CONSTRUCTION PLAN

PRACTICE(S) 412 Grassed Waterway, 606 Subsurface Drain

LANDOWNER CLAYTON KRUSE ET AL ATTN. HANS BREITENMOSER JR

SITE ADDRESS W6874 COUNTY RD Z, Merrill, WI 54452

LANDOWNER PHONE NO. 715-218-1398 COUNTY Lincoln

TOWNSHIP SCOTT T 31 N, R 06 E/W, Sec. 20

FIELD OFFICE Lincoln County TELEPHONE NO. 715-539-1087

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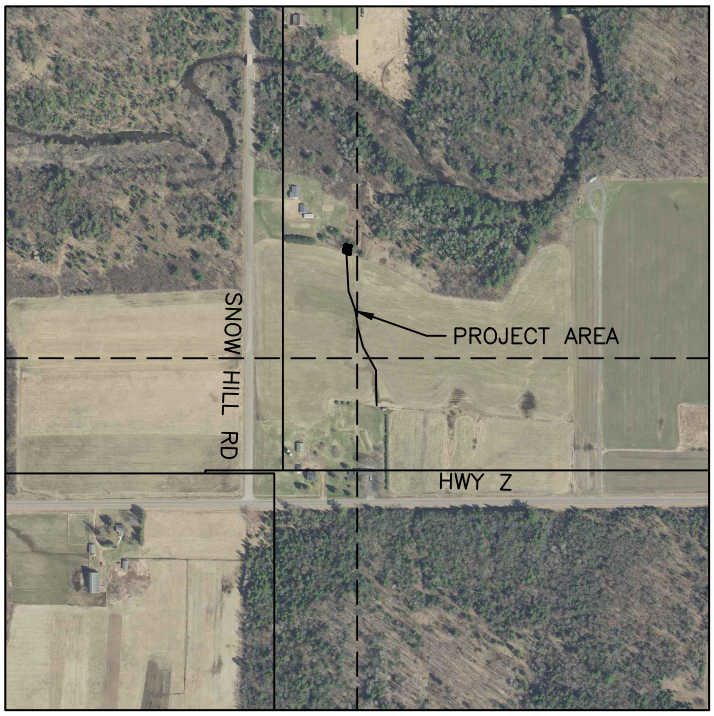


N

Not to Scale

LOCATION MAP

NOTICE TO LANDOWNERS AND EXCAVATORS

Any representation made by the USDA, Natural Resources Conservation Service, or the Lincoln County LCD, as to the approximate location or nonexistence of above or under ground hazards does not relieve the owner of the property or the excavator that is hired to complete construction, from notifying Diggers Hotline of the pending construction. You will be liable for damages resulting from construction activities.
Call Diggers Hotline! Ticket Number _____

CONSTRUCTION DRAWINGS AND SPECIFICATIONS ACCEPTANCE

I have reviewed and understand the construction plans and specifications and agree to complete the work accordingly. Failure to meet these plans and specifications may jeopardize any continued NRCS technical assistance or program cost sharing applied for. I understand that it is my responsibility to secure all necessary permits and licenses, and to complete the work in accordance with all local, state, and federal laws. Modification of these construction plans or specifications must be approved by the NRCS before installation. I assume all responsibility for negotiations and contract agreements with the construction contractors.

Landowner Signature: _____ Date: _____

Designed by: Mitchell McCarthy Date: 2/19/2019

Checked by: Stacy D. Dehne Date: 2-20-19

Approved by: Stacy D. Dehne Date: 2-25-19

The installed practices comply with applicable NRCS technical standards and specifications. The "redlined" construction plans (as-built drawings) reflect changes made during construction.

Construction Approved by: _____ Date: _____

Job Approval Class I

ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY	SHEET NUMBER	WI CONSTRUCTION SPEC. OR JOB SHEET NUMBER
Mobilization and	Job	1		7–Mobilization and
Demobilization				
Grassed Waterway	Lin. Ft.	640	4,5,7	2–Excavation
Seeding	Ac.	0.5	10&11	WI–710 SEEDING
Erosion Netting	Sq. Ft.	8,960	12	WI–710 SEEDING
with Staples				
Rock for Outlet	Cu.Yd.	80	6	9–Rock Riprap
				2–Excavation
Class I non–woven Geotextile for outlet	Sq.Ft.	334	6	013–Geotextiles
6" PE Tile	Lin. Ft	640	5	044–Corrugated Polyethylene
6" Animal Guard	Job	1	8&9	

Quantities are estimated to the neat lines and grades of in–place materials shown on the construction plan unless otherwise stated. Truck yardage, loose fill, shrinkage, etc., must be calculated and compensated for by the contractor preparing a bid or constructing the project.

USDA United States Department of Agriculture
Natural Resources Conservation Service

ESTIMATED QUANTITIES

CLIENT: KRUSE/BREITENMOSER
COUNTY: Lincoln

		Date
Designed	MRM	02/19
Drawn	MRM	02/19
Checked		
Approved		

File Name: WI-005A
Date: 08/14

CONSTRUCTION NOTES

1. ALL UNDERGROUND HAZARDS AND UTILITIES MUST BE INVESTIGATED PRIOR TO CONSTRUCTION. NOTIFICATION OF EFFECTED UTILITY COMPANIES IS THE RESPONSIBILITY OF THE CONTRACTOR. CONTACT DIGGERS HOTLINE AT LEAST THREE DAYS PRIOR TO START OF CONSTRUCTION.

2. A PRE-CONSTRUCTION MEETING SHALL BE SCHEDULED WITH LINCOLN COUNTY PERSONNEL, THE CONTRACTOR, AND THE LANDOWNER PRIOR TO CONSTRUCTION START-UP.

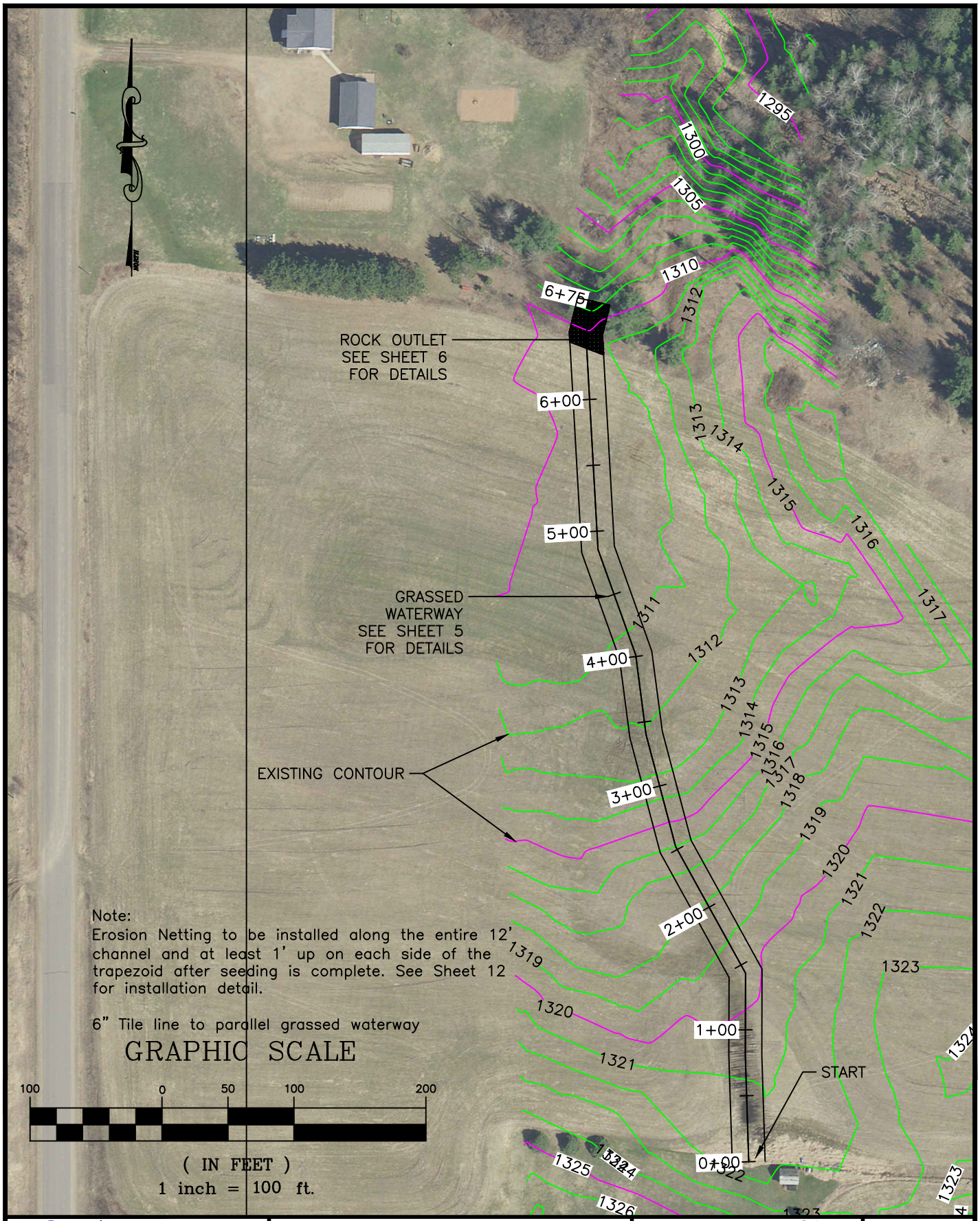
3. THE CONTRACTOR AND/OR LANDOWNER SHALL NOTIFY LINCOLN COUNTY AT LEAST 3 DAYS PRIOR TO START-UP OF CONSTRUCTION.

4. WATERWAY SHALL HAVE A 12' TRAPEZOIDAL BOTTOM WITH 8:1 SIDE SLOPS, WITH A 0.6' to 1.26' DEPTH.

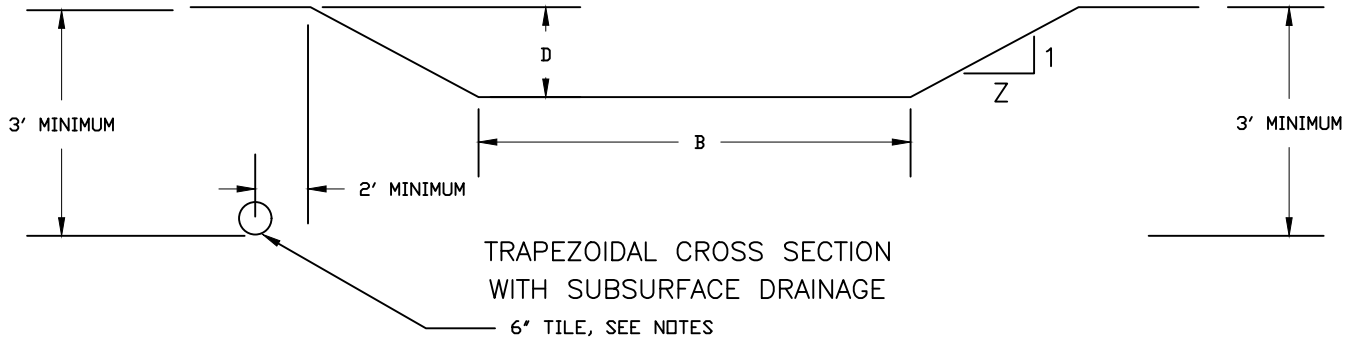
5. EROSION CONTROL NETTING SHALL BE INSTALLED IN THE BOTTOM OF THE WATERWAY AND AT LEAST 1' UP EACH SIDE OF THE TRAPEZOIDAL BOTTOM.

