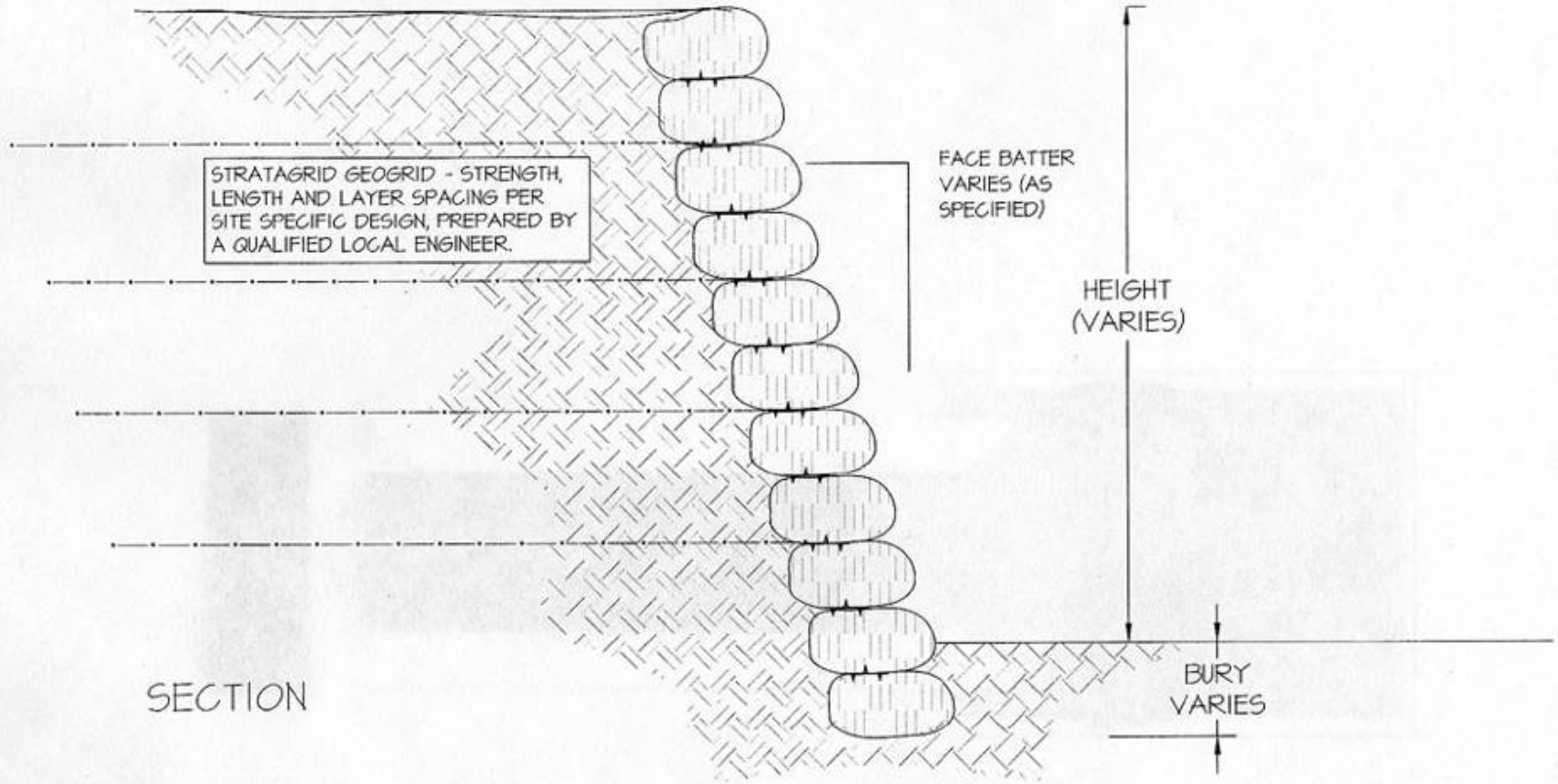

3 GEOGRID REINFORCED DELTALOK WALL; TYPICAL

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Designed by Deltalok Inc. / Printed in Canada

No.	Date	Revision	By
-	-	-	-

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Toll Free: 877.335.8256

Designed by: -
Checked by: -
Date: -
PROJECT TITLE
CITY, STATE
Scale: 3/4"=1'-0"
GEOGRID REINFORCED WALL
Proj. No: -
Drawing No: -

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Summary of erosion and sediment control measures and benefits

Section	Control Measure	Benefits				
		Flow Control (Velocity)	Erosion Control (Stabilization)	Sediment Control (Removal)	Runoff Reduction (Volume)	Flow Diversion
Vegetative & Soil Stabilization Erosion Control Measures						
7E-2	Compost Blanket	M	M	L	M	
7E-3	Dust Control		M			
7E-4	Grass Channel	L	H	L	L	
7E-5	Mulching	L	M	L	L	
7E-6	Permanent Seeding	M	H	M	M	
7E-7	Temporary Rolled Erosion Control Products	L	H			
7E-8	Sodding	M	H	M	M	
7E-9	Surface Roughening	L	L		L	
7E-10	Temporary Seeding	M	H	M	L	
7E-11	Turf Reinforcement Mats	L	H			
7E-12	Vegetative Filter Strip	L	L	M	L	
Sediment Control Measures						
7E-20	Filter Berm	L		L		L
7E-21	Filter Sock	L		L		L

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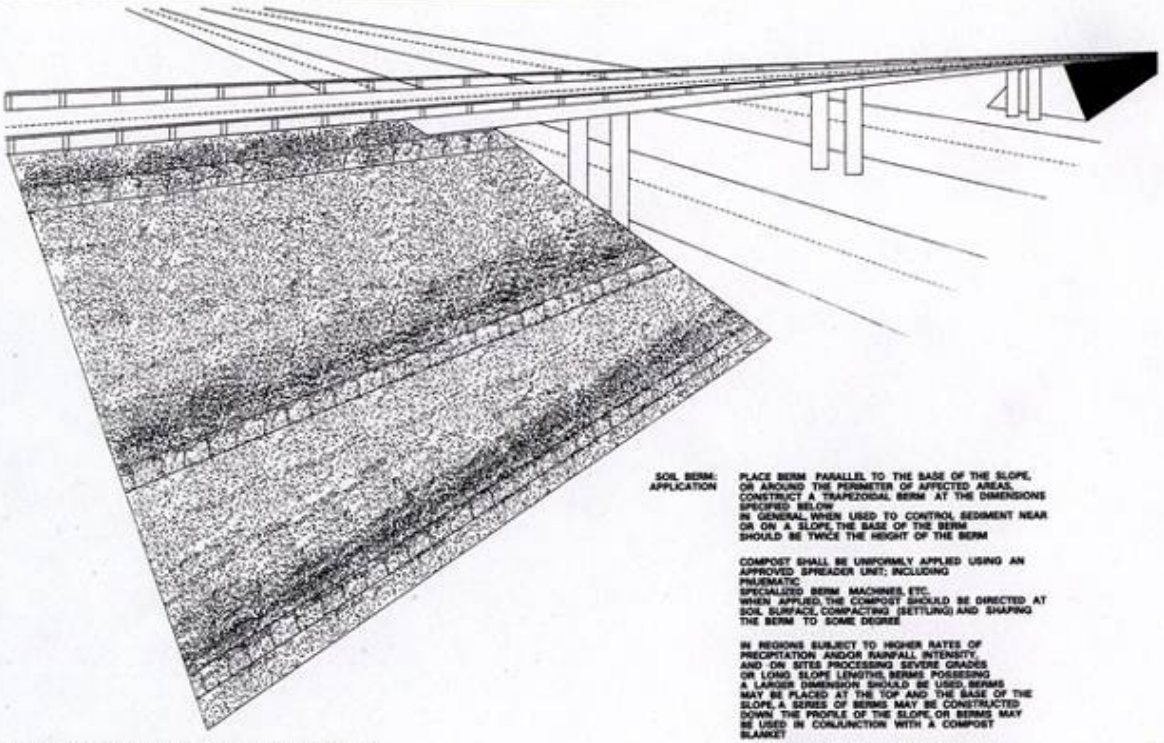
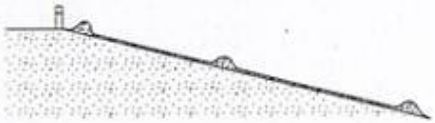
Mild to Extreme Slope Control Systems



