CONSTRUCTION PLAN

PRACTICE(S) WATER AND SEDIMENT CONTROL BASIN (638)

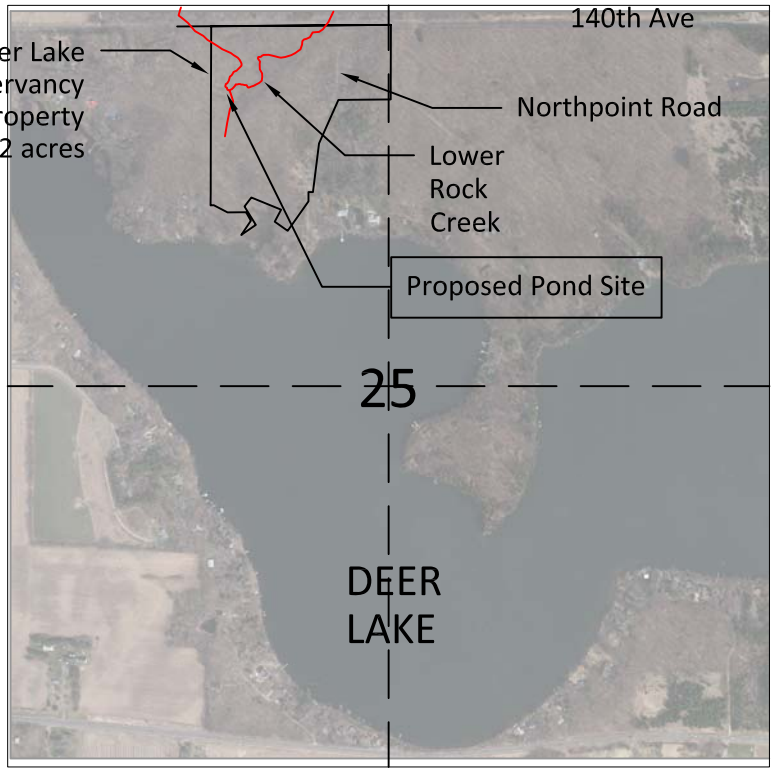
LANDOWNER DEER LAKE CONSERVANCY DISTRICT

ADDRESS PO Box 1139, St Croix Falls, WI 54024

LANDOWNER PHONE NO. -- COUNTY POLK

TOWNSHIP St. Croix Falls T 34 N, R 18W, Sec. 25

FIELD OFFICE POLK COUNTY LWRD TELEPHONE NO. 715-485-8699



DIGGERS HOTLINE

Call 3 Work Days
Before You Dig!

Nationwide
811

Toll Free
1-800-242-8511

TDD
1-800-542-2289

Website
www.diggershotline.com

N

Not to
Scale

LOCATION MAP

NOTICE TO LANDOWNERS AND EXCAVATORS

Any representation made by the USDA, Natural Resources Conservation Service, or the Polk County LWRD, 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 # _____