6. STATION 6+40 TO 6+75 SHALL BE 8" D50 ROCK RIP RAP. SEE PLAN CONTENT FOR DETAILS.

7. ALL WORK TO BE PERFORMED IN ACCORDANCE WITH WISCONSIN NRCS CONSTRUCTION SPECIFICATIONS (ATTACHED TO THIS PLAN).



USDA United States Department of Agriculture Natural Resources Conservation Service	PLAN VIEW CLIENT: KRUSE/BREITENMOSER COUNTY: Lincoln	Designed MRM 02/19 Drawn MRM 02/19 Checked Approved	File Name WI-002 Date 08/14 Sheet 4 of 12



TRAPEZOIDAL CROSS SECTION
WITH SUBSURFACE DRAINAGE

CONSTRUCTION DETAILS

WATERWAY NUMBER	REACH		CHANNEL SLOPE(%)	BOTTOM WIDTH(B) FEET	MINIMUM DEPTH(D) FEET	SIDE SLOPE(Z)	LENGTH FEET
	FROM	TO					
1	0+00	2+00	2.2	12	0.7	8	200
1	2+00	3+25	4.8	12	0.6	8	125
1	3+25	4+25	1.3	12	0.9	8	100
1	4+25	6+40	0.4	12	1.3	8	215

NOTES AND SPECIFICATIONS:

1. TOPSOIL SHALL BE STOCKPILED AND RESPREAD ON THE WATERWAY WHEN NEEDED TO FACILITATE REVEGETATION.
2. PLACE SPOIL WHERE IT WILL NOT INTERFERE WITH SURFACE WATER FLOW INTO THE WATERWAY.
3. MAINTENANCE ITEMS – REPAIR AREAS OF DAMAGED VEGETATION. DO NOT USE THE WATERWAY FOR A TRAVEL LANE. DO NOT PLOW INTO THE WATERWAY SIDES.
4. TILE SHALL BE PERFORATED POLYETHELYNE. MATERIALS AND INSTALLATION SHALL CONFORM TO WI CONSTRUCTION SPECIFICATION 44, ATTACHED.
5. TILE GRADE SHALL BE A MINIMUM OF 0.4%, OR AS SHOWN ON PROFILE DRAWING SHEET 7.
6. A 6' OUTLET SECTION WITH ANIMAL GUARD IS REQUIRED FOR THE TILE. THE OUTLET SECTION MAY BE PVC, CMP, SMOOTH WALL PE, OR OTHER SUITABLE MATERIAL APPROVED BY FIELD TECHNICIAN. OUTLET LOCATION AS SHOWN ON PLAN VIEW SHEET 4.

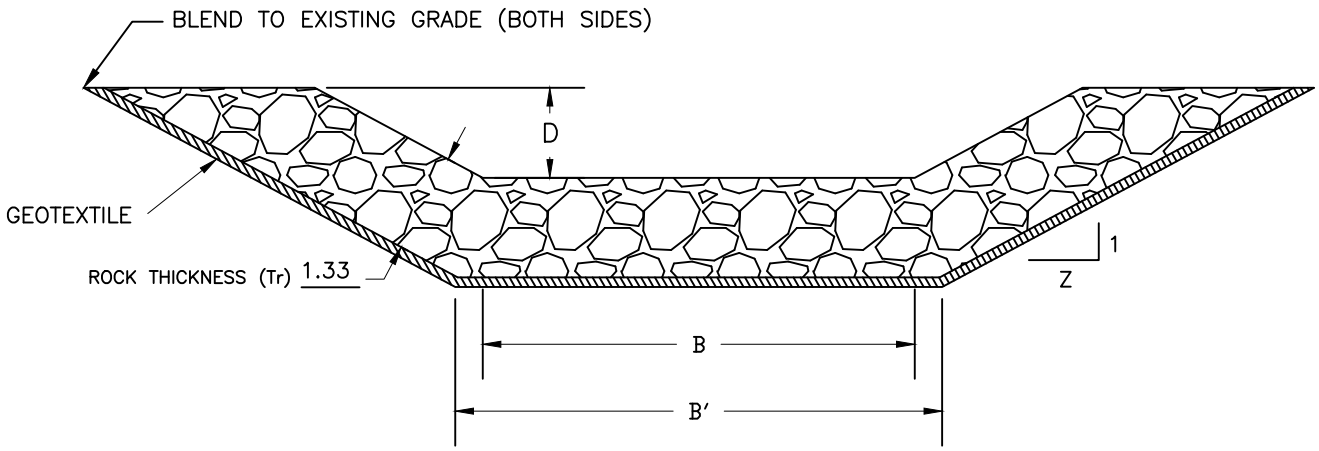
USDA United States Department of Agriculture
Natural Resources Conservation Service

TRAPEZOIDAL GRASSED WATERWAY

CLIENT: KRUSE/BREITENMOSER
COUNTY: Lincoln

		Date
Designed	MRM	02/19
Drawn	MRM	02/19
Checked		
Approved		

File Name WI–402C
Date 07/14
Sheet 5 of 12



TRAPEZOIDAL CROSS SECTION

NOTES:

1. PLACE SPOIL WHERE IT WILL NOT INTERFERE WITH SURFACE WATER FLOW INTO THE WATERWAY.
2. DO NOT USE THE WATERWAY FOR A TRAVEL LANE.
3. B IS DESIGN BOTTOM WIDTH. B' IS REQUIRED CONSTRUCTED WIDTH OF FOUNDATION BEFORE PLACEMENT OF GEOTEXTILE AND ROCK.
   B'=B+(Tr/Z) WHERE Tr = THICKNESS OF ROCK IN FEET.

CONSTRUCTION DETAILS

WATERWAY NUMBER	REACH		CHANNEL SLOPE(%)	BOTTOM WIDTH(B) FEET	DEPTH(D) FEET	SIDE SLOPE(Z)	LENGTH FEET
	FROM	TO					
1	6+40	6+75	2.8	12	1.3	8	35

PERCENT PASSING	SIZE[1] (in.)
100	1.5xD50 – 2.0xD50
85	1.3xD50 – 1.8xD50
50	1.0xD50 – 1.5xD50
10	0.8xD50 – 1.3xD50

[1] ROUND UP TO NEAREST INCH.

EXCAVATION (W.C.S.* 2)	CU. YD.
ROCK RIPRAP (W.C.S. 9)	79 CU. YD.
GEOTEXTILE (W.C.S. 13) CLASS (WOVEN) (NONWOVEN)	334 SQ. FT.
SEEDING	ACRES

* ESTIMATED TO THE NEAT LINES AND GRADE
* WIS. CONSTRUCTION SPECIFICATION

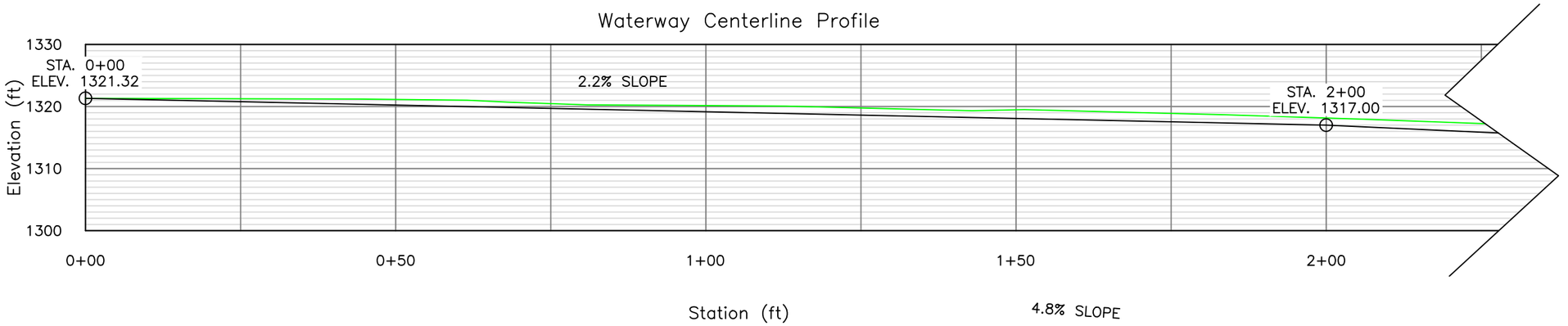
United States Department of Agriculture
Natural Resources Conservation Service