COMPOST BERM AND BLANKET APPLICATION



SIDE VIEW COMPOST BERM AND BLANKET

SOIL BERM: APPLICATION

PLACE BERM PARALLEL TO THE BASE OF THE SLOPE, OR AROUND THE PERIMETER OF AFFECTED AREAS. CONSTRUCT A TRAPEZOIDAL BERM AT THE DIMENSIONS SPECIFIED BELOW
IN GENERAL, WHEN USED TO CONTROL SEDIMENT NEAR OR ON A SLOPE, THE BASE OF THE BERM SHOULD BE TWICE THE HEIGHT OF THE BERM

COMPOST SHALL BE UNIFORMLY APPLIED USING AN APPROVED SPREADER UNIT; INCLUDING PNUEMATIC
SPECIALIZED BERM MACHINES, ETC.
WHEN APPLIED, THE COMPOST SHOULD BE DIRECTED AT SOIL SURFACE, COMPACTING (SETTLING) AND SHAPING THE BERM TO SOME DEGREE

IN REGIONS SUBJECT TO HIGHER RATES OF PRECIPITATION AND/OR RAINFALL INTENSITY, AND ON SITES PROCESSING SEVERE GRADES OR LONG SLOPE LENGTHS, BERMS POSSESSING A LARGER DIMENSION SHOULD BE USED, BERMS MAY BE PLACED AT THE TOP AND THE BASE OF THE SLOPE, A SERIES OF BERMS MAY BE CONSTRUCTED DOWN THE PROFILE OF THE SLOPE, OR BERMS MAY BE USED IN CONJUNCTION WITH A COMPOST BLANKET

ON HIGHLY UNSTABLE SOILS, USE COMPOST IN CONJUNCTION WITH APPROPRIATE STRUCTURAL MEASURES
IF USED IN CONJUNCTION WITH A SILT FENCE, THE SILT FENCE FABRIC SHOULD BE LAID ON THE SOIL SURFACE WITH THE LIP FACING THE SLOPE
THE COMPOST
FILTER BERM SHOULD BE CONSTRUCTED AT THE BASE OF THE SEDIMENT FENCE (DOWNHILL SIDE) AND OVER THE ENTIRE FENCE FABRIC LIP

SEEDING THE BERM MAY BE DONE, IF DESIRED, IN CONJUNCTION WITH PNEUMATIC BLOWING, OR FOLLOWING BERM CONSTRUCTION WITH A HYDRAULIC SEEDING UNIT

COMPOST BERMS SHALL BE BUILT AT THE FOLLOWING DIMENSIONS:

RAINFALL/FLOW RATE	DIMENSIONS FOR THE COMPOST FILTER BERM (HEIGHT x WIDTH)
LOW	1'x2' to 1.5'x3'
AVERAGE	1'x2' to 1.5'x3'
HIGH	1'x2' to 2'x4'

COMPOST BERM DIMENSIONS SHOULD BE MODIFIED BASED ON SPECIFIC SITE AND CLIMATIC CONDITIONS, AS WELL AS PARTICULAR PROJECT RELATED REQUIREMENTS

GENERAL NOTES

SEE SPECIAL PROVISIONS FOR SPECIFIC PROJECT REQUIREMENTS.

FOR USE WITH SLOPES 1:10 TO 1:2 VERTICAL TO HORIZONTAL WITH SHEETFLOW DRAINAGE PATTERNS

USE COMPOST AS DESCRIBED BY SPEC 3896

SOIL BLANKET: APPLICATION

SCARIFY SLOPES AND REMOVE LARGE CLODS, ROCKS, STUMPS, ROOTS LARGER THAN 1/2" IN DIAMETER AND DEBRIS ON SLOPES WHERE VEGETATION ISTO BE ESTABLISHED
SOIL PREPARATION STEP MAY BE ELIMINATED WHERE APPROVED BY THE LANDSCAPE ARCHITECT/DESIGNER, OR WHERE SEEDING AND PLANTING IS NOT PLANNED
WHERE PRACTICAL, TRACK (COMPACT) SLOPE USING A BULLDOZER BEFORE APPLYING COMPOST AS A SURFACE MULCH

COMPOST SHALL BE UNIFORMLY APPLIED USING AN APPROVED SPREADER UNIT; INCLUDING BULLDOZERS, PNUEMATIC BLOWERS, SIDE DISCHARGE MANURE SPREADERS, ETC.
TRACK (COMPACT) THE COMPOST LAYER USING A BULLDOZER, OR OTHER APPROPRIATE EQUIPMENT, WHERE PRACTICAL
ALTERNATIVELY, APPLY COMPOST USING A PNEUMATIC (BLOWER) UNIT, OR OTHER UNIT THAT PROPELS THE PRODUCT. PROJECT COMPOST DIRECTLY AT SOIL SURFACE, THEREBY PREVENTING WATER FROM MOVING BETWEEN THE SOIL–COMPOST INTERFACE
WATER THOROUGHLY TO IMPROVE SETTLING
APPLY COMPOST LAYER APPROXIMATELY 3 FEET OVER THE TOP OF THE SLOPE, OR OVERLAP IT INTO EXISTING VEGETATION

IN REGIONS SUBJECT TO HIGHER RATES OF PRECIPITATION AND/OR RAINFALL INTENSITY, AND ON SITES PROCESSING SEVERE GRADES OR LONG SLOPE LENGTHS, THE COMPOST BLANKET MAY BE USED IN CONJUNCTION WITH A COMPOST FILTER BERM
THE FILTER BERM SHOULD BE APPROXIMATELY 1 FOOT HIGH, BY 2 FEET WIDE, AND MAY BE PLACED AT THE TOP OR BASE (OR BOTH) OF THE SLOPE

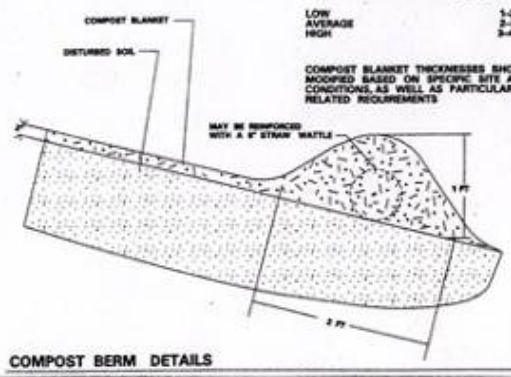
ON HIGHLY UNSTABLE SOILS, USE COMPOST IN CONJUNCTION WITH APPROPRIATE STRUCTURAL MEASURES

APPLYING SEED BEFORE FINAL TRACKING IS PREFERRED WHERE DRY SEEDING IS SPECIFIED
HYDRAULIC SEEDING MAY BE COMPLETED AFTER TRACKING IS COMPLETED

COMPOST SHALL BE APPLIED AT THE FOLLOWING RATES:

RAINFALL/FLOW RATE	APPLICATION RATE FOR COMPOST BLANKET
LOW	1"-2"
AVERAGE	2"-3"
HIGH	3"-4"

COMPOST BLANKET THICKNESSES SHOULD BE MODIFIED BASED ON SPECIFIC SITE AND CLIMATIC CONDITIONS, AS WELL AS PARTICULAR PROJECT RELATED REQUIREMENTS



COMPOST BERM DETAILS

DRAFT – NOT YET APPROVED	DATE 01-16-2002	PROJECT MANAGER	DRAWN BY D. BLAKELY / CHECKED BY L. HOLM	STATE OF MINNESOTA DEPARTMENT OF TRANSPORTATION OFFICE OF ENVIRONMENTAL SERVICES EROSION CONTROL UNIT TRANSPORTATION BUILDING ST. PAUL, MINNESOTA 55155-1899	STANDARD COMPOST BLANKET AND BERM FOR EROSION AND SEDIMENT CONTROL	STATE PROJECT NO. XXXX-XX (T.H. XXX)	SHEET X OF XX SHEETS

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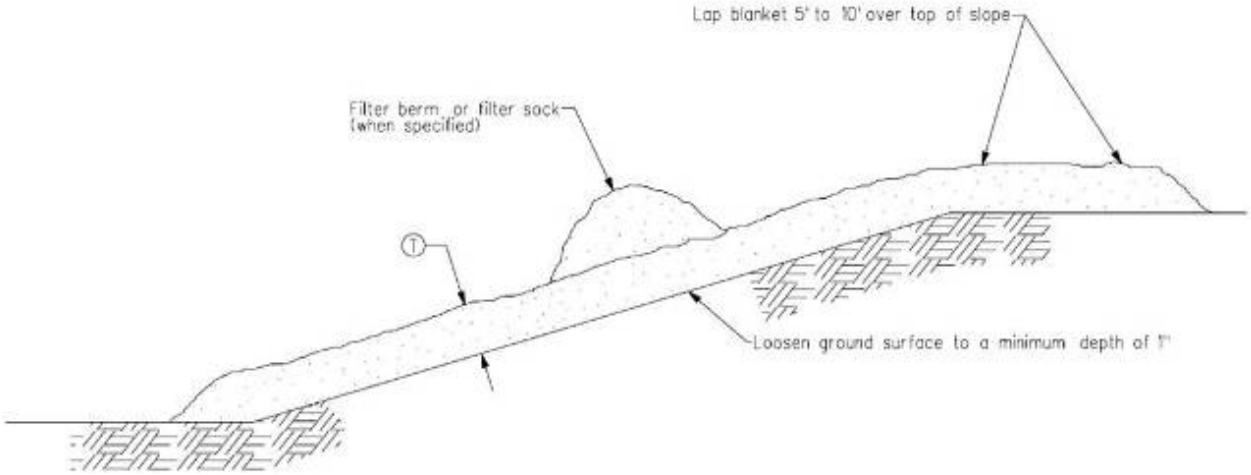
Iowa Detail

GENERAL NOTES:

Compost blanket may be vegetated or unvegetated as specified in the contract documents.



COMPOST BLANKET DETAIL

Table 1

SLOPE	BLANKET THICKNESS (T)
3:1	3"
≤ 4:1	2"

MINIMUM COMPOST BLANKET THICKNESS

SUDAS

REVISION NO. ---

REVISION DATE 10/17/06

FIGURE: 9040.1

SHEET 1 OF 1

COMPOST BLANKET

FIGURE: 9040.1 SHEET 1 OF 1

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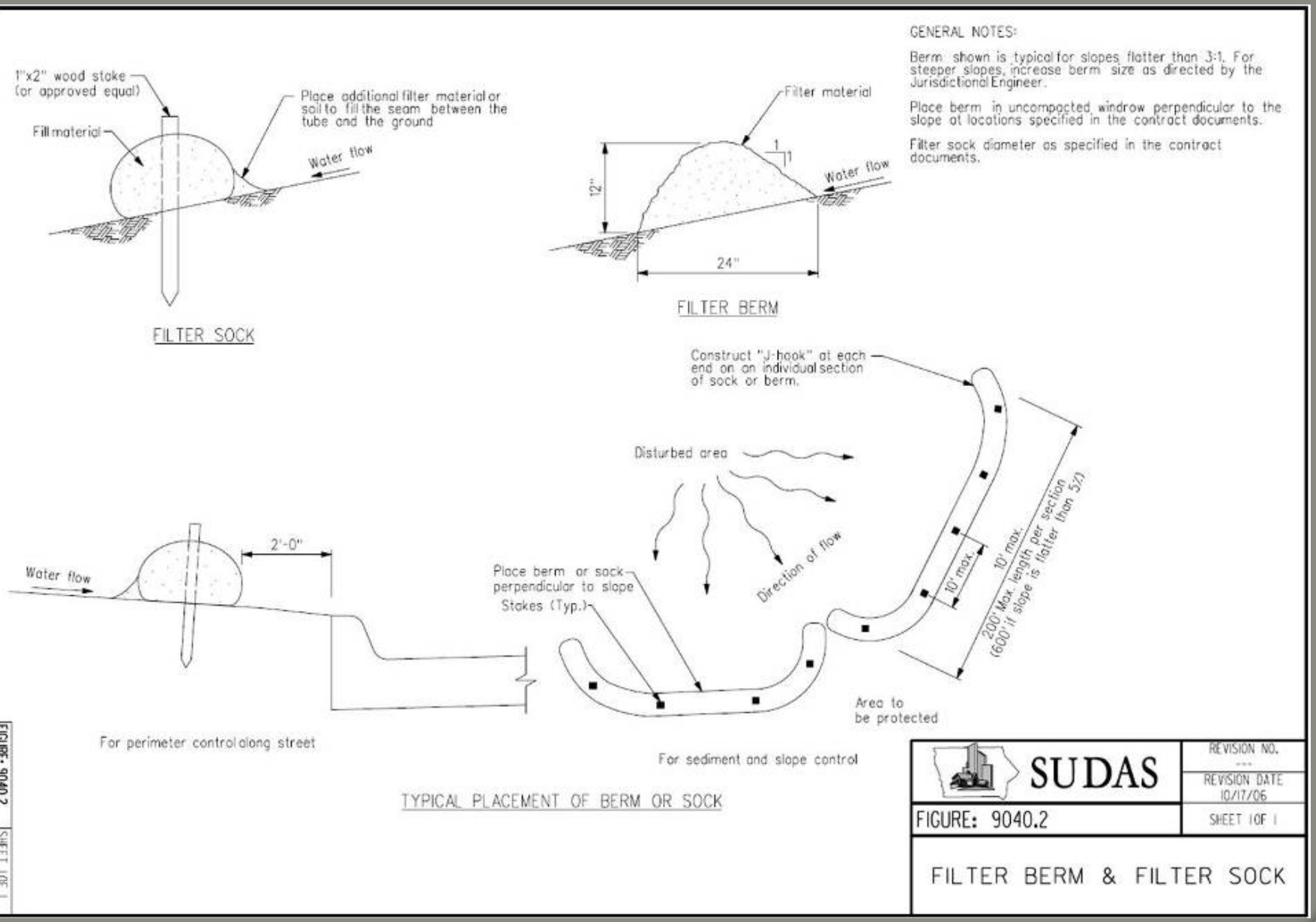

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Fall 2006 TH13 Slope Failure Reconstruction

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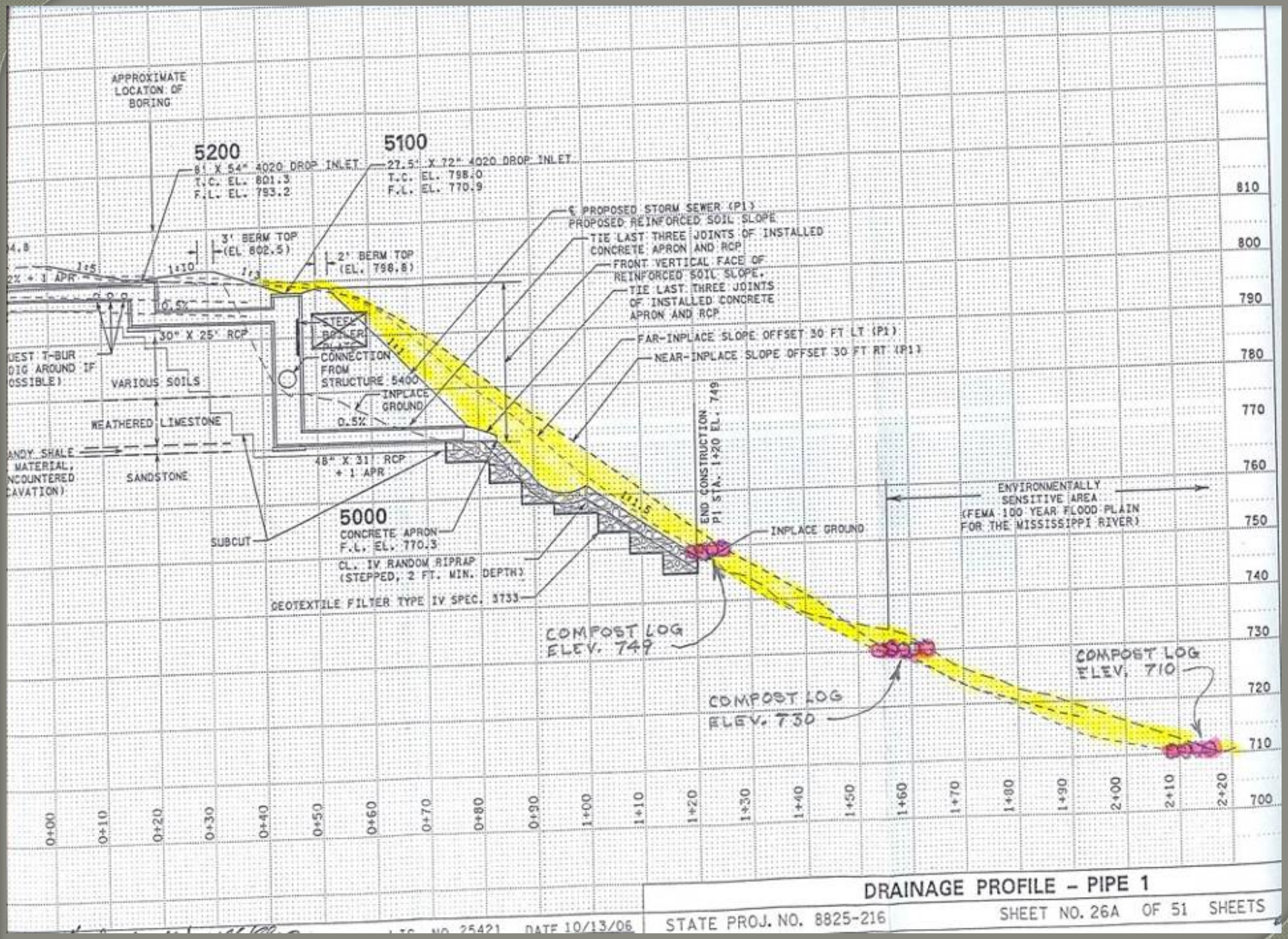