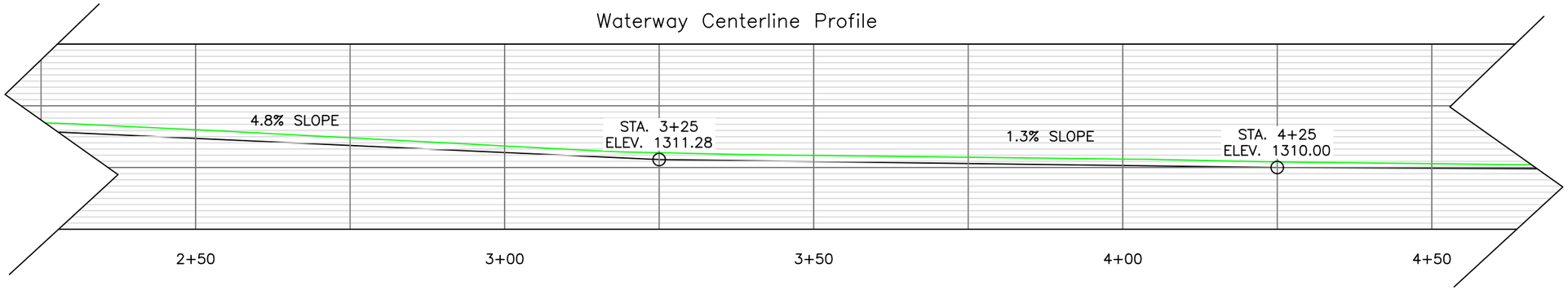
ROCK RIPRAP LINED WATERWAY

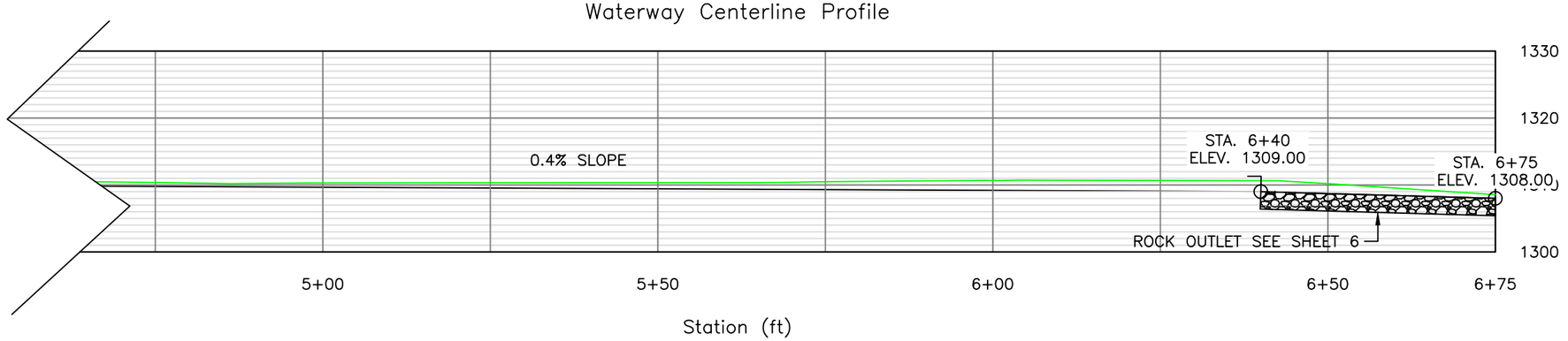
CLIENT: KRUSE/BREITENMOSER
COUNTY: LINCOLN

Designed MRM Date 02/19
Drawn
Checked
Approved

Drawing Name WI-402E
Date 07/14
Sheet 6 of 12







		Date
Designed	MRM	02/19
Drawn	MRM	02/19
Checked		
Approved		

PROFILE VIEW

OWNER: KRUSE/BREITENMOSER

COUNTY: Lincoln

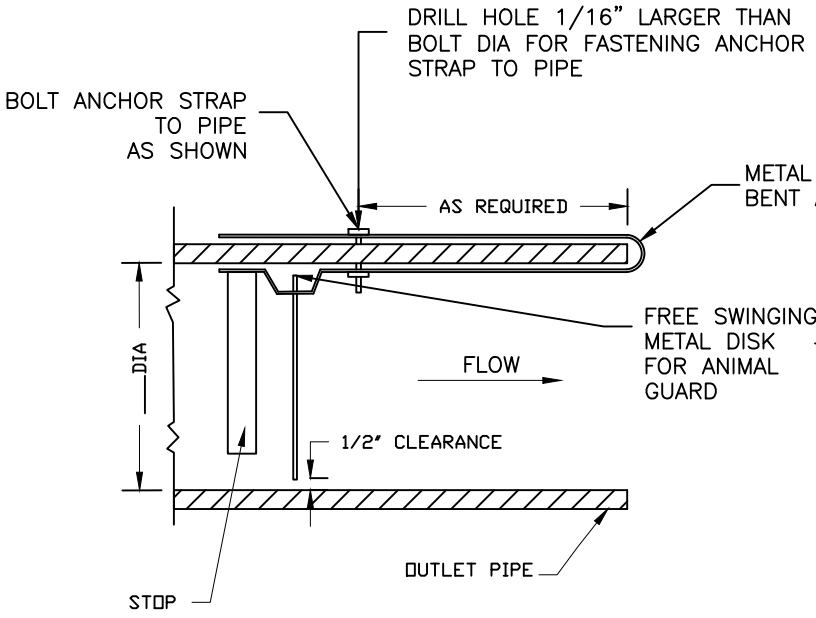
United States Department of Agriculture

Natural Resources Conservation Service

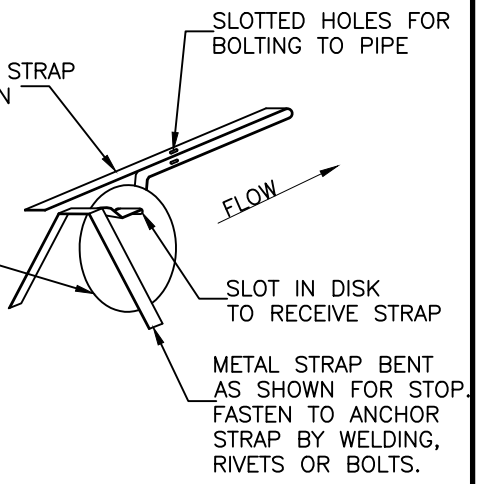
File Name
WI-006

Date
08/14

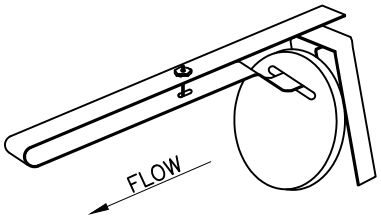
NOTE: ANIMAL GUARD SHALL BE FABRICATED OF MATERIAL THAT RESISTS CORROSION AND IS COMPATIBLE WITH THE OUTLET PIPE.

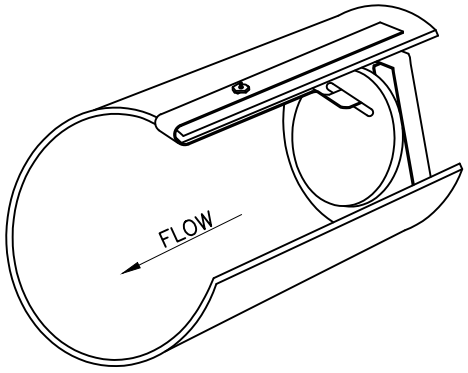


SECTION



PERSPECTIVE VIEW FROM BACK

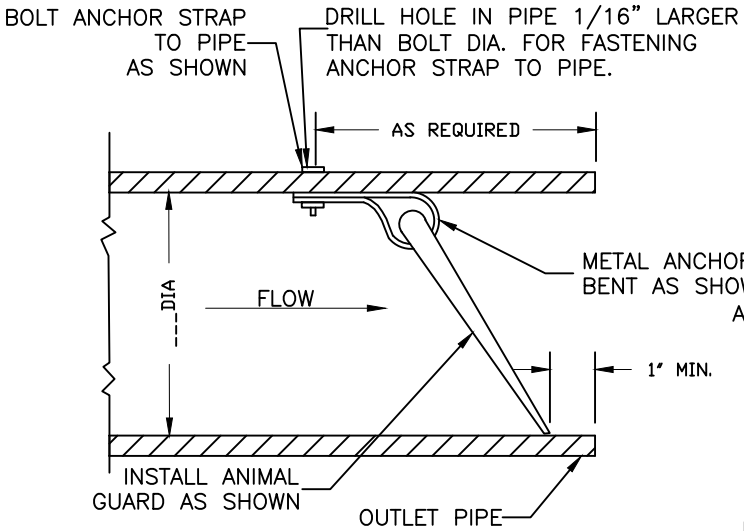




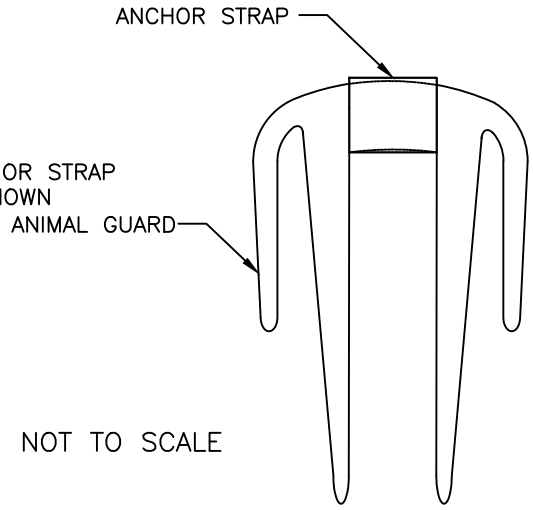
PERSPECTIVE VIEWS FROM OUTLET END OF PIPE

SEE REVERSE SIDE FOR ADDITIONAL INFORMATION

USDA United States Department of Agriculture Natural Resources Conservation Service	ANIMAL GUARDS FOR TILE OUTLETS CLIENT: KRUSE/BREITENMOSER COUNTY: Lincoln	Designed MRM 02/19 Drawn MRM 02/19 Checked Approved	File Name WI–602 Date 07/14 Sheet 8 of 12



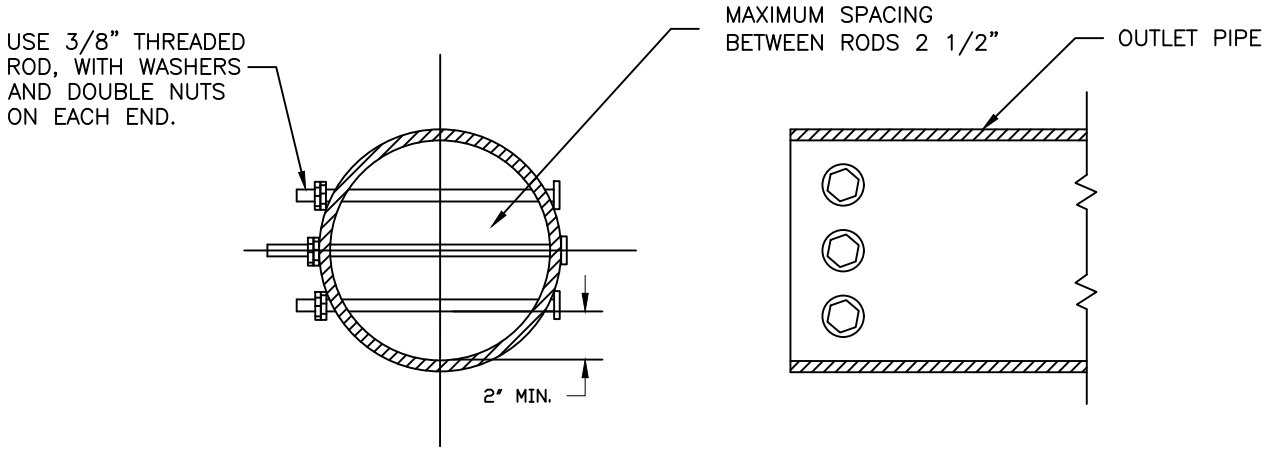
SECTION ON CENTERLINE



NOT TO SCALE

END VIEW

NOTE: ANIMAL GUARD SHALL BE FABRICATED OF MATERIAL THAT RESISTS CORROSION AND IS COMPATIBLE WITH THE OUTLET PIPE.