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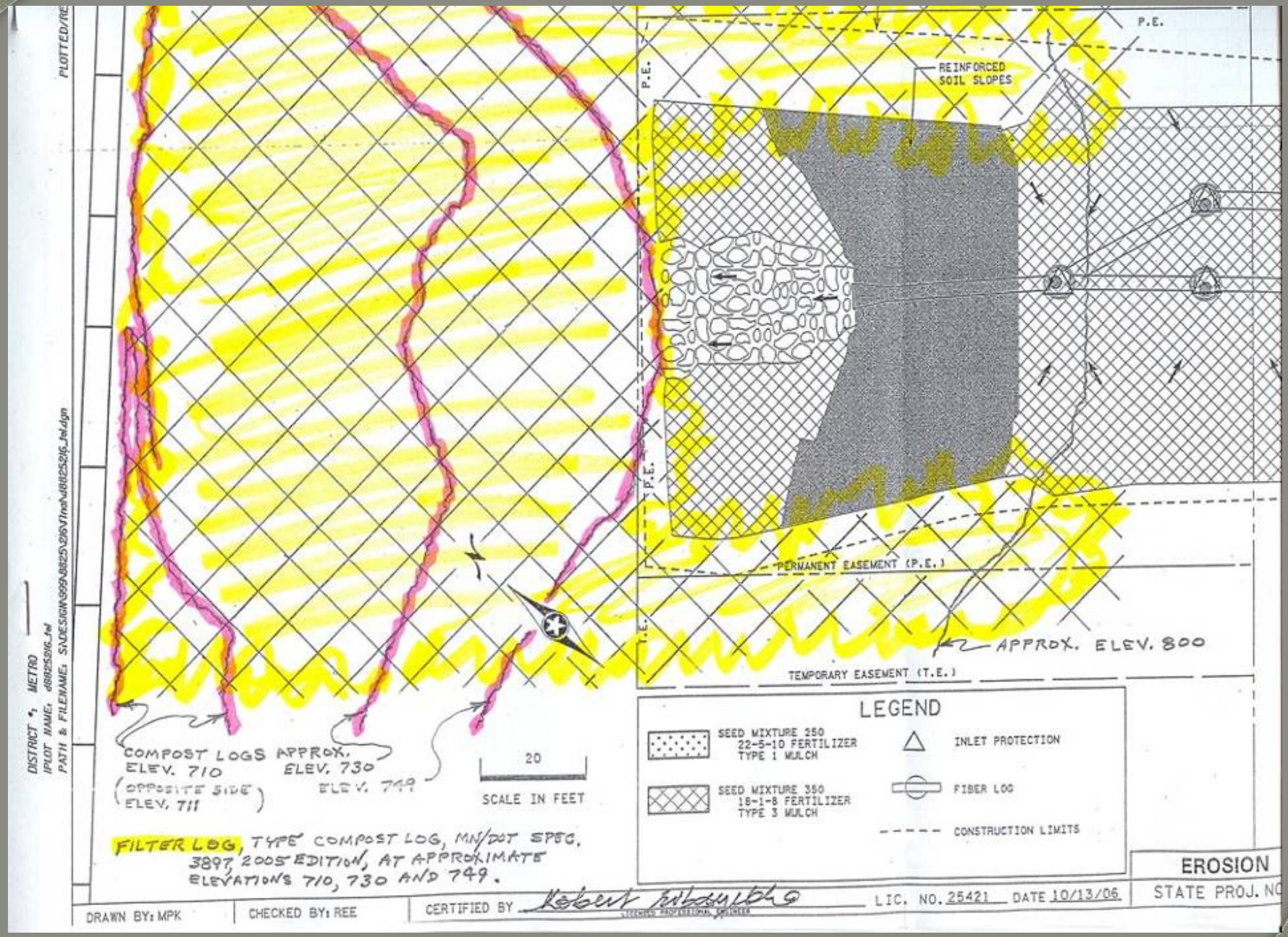

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Selected Project Examples

- TH 61, Erosion Control & Storm Water Quality Program
- TH316 Shoulder repairs
- TH3 Rooting soils, native plant community
- Cottage Grove Park & Ride Rain Gardens
- TH36 Wetland Mitigation Construction
- Landscape rooting soils
- Storm Water Retrofits

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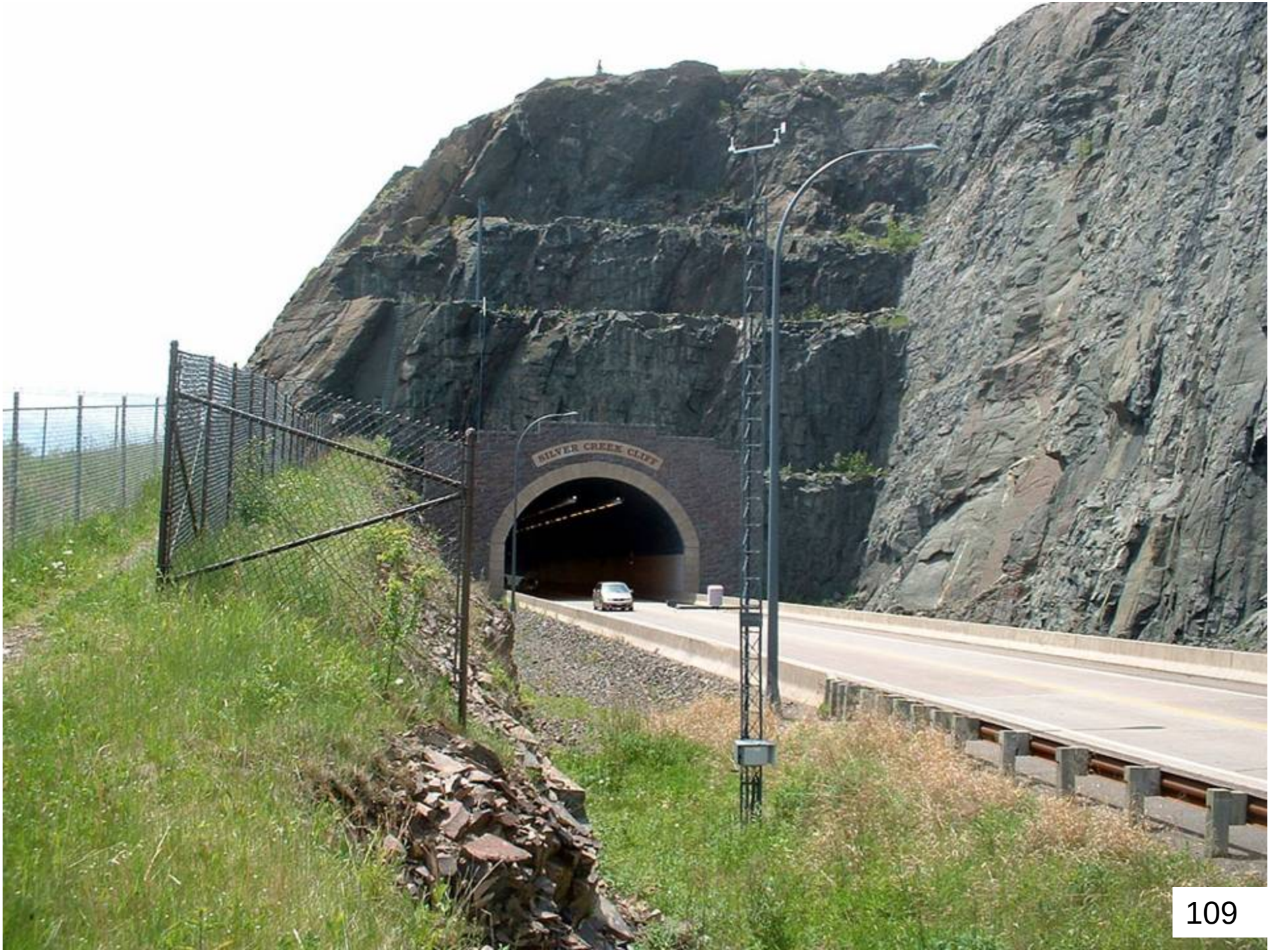