END ELEVATION

SIDE ELEVATION
Not to Scale

NOTE: OTHER OPTIONS FOR SECURING THE RODS IN PLACE INCLUDE COTTER PINS, OR SIMPLY BENDING THE RODS AT RIGHT ANGLE TO THE PIPE. SMOOTH ROD WOULD BE ACCEPTABLE IF THESE METHODS ARE USED.

SEEDING DATES NORTH

TIME PERIOD	DATES			TYPE OF SEEDING
Spring	May 1	through	June 15	Permanent
Summer	June 16	through	see WI-710ss pg 2	Temporary *
Late Summer	July 15	through	August 10	Permanent
Fall	August 11	through	see WI-710ss pg 2	Temporary *
Late Fall	November 1	through	Snow Cover	Dormant
Winter	Snow Cover	through	April 30	Not Allowed

MATERIALS

If no soil test is available, apply a minimum of 150 pounds of 20-10-10 fertilizer per acre. This is equivalent to 30 pounds nitrogen (N), 15 pounds phosphate (P205), and 15 pounds potash (K2O) per acre. Apply two tons of 80-89 lime or equivalent.

* Seed a temporary cover crop of _____ at #N/A # /ac (#N/A bu/ac)
A permanent seeding shall be completed during the next acceptable time period following a temporary seeding.

MINIMUM PURE LIVE SEED (PLS) [1] RATE PER ACRE AND TOTAL POUNDS OF SEED NEEDED

	SEEDING MIX (DESIGN) 17	LOCATION: 1 ACRES: 1.00		SEEDING MIX (AS-BUILT)	LOCATION ACRES	
	SPECIES	RATE	POUNDS	SPECIES	RATE	POUNDS
	Redtop	1.1	1.1			
	Timothy	3.3	3.3			
	Red Clover	5.5	5.5			
**		#N/A	#N/A			

[1] PLS = (% Germination x % Purity) ADDITIONAL SEED PERCENTAGE: 10 %

** Companion Crop Mulching Require Yes

Additional native seeds may be required by permitting agencies. These addition are allowed.
Seed mixture shall meet all requirements of the WI weed laws.
Species identified as restricted or prohibited by law shall not be planted.
Certified seed shall be used, and the seeding rates will be based on pure live seed.
For dormant seedings, increase the seeds per square foot by 15%.

SEEDBED PREPARATION

Seedbed preparation shall immediately follow construction activities.
Prepare a fine, firm seedbed to a minimum depth of three inches. A seedbed is considered firm when a footprint penetrates 1/4 to 1/2 inch deep.

SEEDING

Inoculate legumes with the specific inoculum for the species in accordance with the manufacturer's recommendations. When using a hydroseeder, five times the recommended rate of inoculant shall be added to the hydroseeder. Inoculant shall not be mixed with liquid fertilizer.

Seed may be broadcast or drilled as appropriate to the site.
Seed, fertilize, and lime as soon as possible after construction.
Seeding perpendicular to direction of flow is required to limit erosion.

SEEDING CONTINUED

Seed grasses and legumes no more than 1/4 inch deep.

Consider seeding at a lower rate and making 2 passes to ensure more uniform distribution.

TEMPORARY SEEDING OPTIONS

Select one of the following species for temporary cover if:

1) The required seeds or plant stock are not available or the normal permanent seeding period for the species has passed

   Forage Sorghum - 1/2 bushel per acre (May 15-July 15)
   Sorghum - Sudangrass Hybrid - 1 bushel per acre (May 15-July 15)
   Sudangrass - 1 bushel per acre (May 15-July 15)
   Winter Wheat - 2 bushels per acre (Aug 1-Oct 1)
   Winter Cereal Rye - 2 bushels per acre (Aug 1-Oct 15)
   Oats - 2 bushels per acre (Apr 1-Sept 1)
   Annual Ryegrass - 20 Pounds per acre (Apr 1-Sept 1)

2) Triazine herbicide carryover will not allow establishment of permanent cover immediately.

   Forage Sorghum - 1/2 Bushel per acre (May 15-July 15)
   Sorghum - Sudangrass Hybrid - 1 Bushel per acre (May 15-July 15)
   Sudangrass - 1 Bushel per acre (May 15-July 15)

DORMANT SEEDING

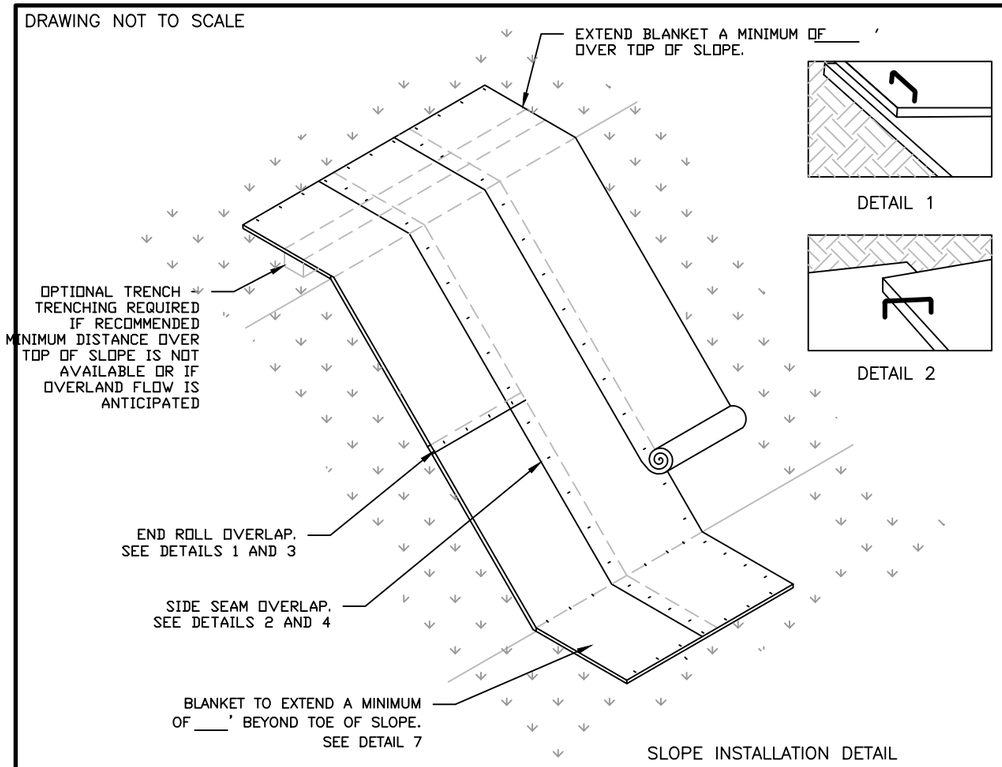
Seed is broadcast and incorporated, no-tilled, or drilled into the seedbed .
Seedbed preparations and conditions are similar to conventional seeding.

MULCHING

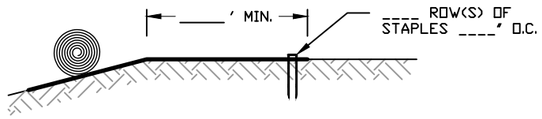
Mulching shall be done immediately after seedbed preparation and seeding.
Mulch shall be applied immediately after final grading for areas seeded at a later date.
Mulch material shall be relatively free of disease, pesticides, chemicals, noxious weed seeds, and other pests and pathogens.
Spread straw and hay mulch uniformly and at the rate of 1.5-2.0 tons per acre (60-70 bales). This application results in a layer of 6 to 7 stems, 1 to 2 inches thick, and provides a minimum 70% ground cover. Some soil surface can be seen after the application. Crimping (disking), wood cellulose fiber, tackifiers, netting, pinning, or other acceptable methods of anchoring will be used if needed to hold the mulch in place.

If other mulch materials are used, the rate of application shall meet the manufacturer's recommendations.

DRAWING NOT TO SCALE

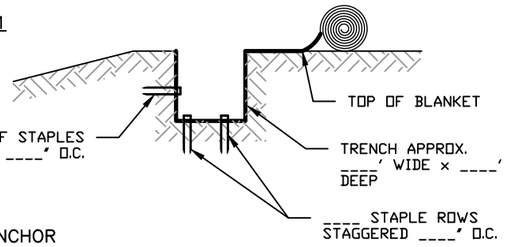


SLOPE INSTALLATION DETAIL



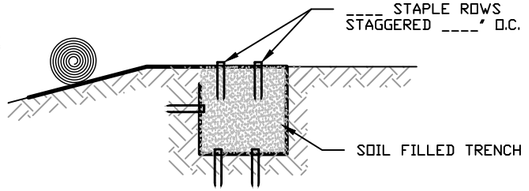
CREST ANCHOR – NO TRENCH

STEP 1

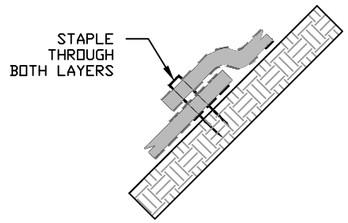


TRENCH ANCHOR OPTION 1

STEP 2

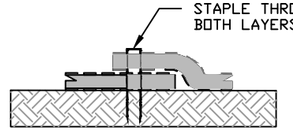


DETAIL 3 – END ROLL OVERLAP

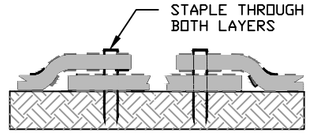


END SEAM OF BLANKETS OVERLAP MINIMUM ____". UPSLOPE BLANKET LAPS OVER DOWNSLOPE BLANKET IN A SHINGLE AFFECT.