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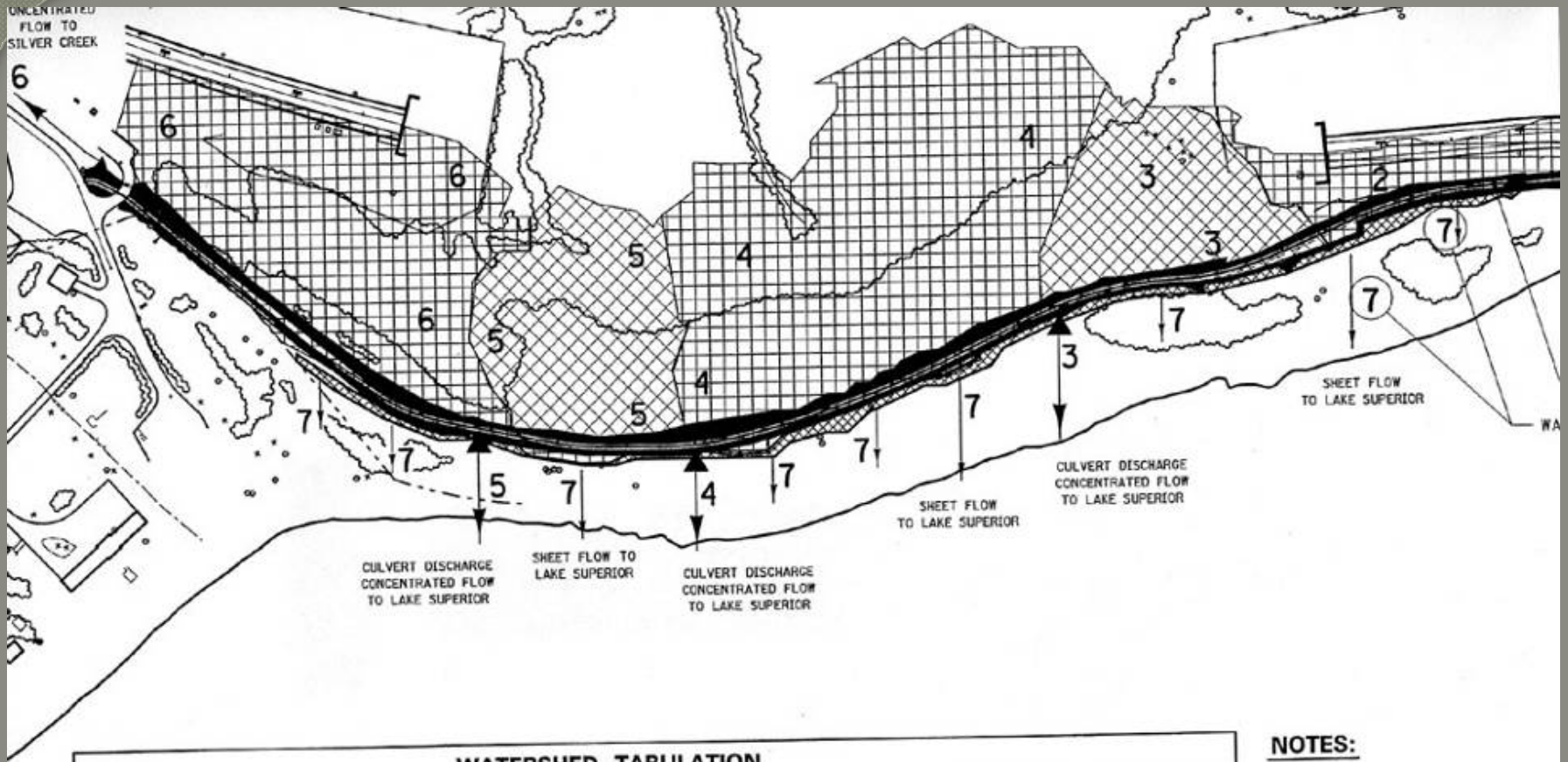

WATERSHED TABULATION

AREA	SURFACE AREA TOTAL	DISTURBED AREA	FLOW TYPE	RECEIVED BY	AREA	S.Y.	AC.	RAPID STABILIZATION METHOD 3	4	5
1	23,630 S.F.	7,285 S.F.	CONCENTRATED	LAKE SUPERIOR	1	809	0.17	X	X①③	X
2	81,497 S.F.	28,678 S.F.	CONCENTRATED	LAKE SUPERIOR	2	3186	0.66	X③④		X③
3	81771 S.F.	5,458 S.F.	CONCENTRATED	LAKE SUPERIOR	3	606	0.13		X①③	X
4	247,193 S.F.	7,744 S.F.	CONCENTRATED	LAKE SUPERIOR	4	860	0.18		X①③	X
5	92,824 S.F.	4,682 S.F.	CONCENTRATED	LAKE SUPERIOR	5	520	0.11		X①③	X
6	190,447 S.F.	12,190 S.F.	CONCENTRATED	SILVER CLIFF CREEK	6	1354	0.28		X①③	X
7		6,660 S.F.	SHEET FLOW	LAKE SUPERIOR	7③	740	0.15		X①②③	

NOTES:

① ALL SLOPES AND DISTURBED AR
MUST BE STABILIZED 200' UPST

② ALL POSITIVE SLOPES TO LAKE
PROGRESSIVELY WORKING THE A

③ 1/6 ACRE INCREMENTS WITHIN
EXPOSED SOILS - 7 DAYS

④ ALL TOPSOIL STOCKPILES WILL

FILE NAME	DATE	PROJECT MANAGER	DRAWN BY	
CAEN2KS004\I:\sitedevelopment\mn\prj\class4\silvercl\finals\silvercliff.004	04-MAR-2004 17:13	D. OBERNOLTE	CHECKED BY D. OBERNOLTE	I HEREBY CERTIFY THAT THIS PLAN WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL LANDSCAPE ARCHITECT UNDER THE LAWS OF THE STATE OF MINNESOTA. DATE 02-03-03 LIC. NO. 19383

STATE OF MINNESOTA
DEPARTMENT OF TRANSPORTATION
OFFICE OF TECHNICAL SUPPORT
SITE DEVELOPMENT MS498
TRANSPORTATION BUILDING
ST. PAUL, MINNESOTA 55155-1899

SILVER CREE

STATE PROJ. NO.