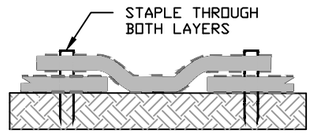
DETAIL 4 – SIDE SEAM OVERLAP



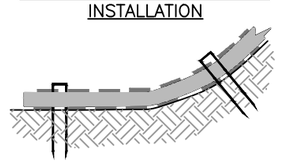
DETAIL 5 – CHANNEL INSTALLATION OPTION 1

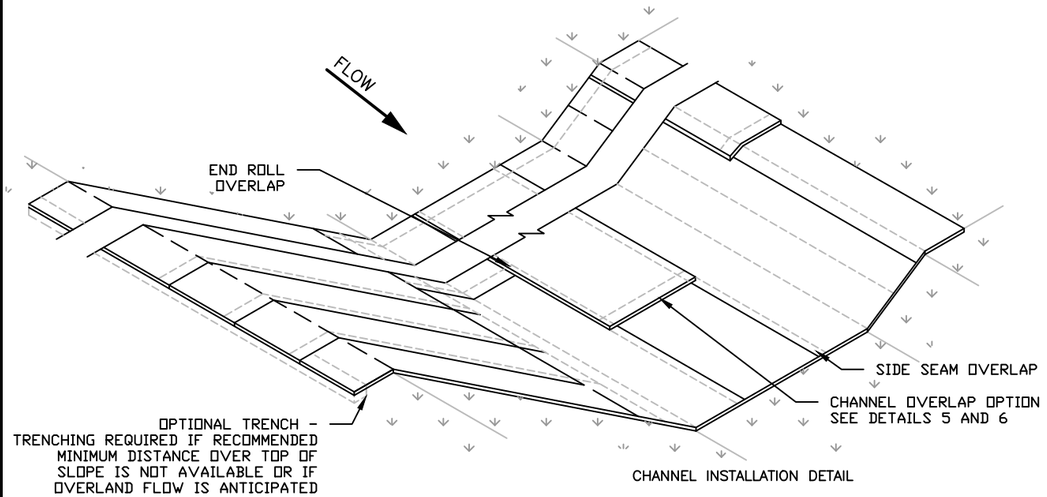


DETAIL 6 – CHANNEL INSTALLATION OPTION 2



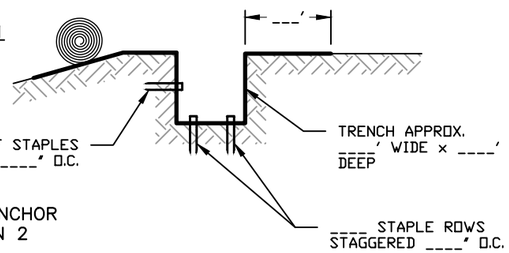
DETAIL 7 – TOE OF SLOPE INSTALLATION





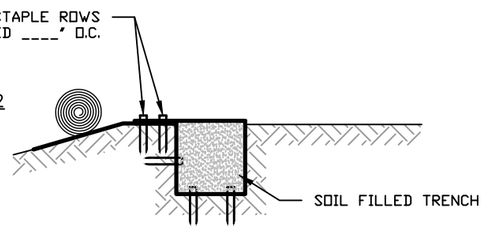
CHANNEL INSTALLATION DETAIL

STEP 1

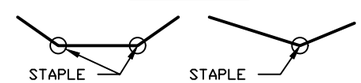


TRENCH ANCHOR OPTION 2

STEP 2



CRITICAL STAPLE LOCATIONS IN CHANNELS

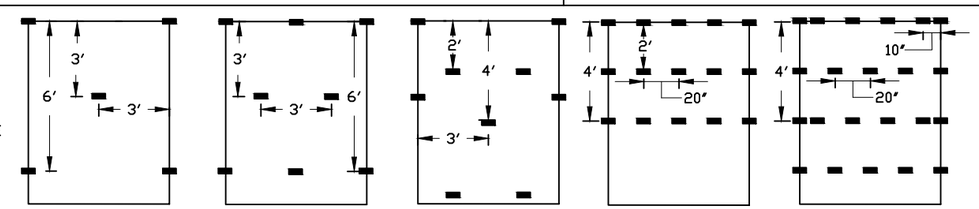


NOTES:

1. STAPLE PATTERNS ARE DEPENDENT UPON SLOPE CONDITIONS AND MANUFACTURER'S RECOMMENDATIONS.
2. STAPLES OF 11 GAUGE OR HEAVIER SHALL BE USED TO HOLD MATS AND NETS IN PLACE.
3. STAPLES SHALL BE U–SHAPED WITH A 1–INCH CROWN.
4. STAPLE LENGTHS ARE DETERMINED BASED ON SOIL CONDITION. SEE WI STANDARD 484–MULCHING FOR STAPLE LENGTH REQUIREMENTS. STAPLES SHALL BE 8" LONG.
5. FOLLOW MANUFACTURER'S RECOMMENDATIONS FOR BOTH END AND EDGE OVERLAP LENGTH.
6. CONSIDER THE USE OF BIODEGRADABLE STAPLES IN LOCATIONS WHERE WIRE STAPLES ARE DETERMINED TO BE A RISK.

STAPLE PATTERNS

(CIRCLE STAPLE PATTERN(S) TO BE USED)



		Date
Designed	MRM	02/19
Drawn	MRM	02/19
Checked		
Approved		

EROSION CONTROL MAT INSTALLATION

OWNER: KRUSE/BREITENMOSER

COUNTY: Lincoln

United States Department of Agriculture

Natural Resources Conservation Service

Drawing Name
WI–790

Date
02/2017

Sheet 12 of 12

Operation and Maintenance Plan
Grassed Waterway

Cooperator: CLAYTON KRUSE ET AL ATTN. HANS BREITNMOSER JR Date: 02/2019

By: MITCHELL MCCARTHY Title: CONSERVATION PROGRAM MANAGER

Project Location: W6874 COUNTY RD Z, Merrill, WI 54452

I agree to the following for the next 10 years.

1. During the first year of the seeding establishment growing season, waterway vegetation must be clipped by August 1 to allow seeded grasses to compete with weed species.
2. Vegetation height should be maintained between 8 inches and 14 inches.
3. Channel bottom will not be used as a field access road. Lift tillage equipment when crossing waterways.
4. Chemicals which kill grass will not be sprayed onto or allowed to drain into the waterway.
5. Waterway side slopes are not to be tilled.
6. After vegetation has been established one or more years, delay mowing until after August 1 to allow nesting birds to complete nesting. Haying when conditions are dry enough is allowed.
7. A maintenance program shall be established to maintain waterway capacity, vegetative cover, and outlet stability. Vegetation damaged by machinery, herbicides, or erosion must be repaired promptly.
8. Inspect grassed waterways regularly, especially following heavy rains. Damaged areas will be repaired, and remove sediment deposits to maintain capacity of grassed waterway. Landowners should be advised to avoid areas where forbs have been established when applying herbicides.
9. Avoid using waterways as turn–rows during tillage and cultivation operations.
10. Prescribed burning and mowing may be appropriate to enhance wildlife values, but must be conducted to avoid peak nesting seasons and reduced winter cover.

Cooperator's signature: _____ Date: _____

I have discussed the maintenance guidelines with the above cooperator.

Conservationist's signature: _____ Date: _____

USDA United States Department of Agriculture Natural Resources Conservation Service	OPERATIONS & MAINTENANCE PLAN CLIENT: KRUSE/BREITENMOSER COUNTY: Lincoln	Designed MRM 02/19 Drawn MRM 02/19 Checked Approved	File Name Date 08/14 Sheet 1 of 1

Construction Quality Assurance Plan
Grassed Waterways

LANDOWNER: CLAYTON KRUSE ET AL ATTN. HANS BREITNMOSER JR

LOCATION OF PRACTICE OR PLAN ID: W6874 COUNTY RD Z, Merrill, WI 54452

INSPECTOR: MITCHELL MCCARTHY APPROVER: _____ Date: _____

ENGINEERING JOB CLASS: I

Initial and date items as completed. Date all additional documentation and keep in construction file.

PRE-CONSTRUCTION

- ☐ Verify that the landowner or contractor notified all utilities prior to construction. Document DIGGERS HOTLINE Ticket Number _____.
- ☐ Obtain copies of PERMITS, or documentation that they aren't needed.
- ☐ Inspect EROSION CONTROL PRACTICES (silt fence, etc.) if they are called for in the plan. Document proper installation with photographs and job diary notations.

MATERIALS

- ☐ EROSION CONTROL blanket material. Obtain a tag from the material, an invoice or product brochure from the supplier.
- ☐ FERTILIZER. Place tag in construction documentation file. Document quantity. Verify meets drawing WI-710 requirements. 150 lbs. of 20-10-10 per acre required.
- ☐ LIME. Document quantity. 2 tons of 80 - 85 lime required.
- ☐ SEED. Document species, quantities of pure live seed, and date seeded. Verify that it meets requirements of WI-710 drawing. Place seed tag in construction documentation file. Document type used and quantity.

CONSTRUCTION

- ☐ SITE PREPARATION Record in job diary when striping and topsoil stockpiling is done.
- ☐ LAY OUT the alignment of the waterways prior to excavation. Mark cuts on stakes if the contractor requests the information. Place grade stakes every 100' along alignment.
- ☐ SURVEY profile of drainage tile. Redline on as-built drawings.
- ☐ INSPECT subgrade prior to topsoil placement. Survey cross sections and profile. Verify depth meets drawing requirements. If different from design, re-design must be approved by someone with design job approval authority or contractor must correct to meet the plans. Red-line on as-built drawings.

FINAL INSPECTION

- ☐ Obtain final PROFILE AND CROSS-SECTIONS of completed waterway(s). Minimum is one cross-section per design reach of waterway. Verify correct:

_____ Bottom Width - Planned bottom width is 12'.
_____ Depth - Planned depth is 0.6' to 1.3'.
_____ Channel Grade - Planned channel grade is 0.4% TO 4.8%.
_____ Side Slopes - Planned side slope is 8:1.
_____ Final Length of waterway(s). Record the information in engineering field notes.

- ☐ Verify a stable, adequate OUTLET. Document with a notation in the job diary. Take photograph.
- ☐ Verify that all disturbed areas not to be cropped are FERTILIZED, LIMED, SEEDED AND MULCHED. Note and record the date of seeding, note whether germination has occurred, note orientation of seed rows (should be perpendicular to waterway channel). Document how seed was applied. Document how mulch was stabilized.
- ☐ Observe the INSTALLATION OF THE EROSION CONTROL blanket material; verify that installation follows the construction specification, record observations in engineering field notes.
- ☐ Document installed quantities (payment units) of the practices. Note: Financial assistance programs may have payment units different than the e-FOTG conservation practice standards reporting units.

Document all of the above with photographs, data in engineering field book and job diary.
I have reviewed this plan and understand my responsibilities in the quality assurance needed for my project.

Landowner's Signature: _____ Date: _____

USDA United States Department of Agriculture Natural Resources Conservation Service	QUALITY ASSURANCE PLAN CLIENT: KRUSE/BREITENMOSER COUNTY: Lincoln	Designed MRM 02/19 Drawn MRM 02/19 Checked Approved	File Name Date 08/14 Sheet 1 of 1

WISCONSIN CONSTRUCTION SPECIFICATION

2. EXCAVATION

A. SCOPE

The work shall consist of the excavation of all materials necessary for the construction of the work.