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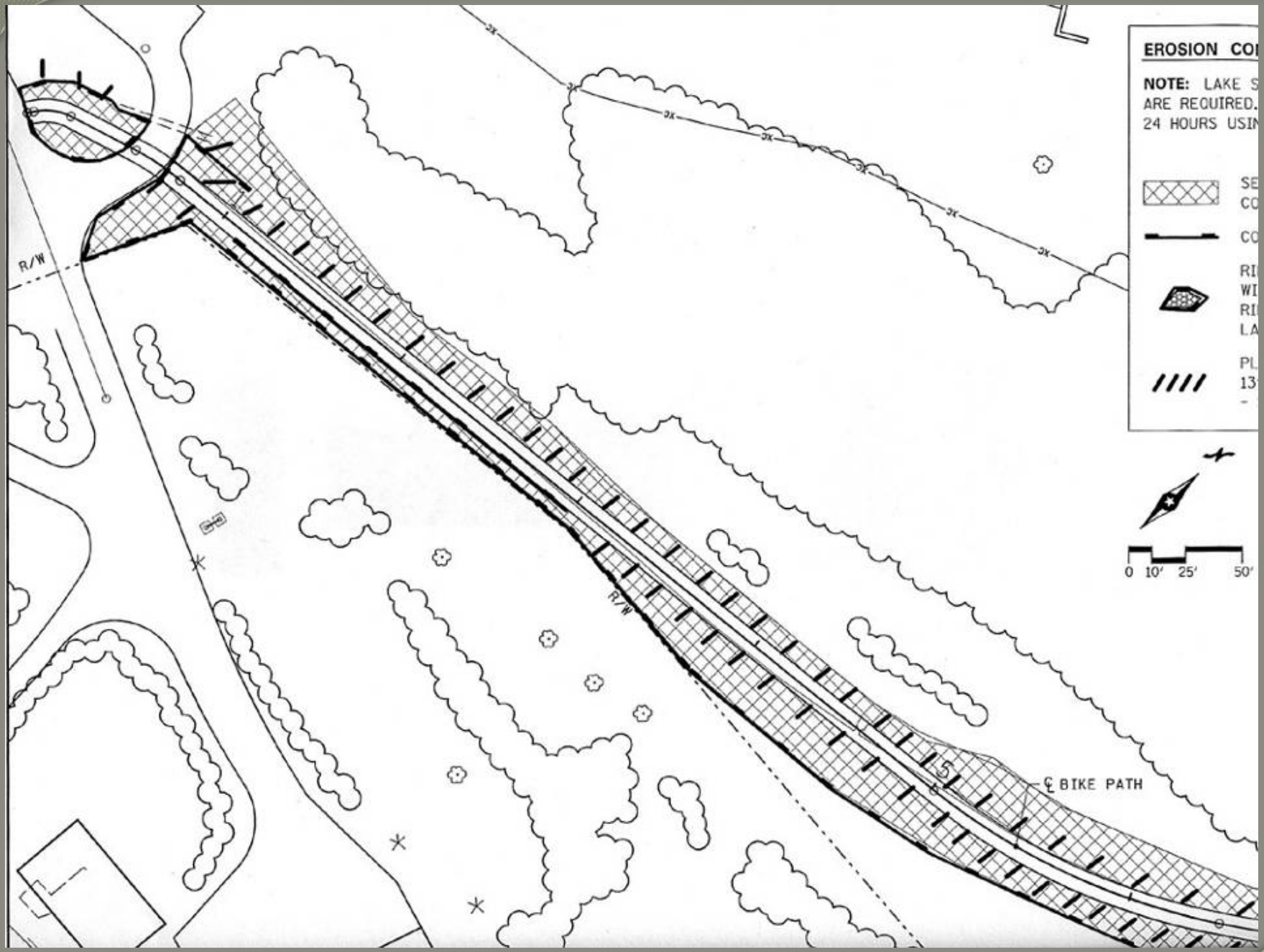

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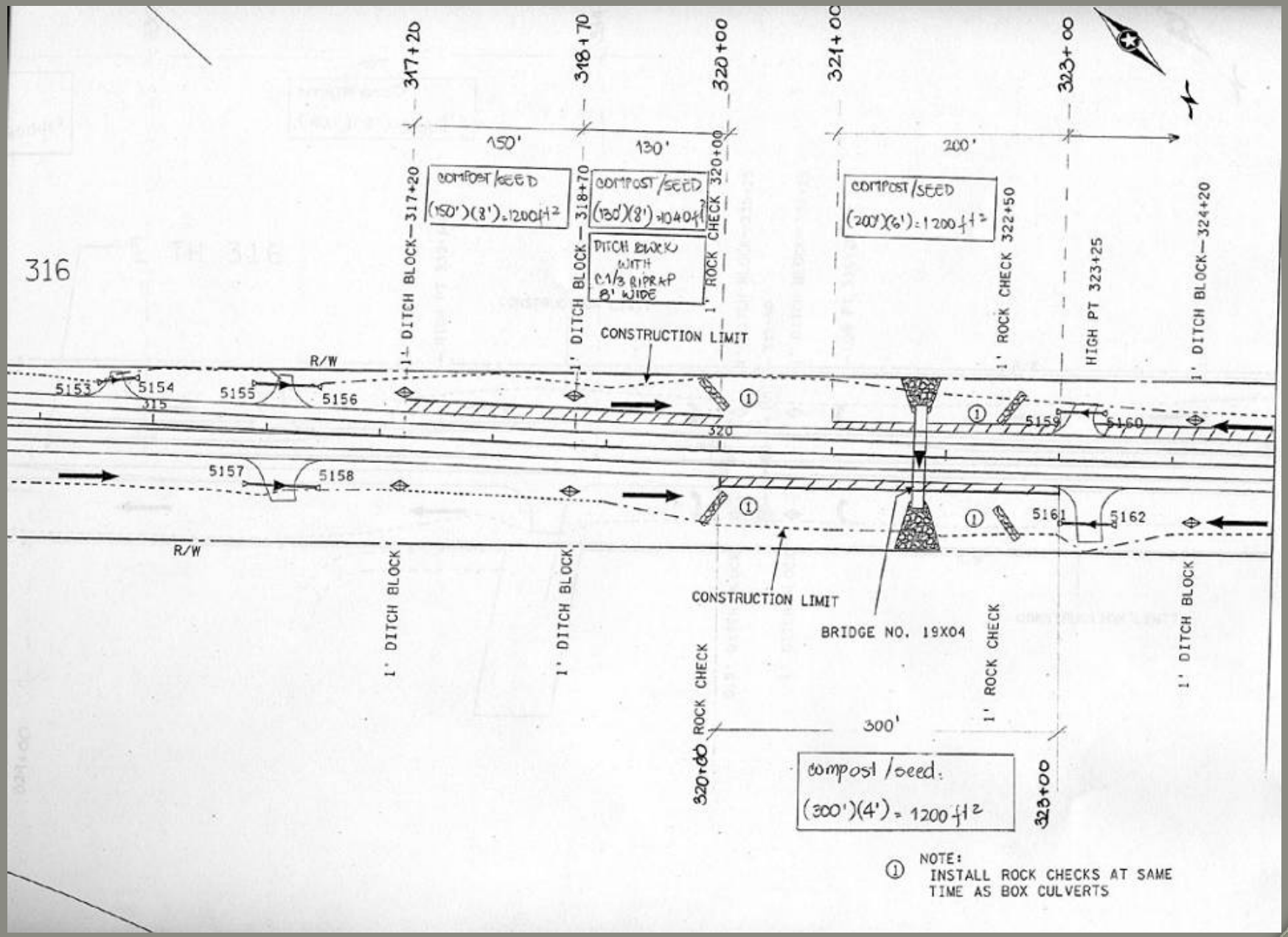

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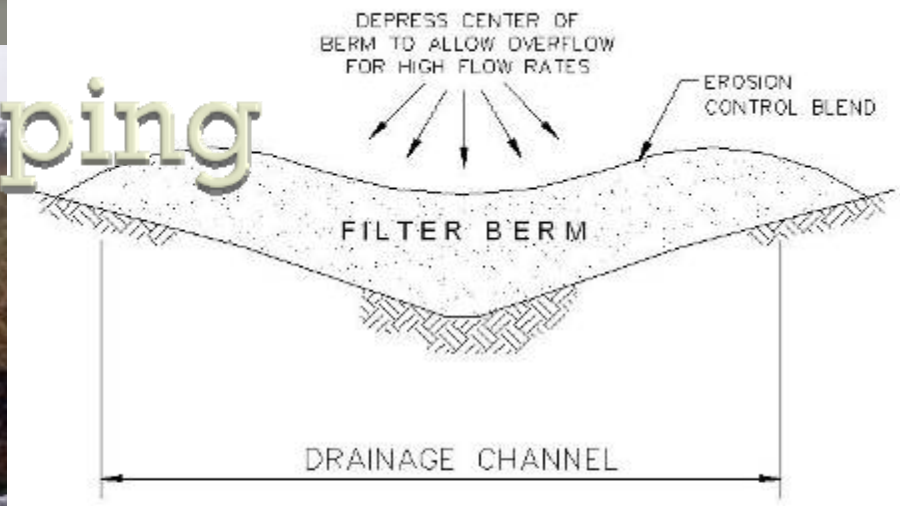
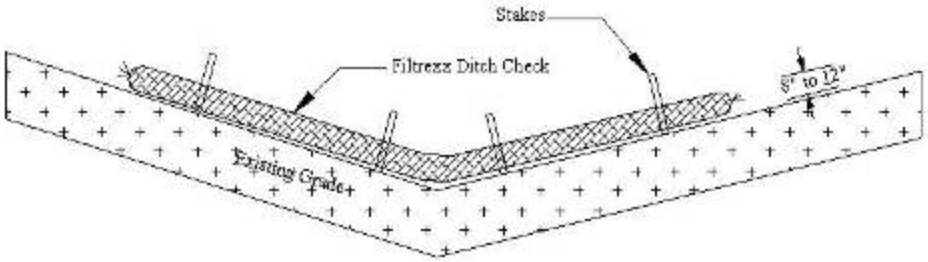
Nutrient Trapping



FILTER BERM DETAIL
PROFILE OF FILTER BERM
IN DRAINAGE CHANNEL

Drainage Channel



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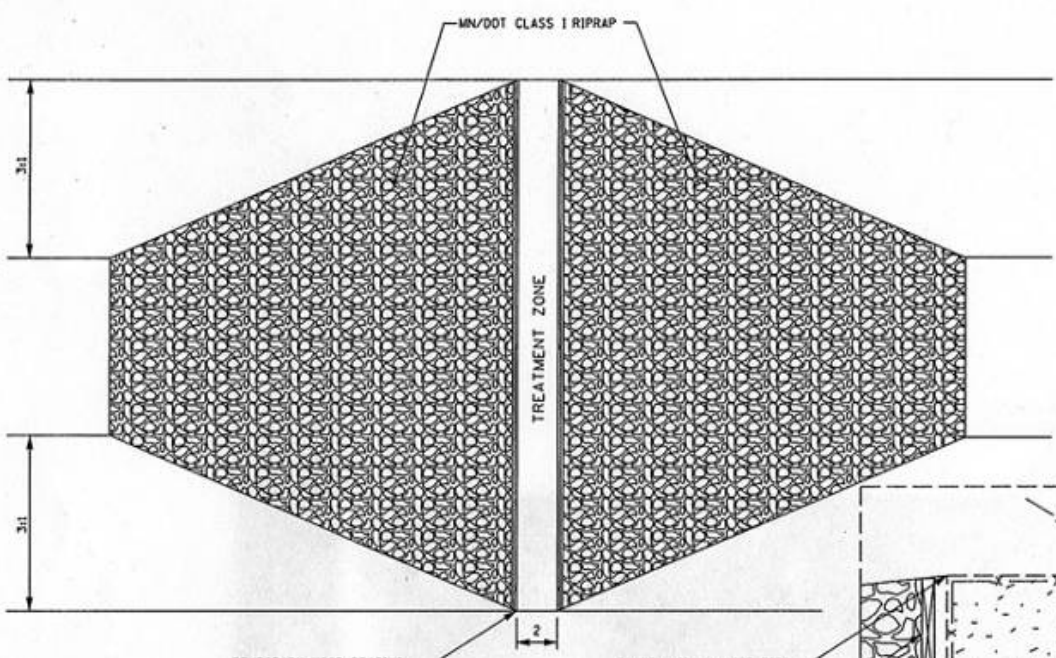
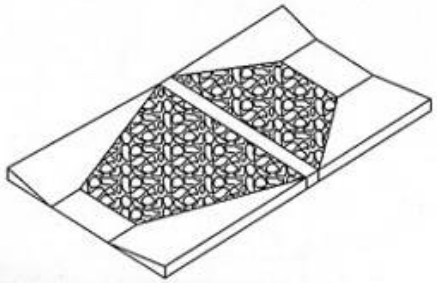
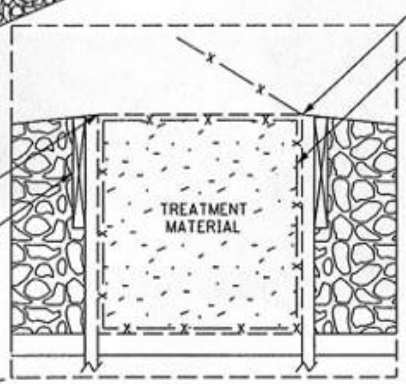




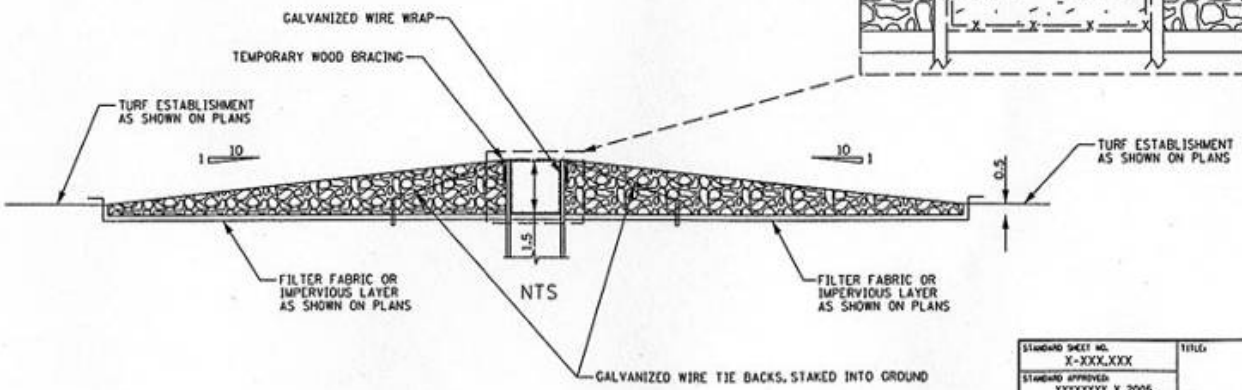


LEGEND

— — — FILTER FABRIC

—X—X— GALVANIZED WIRE FENCING

CONTAMINANT	TREATMENT MATERIAL
HEAVY MATALS	PEAT/COMPOST MIXTURE
OILS	ACTIVATED CARBON
VOC/ORGANICS	ACTIVATED CARBON
FECAL MATTER	PEAT/COMPOST MIXTURE
NITROGEN PHOSPHORUS OR POTASIUM	COMPOST OR PEAT/COMPOST MIXTURE
SEDIMENTS	COMPOST AND FLOCULLANTS