B. USE OF EXCAVATED MATERIALS

To the extent that they are needed, all suitable materials removed from the specified excavations shall be used in the construction of the required earthfill. The suitability of materials for specific purposes will be determined by the Technician. The Contractor shall not waste or otherwise dispose of suitable excavated materials.

C. DISPOSAL OF WASTE MATERIALS

All surplus or unsuitable excavated materials will be designated as waste and shall be disposed of at the locations shown on the drawings or as approved by the Technician. Waste materials shall not be placed in wetlands or regulated floodplains.

Material placed in designated waste disposal areas shall be left in a sightly condition and sloped to provide positive drainage. Compaction of the waste materials will not be required unless specified by the construction plans.

Waste material excavated from channels may be deposited in leveled spoilbanks or areas adjacent to the channel work (if permissible). The shape and slopes of the spoilbanks shall be indicated on the drawings or as approved by the Technician. Spoil piles shall be located a minimum of 12 feet from the top of the channel side slope.

Spoil piles or disposal areas shall be protected to minimize site erosion and the production of sediment. Protective measures may include but are not limited to diversions, seeding, mulching, sediment basins, and silt fences.

D. SPECIAL REQUIREMENTS FOR STRUCTURE AND TRENCH EXCAVATION

The required dimensions and side slopes of all structure and trench excavations shall be as shown on the drawings.

Excavation beyond the limits of the specified lines and grades shall be corrected by filling the resulting voids with approved compacted materials.

Excavation for the installation of pipes shall follow the practices contained in the Occupational Safety and Health Administration (OSHA) Subpart P, Excavation, of 29 CFR 1926.650, .651 and .652.

Side slopes shall be excavated or braced to safeguard the work and workers. When bracing or supporting is required, the width of the excavation shall be adjusted to allow for the space occupied by the sheeting, bracing, or other supporting installations. The Contractor shall furnish, place, and subsequently remove such supporting installations.

E. REMOVAL OF WATER

The Contractor shall construct and maintain all necessary cofferdams, channels, flumes, pumping equipment, and/or other temporary diversion and protective work for dewatering the various parts of the work. Foundations, cutoff trenches, and other parts of the work shall be maintained free from water as required for constructing each part of the work. After having served their purpose, all cofferdams and other temporary protective works shall be removed or leveled to give a sightly appearance and so as not to interfere in any way with the operation, usefulness, or stability of the permanent structure.

F. BORROW EXCAVATION

When the quantities of suitable materials obtained from specified excavations are insufficient to construct the specified fill portions of the permanent works, additional materials shall be obtained from the designated borrow areas.

When shown on the drawings, sediment basins, terraces, diversions, or other measures shall be constructed to protect the borrow areas from erosion and retain sediment within the borrow area.

The upper six (6) inches of soil shall be stripped from all borrow areas. This stripping shall be performed immediately prior to use of the borrow material to reduce the time the area is exposed to erosion. For large borrow areas, only a portion of the area should be stripped at a time. This material shall be redistributed over the area from which it came after borrow excavation is completed.

The extent of excavation and the selection of materials from the borrow area shall be as directed by the Technician. On completion of excavation, all borrow areas shall be left in a sightly condition. All borrow areas shall be graded to blend with existing topography and sloped to prevent ponding and provide positive drainage.

WISCONSIN CONSTRUCTION SPECIFICATION

7. MOBILIZATION AND DEMOBILIZATION

A. SCOPE

The work consists of the mobilization and demobilization of the Contractor's forces and equipment necessary for performing the work.

B. EQUIPMENT AND MATERIAL

Mobilization shall include:

- All activities and associated costs for transportation of the Contractor's personnel, equipment, and operating supplies to the site.
- Establishment of necessary general facilities for the Contractor's operations at the site.
- Premiums paid for performance and payment bonds, if required.
- Construction and maintenance of haul roads and equipment parking areas.
- Other job related items.

Demobilization shall include:

- All activities and costs for transportation of personnel, equipment, and supplies not utilized in the project from the site.
- Disassembly, removal, and site cleanup of facilities assembled on the site.
- Repair of access roads, temporary haul roads, and equipment parking areas leaving the project site in the same or better condition than at the start of the project.
- General cleanup and housekeeping needed to restore a neat and orderly project site.

Access to the site, equipment parking, and staging areas are limited to that shown on the drawings or as approved by the technician.

WISCONSIN CONSTRUCTION SPECIFICATION

9. ROCK RIPRAP

A. SCOPE

The work shall consist of testing, furnishing, transporting, and placing rock riprap, including filter, bedding or geotextile materials where specified, in the construction of loose rock riprap revetments, blankets, rock toes, crossings, rock chutes, channel linings and other similar structures.

B. QUALITY OF MATERIALS

The rock shall be obtained from tested sources unless exempted below. Rock sources used for streambank protection, lined waterways, rock chutes, or other similar major projects (Engineering Job Approval Authority Job Class II and greater) shall be tested prior to use. A test is required a minimum of every ten (10) years. The Technician may require a more current test.

Rock riprap from igneous or metamorphic origins such as granite, basalt, and quartzite may be used without testing. Dolomite from quarries within the map legend units shown in Figure 1 may also be used without testing:

- Dolomite (Sd) - all counties.
- Sinnipee Group (Os) and Prairie du Chien (Opc) exempt only in the following counties: Marinette, Oconto, Shawano, Brown, Outagamie, Calumet, Winnebago, Green Lake, and Fond du Lac.

The Technician shall inspect and approve sources of these rock types prior to use and determine if testing is required.

Rock for equipment or cattle channel crossings, access roads, heavy use area protection or similar minor structures need not be tested.

Individual rock fragments shall be dense, sound and free from cracks, seams and other defects conducive to accelerated weathering. The rock fragments shall be angular to subrounded in shape. The least dimension of each individual rock fragment shall be not less than one-third the greatest dimension of the fragment. It should also be free from dirt, clay, sand, rock fines and other materials not meeting the gradation limits. Rock shall be excavated, selected and handled as necessary to meet the grading requirements stated in the construction plans.

Representative samples of rock requiring testing shall conform to the following requirements:

Bulk Specific Gravity (saturated surface-dry basis). Not less than 2.50 when tested in accordance with ASTM Specification C 127 on samples prepared as described for soundness testing.

Absorption. Not more than four (4.0) percent when tested in accordance with ASTM C 127 on samples prepared as described for soundness testing.

Soundness. The weight loss in five cycles shall not be more than 28 percent when tested by the sodium sulfate soundness test method in the modified ASTM C 88 or AASHTO T 104. Losses in excess of 20 percent are acceptable only when the design D_{50} rock size has been increased by 10 percent for a loss of 20-23.9 percent or 20 percent for a loss of 24-28 percent.

C. METHODS OF TESTING

Bulk Specific Gravity and Absorption shall be determined by ASTM C 127 on samples prepared as described for rock cube soundness testing.

Rock Cube Soundness. Soundness testing shall be performed by ASTM C 88 for coarse aggregate modified as follows.

The sodium sulfate soundness test shall be performed on a test sample of 5000 ± 300 grams of rock fragments, reasonably uniform in size and cubical in shape and weighing, after sampling, approximately 100 grams each. The test sample shall be obtained from rock samples that are representative of the total rock mass, as noted in ASTM Specification D 4992, and that have been sawed into slabs as described in ASTM Specification D 5121. The samples shall be further reduced in size by sawing the slabs into cubic blocks. The thickness of the slabs and the size of the sawed blocks shall be determined by the size of the available test apparatus and as necessary to provide, after sawing, the approximate 100 gram samples.

Due to internal defects, some of the cubes may break during the sawing process or during the initial soaking period. Cubes that break during this preparatory process shall not be tested. Such breakage, including an approximation of the percentage of cubes that break, shall be noted in the test report.

After the sample has been dried, following completion of the final test cycle and washing to remove the sodium sulfate, the loss of weight shall be determined by subtracting from the original weight of the sample the final weight of all fragments which have not broken into three or more fragments. (Samples that break into three or more large fragments during testing will be assigned a final weight of 0.0.) The test report shall show the percentage loss of the weight. Photographic documentation of all samples before and after testing shall be part of the test report.

A rock source may be rejected if the rock from that source deteriorates in less than 5 years under similar use and exposure conditions expected for the rock to be installed under this specification, even though it meets the testing requirements stated above.

Deterioration is defined as the visual loss of more than one-quarter of the original rock volume, or severe cracking that would cause a rock to split.

D. GRADATION

The gradation of the rock riprap and filter or bedding material shall be as shown in the construction plans.

Rock used for streambank protection, lined waterways, rock chutes, or other similar major projects (Engineering Job Approval Authority Job Class II and greater) shall have a gradation verification be done by one of the following methods.

Method A

Measurement of a random truck load of stone (reference sample) according to the procedure outlined in EFH-17, Procedure for Determining Rock Weights, Sizes, and Gradations; or ASTM D5519, Standard Test Methods for Particle Size Analysis of Natural and Man-Made Riprap Materials (Test Method A).

Method B

Creation of reference samples of rock of at least 0.5 tons, made according to the procedure outlined in EFH-17 (Tables 1 - 5), creating the envelope limits of the gradation specified.

Control of project gradation will be by visual inspection comparing rock delivered to the reference samples.

The reference sample(s) may be used as part of the finished riprap or remain at the quarry.

Any difference of opinion between the Technician and the Contractor shall be resolved by dumping and checking (by measurement) the gradation of a random truck load of stone by Method A. Mechanical equipment, a sorting site, and labor needed to assist in checking gradation shall be provided by the Contractor at no additional cost.

E. SUBGRADE PREPARATION

The subgrade surfaces on which the riprap, filter or bedding material is to be placed shall be cut or filled and graded to the lines and grades as shown on the drawings or as directed by the Technician. When fill to subgrade lines is required, it shall consist of approved materials and shall be compacted as specified in Wisconsin Construction Specification 3, Earthfill. Riprap, filter, bedding or geotextile shall not be placed until the foundation preparation is completed, and approved by the Technician.

F. FILTER AND BEDDING

Filter or bedding material, when required, shall be spread uniformly on the prepared subgrade surfaces to the depth shown on the drawings. The surfaces of the layers shall be finished reasonably free of mounds, dips or windrows and shall meet the gradation shown on the plans or as specified in Wisconsin Construction Specification 8.

Geotextile, when required, shall meet the requirements shown on the drawings and as specified in Wisconsin Construction Specification 13, Geotextiles.