STANDARD SHEET NO. X-XXX.XXX	TITLE: TEMPORARY EROSION CONTROL BIO DITCH CHECK
STANDARD APPROVED: XXXXXXXX X, 2005	

SHEET NO. OF SHEETS

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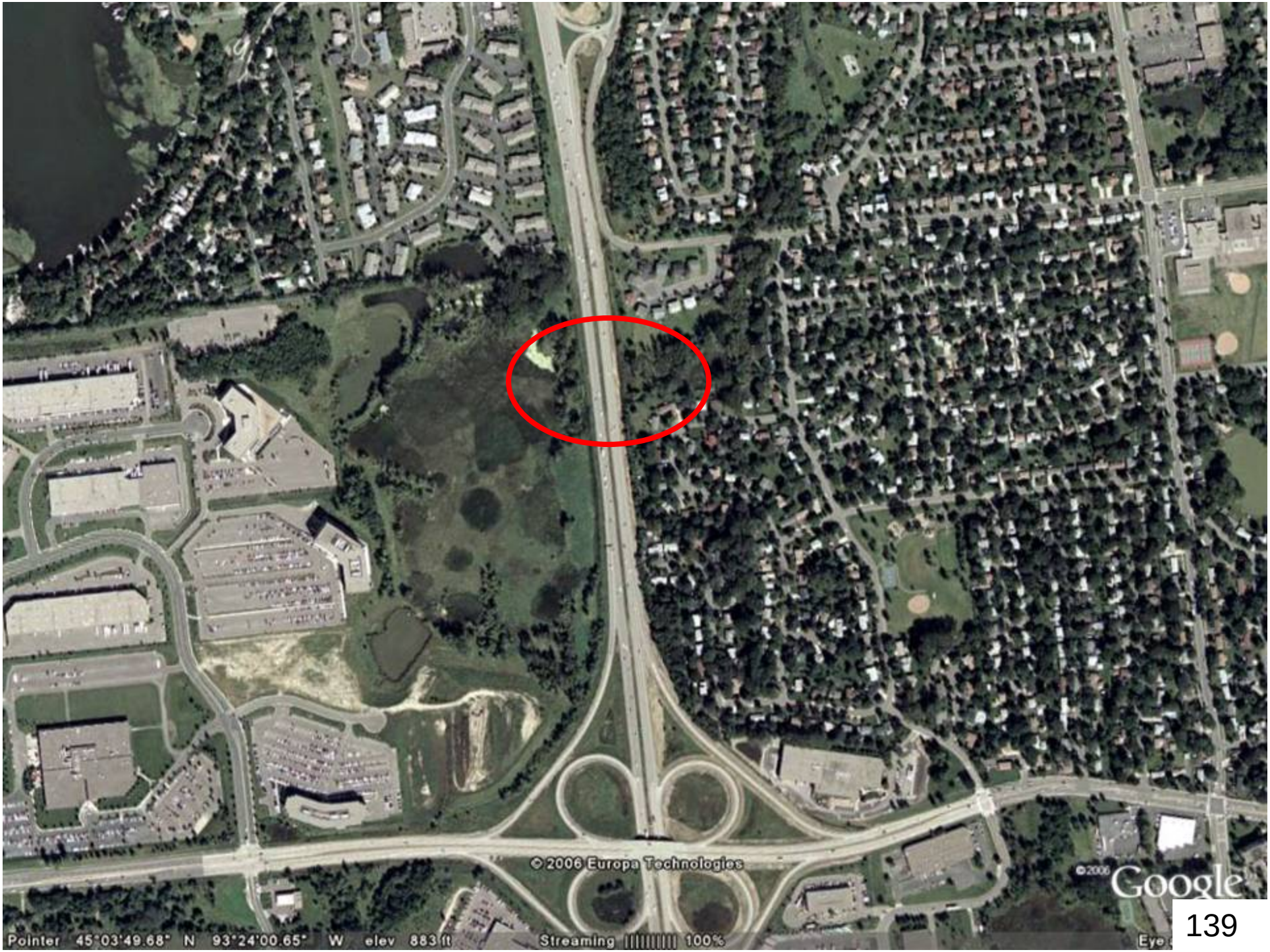

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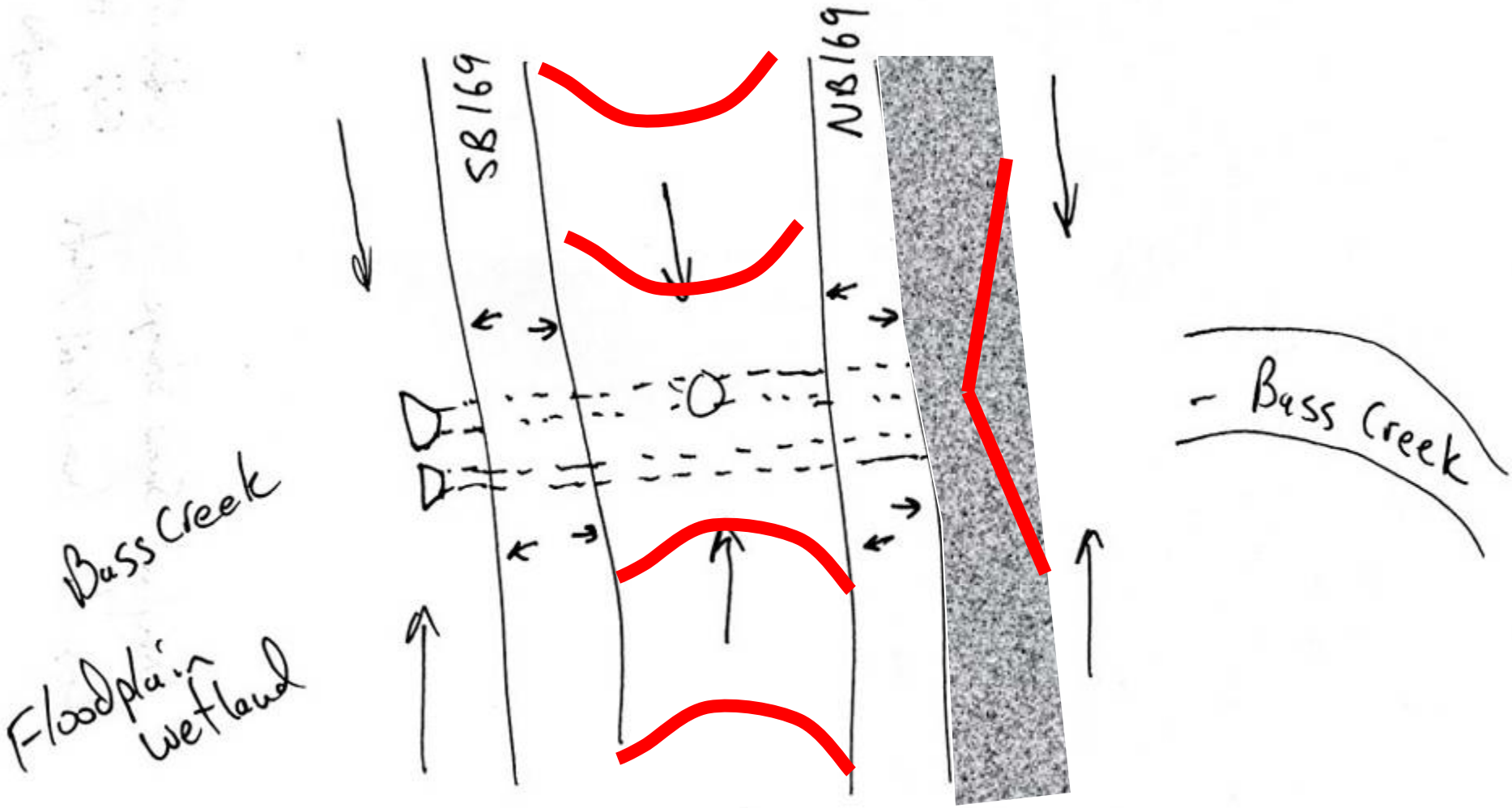

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Bass Creek Stormwater Quality BMPs

- Compost diversion chevrons
- Compost filter blankets
- Compost filter berms

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Changing Problems

- Disease transmission
- Biohazard, ecoterrorism?
  - Notice of Violation: MPCA/MDA
- Stakeholder complaints
- MS4, ditch maintenance
  - Impaired waters
    - bacteria
  - TMDL
    - Bacteria
- What to do with the processed materials

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Safety is Job One

- Exposure issues of skin, lungs, eyes
  - Hauling
  - Applicator
  - Public stakeholders

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No Limit to Imagination

- Landscape medium
- Lawn Medium, minimum watering
- Erosion Control
- Sediment control
- Steep slope stabilization
- Storm water quality
- Chemical management
- Wetland restoration
- Safety

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Questions

- dwayne.stenlund@dot.state.mn.us
- 651-366-3625
- 612-810-9409

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Use of Organics

- Muck (wetland peaty) soils
- Peat
- Wood slash
- Compost
  - Leaf and grass feedstock
  - Manure/animal parts feedstock
  - Roadkill

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