G. PLACING ROCK RIPRAP

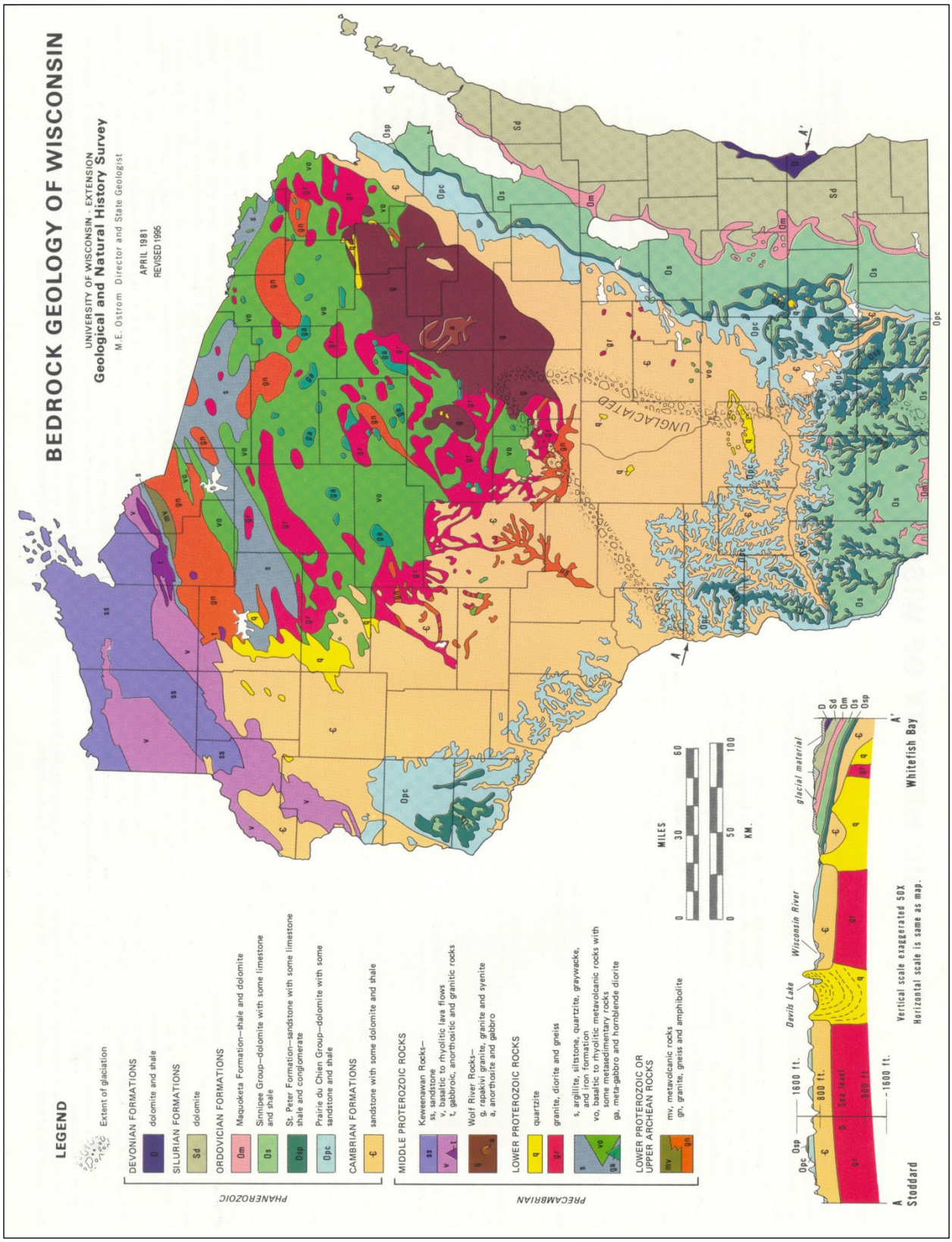
The rock riprap shall be placed by equipment on the surfaces and to the depths specified. The rock riprap shall be installed to the full course thickness in one operation and in such a manner as to avoid displacement of underlying materials. The rock for riprap shall be delivered and placed in a manner that will ensure that the riprap in-place shall be reasonably homogeneous with the larger rocks uniformly distributed and firmly in contact one to another with the smaller rocks and spalls filling the voids between the larger rocks. Some hand placing may be required to provide a neat and uniform surface or to prevent damage to structures.

H. VEGETATED ROCK RIPRAP

If the rock riprap is to be vegetated, topsoil shall be placed by equipment in the riprap voids (surface) and on the surface of the rock to the depth specified. The topsoil placement shall not take place before the placement of the rock riprap is approved by the Technician. Topsoil shall be placed in such a manner as to avoid displacement of the underlying rock.

The topsoil may extend from the top of the riprap down to the bankfull elevation (OHWM) or as shown on the drawings. Care shall be taken so topsoil is retained on the rock and is not allowed into the water body. The area shall be seeded and mulched within 12 hours following topsoil placement.

Figure 1


BEDROCK GEOLOGY OF WISCONSIN
UNIVERSITY OF WISCONSIN - EXTENSION
Geological and Natural History Survey
M.E. Ostrom Director and State Geologist
APRIL 1981
REVISED 1996
LEGEND
Extent of glaciation
PHANEROZOIC
DEVONIAN FORMATIONS
D dolomite and shale
SILURIAN FORMATIONS
Sd dolomite
ORDOVICIAN FORMATIONS
Om Maquoketa Formation—shale and dolomite
Os Sinnipee Group—dolomite with some limestone and shale
Osp St. Peter Formation—sandstone with some limestone shale and conglomerate
Opc Prairie du Chien Group—dolomite with some sandstone and shale
CAMBRIAN FORMATIONS
€ sandstone with some dolomite and shale
PRECAMBRIAN
MIDDLE PROTEROZOIC ROCKS
Keweenawan Rocks—
ss, sandstone
v, basaltic to rhyolitic lava flows
t, gabbroic, anorthositic and granitic rocks
Wolf River Rocks—
g, rapakivi granite, granite and syenite
a, anorthosite and gabbro
LOWER PROTEROZOIC ROCKS
q quartzite
gr granite, diorite and gneiss
s, argillite, silstone, quartzite, graywacke, and iron formation
vo, basaltic to rhyolitic metavolcanic rocks with some metasedimentary rocks
ga, meta-gabbro and hornblende diorite
LOWER PROTEROZOIC OR UPPER ARCHEAN ROCKS
mv, metavolcanic rocks
gn, granite, gneiss and amphibolite
UNGLACIATED
MILES
KM.
A Stoddard
Devils Lake
Wisconsin River
glacial material
A' Whitefish Bay
1600 ft.
800 ft.
Sea level
Vertical scale exaggerated 50X
Horizontal scale is same as map.

WISCONSIN CONSTRUCTION SPECIFICATION

13. GEOTEXTILES

1. SCOPE

This work shall consist of furnishing all materials, equipment, and labor necessary for the installation of geotextiles.

2. MATERIALS

The class and type of geotextile shall be as shown on the drawings.

Geotextiles shall be manufactured from synthetic long chain or continuous polymeric filaments or yarns composed of at least 95 percent by weight of polypropylene, polyethylene, polyester, polyamide, or polyvinylidene-chloride. Fibers shall contain stabilizers and/or inhibitors to enhance its resistance to ultraviolet light. The geotextile shall be formed into a stable network of filaments or yarns that retain dimensional stability relative to each other, including selvages. The geotextile shall be free of any chemical treatment or coating that might significantly reduce its permeability and shall have no flaws or defects that significantly alter its physical properties.

Thread used for factory or field sewing shall be of a contrasting color to the fabric and made of polypropylene, polyester, or polyamide thread. The sewing thread shall have a minimum breaking strength of 28 pounds when tested in accordance to ASTM D 2256. The thread shall be as resistant to ultraviolet light as the geotextile being sewn.

Additional requirements for geotextile materials are as follows:

a. Slit Tape Geotextile

Slit tape geotextile shall conform to the physical properties listed in Table 1. The slit tape geotextile shall be manufactured from a filament that is woven. The edges of the material shall be selvaged or otherwise finished to prevent the outer filament from unraveling.

b. Woven Geotextile

Woven geotextile shall conform to the physical properties listed in TABLE 1. The woven geotextile shall be manufactured from monofilament yarn that is woven into a uniform pattern with distinct and measurable openings. The fabric shall be manufactured so that the yarns will retain their relative position with regard to each other. The edges of the material shall be selvaged or otherwise finished to prevent the outer yarn from unraveling.

c. Nonwoven Geotextile

Nonwoven geotextile shall conform to the physical properties listed in TABLE 2. Nonwoven geotextile shall be manufactured from randomly oriented fibers that have been bonded together by needle-punching.

3. SHIPPING AND STORAGE

Geotextiles labeling, shipment, and storage shall follow ASTM D 4873. Product labels shall clearly show the manufacturer or supplier name, style name, and roll number. Each geotextile roll shall be wrapped with a material that will protect the geotextile, including the ends of the roll, from damage due to shipment, water, sunlight, and contaminants. The protective wrapping shall be maintained during periods of shipment and storage.

Prior to use, the geotextile shall be inspected and approved by the Technician, then stored in a clean, dry, place, out of direct sunlight, not subject to temperature extremes, and with the manufacturer's protective cover in place.

4. SURFACE PREPARATION

The surface on which the geotextile is to be placed shall be graded to the neat lines and grades as shown on the drawings. The surface shall be reasonably smooth and free of holes, vegetation, excessive mud, and projections. The surface preparation will be inspected and approved by the Technician prior to placing the geotextile.

5. PLACEMENT

a. General

The geotextile shall be placed on the approved, prepared surface at the locations and in accordance with the details shown on the drawings. The geotextile shall be unrolled along the placement area and loosely laid (not stretched) in such a manner that it will conform to the surface irregularities when the stone or other material is placed on or against it. The geotextile may be folded and overlapped to permit proper placement in the designated area.

No cuts, punctures, tears, or gaps in sewn or overlapped joints will be permitted in the geotextile.

The panel length shall be placed parallel to the direction of water flow, except as stated below in paragraph b. Slope Protection and d. Road Stabilization.

The geotextile panels may be joined by overlapping the roll ends 36 inches and sides a minimum of 18 inches and securing the overlap against the underlying foundation materials. The fabric shall be restrained as needed to prevent lifting and displacement during construction. Allowable restrainment methods include backfilled trenches, stitching, sandbags, rocks, and securing pins that are approved and provided by the geotextile manufacturer. The upstream or up-slope geotextile shall overlap the abutting down-slope geotextile.

The geotextile panels may be joined by machine sewing using thread described under 2. Materials. The seam shall conform to Federal Standard SSa-2, SSn-2 or SSd-2.The sewing shall consist of two parallel stitched rows spaced approximately 1 inch apart. Each row of stitching shall be located a minimum of 2 inches from the geotextile edge. The seam type and sewing machine to be used shall produce a seam strength, in the specified geotextile, that provides a minimum of 90 percent of the tensile strength in the weakest principal direction of the geotextile being used, when tested in accordance with ASTM D 4884. The seams may be factory or field sewn. All seaming and stitching of woven geotextiles shall be in the selvage.

Non-woven geotextiles shall be sewn a minimum of ½ inch from the edge. Geotextile shall be installed with the sewn seams pointing up.

The geotextile shall be restrained as needed during placement of overlying materials to prevent slippage, folding, or other movements of the geotextile.

Prior to covering, the geotextile shall be inspected by the Technician to ensure that the geotextile has not been damaged during construction. Backfill shall be placed by end dumping onto the geotextile from the edge of the geotextile or over previously placed backfill. Vehicles shall not be allowed directly on the geotextile. Materials shall be placed on the geotextile without causing tears, punctures, or separations of overlaps or sewn joints. Should such damage occur, the backfill around the damaged or displaced area will be removed and the subgrade restored to the original approved condition. Repair of the area shall consist of a patch of the same type of geotextile overlaying the existing geotextile. The patch shall extend a minimum of 2 feet from the edge of any damaged area.

b. Slope Protection

The geotextile shall not be placed until it can be anchored and protected with the intended covering within 48 hours. Temporary cover, for protection from ultraviolet light, may be used if the 48-hour limit will be exceeded. Material will not be dropped from a height of more than 3 feet on to uncovered geotextile. In lakeshore applications, the geotextile may be unrolled parallel or perpendicular to the bank. The geotextile shall be joined by machine sewing if the panel length is placed perpendicular to the direction of water flow (wave runup).

c. Subsurface Drains

The geotextile shall not be placed until drainfill or other material can be used to cover it within the same working day. Material will not be dropped from a height of more than 5 feet on to the geotextile and sharp, angular aggregates will not be used unless the drawing details state otherwise.

d. Road Stabilization

The geotextile shall be unrolled in a direction parallel to the roadway centerline in a loose manner permitting it to conform to surface irregularities when the roadway fill material is placed on it. Overlap shall be in the direction of construction. The minimum overlap of geotextile panels joined without sewing shall be 24 inches. The geotextile may be temporarily secured with pins recommended by the manufacturer. They shall be removed prior to placement of the covering material. Slit tape geotextile shall not be used in a wet location. Material will not be dropped from a height of more than 5 feet on to uncovered geotextile.

Table 1. Requirements for Woven Geotextiles by Use

Property	Test Method	Slope Protection		Road Stabilization	
		Unprotected (Class I)	Protected (Class II)	(Class IV)	Slit Tape
Tensile Strength (lbs.)[1]	ASTM D 4632 Grab Test	≥ 250 in any principal direction	≥ 120 in any principal direction	≥ 180 in any principal direction	≥ 200 in any principal direction
Elongation at failure (Percent)[1]	ASTM D 4632 Grab Test	≤ 20	≤ 35	≤ 35	≤ 10
Puncture (lbs.) [1]	ASTM D 6241	≥ 900	≥ 350	≥ 350	≥ 700
Ultraviolet Light (percent residual tensile strength)	ASTM D 4355 150 hours exposure	70 minimum	70 minimum	70 minimum	70 minimum
Apparent Opening Size (AOS)	ASTM D 4751	≥ #100 (.150 mm) and ≤ #70 (.212 mm) [3]	≥ #100 (.150 mm) and ≤ #70 (.212 mm) [3]	≥ #100 (.150 mm) and ≤ #70 (.212 mm) [3]	As specified or a min. size > #50 [3]
Percent Open Area (POA)	CW-02215 [2]	4.0 min.	4.0 min.	1.0 min.	N/A
Permittivity (1/seconds)	ASTM D 4491	0.20 minimum	0.10 minimum	0.10 minimum	0.05 minimum
Water Flow (gal/sq. ft./minute)	ASTM D 4491	15 minimum	7.5 minimum	7.5 minimum	3.8 minimum

[1]Minimum average roll values (MARV); calculated as the mean minus two standard deviations, yielding a 95 percent confidence level that the table value will be equaled or exceeded.

[2]Test Methods prepared by U. S. Army Corps of Engineers

[3]U. S. Standard Sieve Size

Table 2. Requirements for Nonwoven Geotextiles by Use

Property	Test Method	Slope Protection		Subsurface Drainage	Road Stabilization
		Unprotected (Class I)	Protected (Class II)	(Class III)	(Class IV)[3]
Tensile Strength (lbs.) [1]	ASTM D 4632 Grab Test	≥ 180	≥ 120	≥ 90	≥ 180
Elongation At failure (percent)[1]	ASTM D 4632 Grab Test	≥ 50	≥ 50	≥ 50	≥ 50
Puncture (lbs.) [1]	ASTM D 6241	≥ 350	≥ 250	≥ 200	≥ 200
Ultra-Violet Light (percent residual tensile strength)	ASTM D 4355 150 hours exposure	70 minimum	70 minimum	70 minimum	70 minimum
Apparent Opening Size (AOS)	ASTM D 4751	As specified or max. #40 [2]	As specified or max. #40 [2]	As specified or max. #40 [2]	As specified or max. #40 [2]
Permittivity (1/seconds)	ASTM D 4491	0.70 minimum	0.70 minimum	0.70 minimum	0.10 minimum
Water Flow (gal/sq. ft./ minute)	ASTM D 4491	52.5 minimum	52.5 minimum	52.5 minimum	7.5 minimum

[1]minimum average roll values (MARV); calculated as the mean minus two standard deviations, yielding a 95 percent confidence level that the table value will be equaled or exceeded.

[2]U. S. Standard Sieve Size.

[3]Heat-bonded or resin-bonded geotextile may be used.

WISCONSIN CONSTRUCTION SPECIFICATION

44. CORRUGATED POLYETHYLENE TUBING

1. SCOPE

The work shall consist of furnishing and installing corrugated polyethylene tubing with the necessary fittings and appurtenances as shown on the drawings and as outlined in this specification.

2. MATERIALS

Corrugated polyethylene tubing and fittings shall conform to the material requirements for the appropriate tubing size as shown in the following specifications:

- ASTM F 667/667M: 3 to 24 inch diameter pipe
- ASTM F 894: 18 to 120 inch diameter profile wall pipe
- AASHTO M 252: 3 to 10 inch diameter pipe
- AASHTO M 294: 12 to 60 inch diameter pipe

The tubing shall be appropriately marked with the ASTM or AASHTO designation.

When perforations are specified, the water inlet area shall be a minimum of 1 square inch per lineal foot of tubing. The inlets shall either be circular perforations or slots equally spaced along the length and circumference of the tubing. Unless otherwise specified, circular perforations shall not exceed 3/16 inch in diameter, and slot perforations shall not be more than 1/8 inch wide.

Geotextile filter socks, when required, shall meet the material requirements specified by the manufacturer for the intended use of the tubing.

Granular bedding material, when specified, shall conform to the requirements specified on the drawings.

3. HANDLING AND STORAGE

Tubing shall be delivered to the job site and handled by means that provide adequate support to the tubing and do not subject it to undue stresses or damage. When handling and placing corrugated polyethylene tubing, care shall be taken to prevent impact blows, abrasion damage, and gouging or cutting (by metal edges and/or surface or rocks). The manufacturer's special handling requirements shall be strictly observed. Special care shall be taken to avoid impact when the pipe must be handled at a temperature of 40 degrees Fahrenheit or less.

4. EXCAVATION

Unless otherwise specified or approved, excavation for and subsequent installation of each tubing line shall begin at the outlet end and progress upgrade. The trench or excavation for the tubing shall be constructed to the lines, depths, cross sections, and grade shown on the drawings.

Trench shields, shoring and bracing, or other suitable methods necessary to safeguard the workers shall be furnished, placed, and subsequently removed by the contractor.

5. BEDDING THE TUBING

Tubing shall not be laid on a rock foundation. In the event that boulders, rock or ledge rock, or other cemented materials that prevent satisfactory bedding are encountered at the required grade, the trench shall be excavated to a depth of at least 6 inches below the grade and backfilled to the required grade with a sand-gravel mixture or other approved material.

If the bottom of the trench does not provide a sufficiently stable or firm foundation for the tubing, a sand-gravel mixture or other approved materials shall be used to stabilize the bottom of the trench.

When a granular filter or envelope is specified, the filter or envelope material shall be placed in the bottom of the trench just before the tubing is laid. The tubing shall then be laid and the filter and envelope material placed to a depth over the top of the tubing of not less than that shown on the drawings.

When a granular filter or envelope is not specified, the bottom of the earthen trench shall be shaped to form a semicircular, trapezoidal, or 90-degree "V" groove in its center. This groove shall provide support for not less than a fourth of the outside circumference of the tubing. After the tubing is placed in the excavated groove, it shall be capped with friable material from the sides of the trench. The friable material shall be placed around the tubing, completely filling the trench to a depth of at least 3 inches over the top of the tubing. For material to be suitable, it must not contain hard clods, rocks, frozen soil, or fine material that will cause a silting hazard to the drain. Tubing placed during any day shall be blinded (place required soil material around and over pipe) and temporarily capped before construction activities are completed for that day.

6. PLACEMENT AND JOINT CONNECTIONS

All tubing shall be installed to the grade shown on the drawings. After the tubing is placed in the trench and blinded, sufficient time shall be allowed for the tubing to adapt to the soil temperature before backfilling.

Maximum allowable stretch of the tubing is 5 percent. Special precautions must be implemented on hot, bright days to ensure that the stretch limit is not exceeded and excessive deflection does not occur as a result of installation procedures, including backfill operations.

Perforated pipe shall be laid with the perforations down and oriented symmetrically about the vertical centerline. Perforations shall be clear of any obstructions when the tubing is laid.

Lateral connections shall be made with manufactured junctions comparable in strength with the specified tubing.

The pipe ends and the couplings shall be free of foreign material when assembled. During the placement of the tubing, each open end shall be closed off with a suitable cover or plug at the end of the workday until work resumes.

All split fittings shall be securely fastened with nylon cord or plastic zip ties before any backfill is placed.

All buried ends of the tubing shall be supplied with end caps unless otherwise shown on the drawings.

7. BACKFILLING

The backfilling of the trench shall be as shown on the drawings and completed as rapidly as is consistent with the soil conditions. Automatic backfilling machines may be used. Backfill shall be placed so that displacement or deflection of the tubing will not occur. Backfill shall extend above the ground surface to allow for settlement and be well rounded and centered over the trench.