Landowner Acceptance: See WI Jobsheet 819

Designed by: SCOTT GEDDES, P.E. Date: 10/18/2017

Checked by: _____ Date: _____

Approved by: _____ Date: _____

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 _____

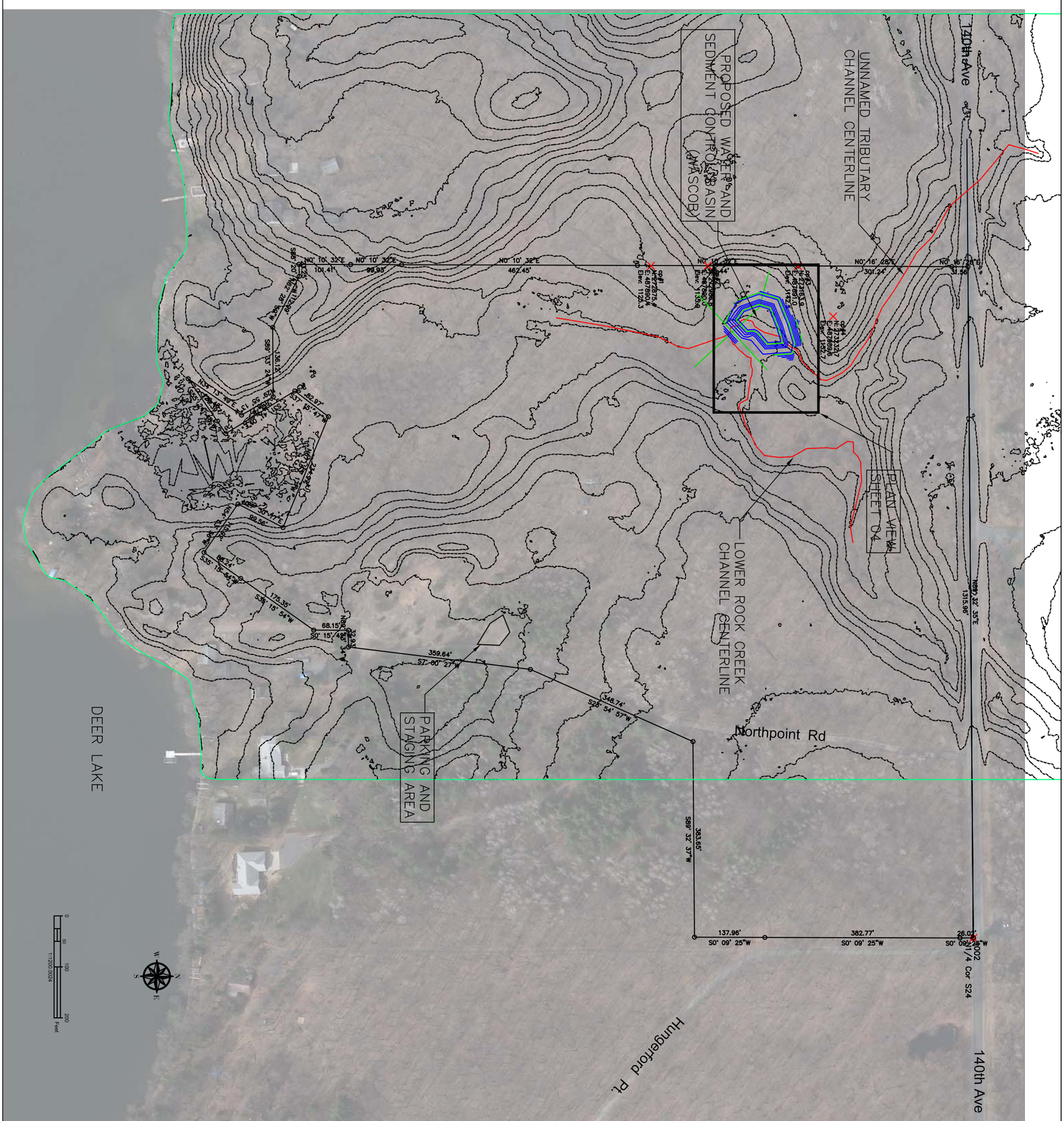
ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY	SHEET NUMBER	WI. CONSTRUCTION SPEC. OR JOB SHEET NUMBER
CLEARING AND GRUBBING	ACRE	0.5	3	WCS 1
EXCAVATION	CU YD	1400	--	WCS 2
EARTHFILL	CU YD	250	--	WCS 3
PVC PIPE, 8" DIA W/ ANIMAL GUARD	LIN FT	8	6	WCS 15
PERFORATED PLASTIC TUBING, 6"	LIN FT	50	6	WCS 15
GRAVEL OR CRUSHED STONE	TON	4	6	WCS 11
SEEDING, FERTILIZER AND MULCH	ACRE	0.8	7	WI-710
ROCK RIPRAP, D50=12"	TON	45	4	WCS 9
GEOTEXTILE FABRIC	SQ YD	75	4	WCS 13
--		--	--	--

NOTES:

1. CONSTRUCTION OPERATIONS SHALL BE CARRIED OUT IN SUCH A MANNER AND SEQUENCE THAT EROSION AND WATER POLLUTION WILL BE MINIMIZED. DNR CONSTRUCTION SITE BEST MANAGEMENT PRACTICES AND CHAPTER 10 OF THE WISCONSIN DEPARTMENT OF TRANSPORTATION FACILITY DEVELOPMENT MANUAL SHALL BE USED AS A GUIDE
2. ALL AREAS OF THE EMBANKMENT, AUXILIARY SPILLWAY, OUTLET CHANNEL AND OTHER DISTURBED AREAS OF THE PERMANENT POOL SHALL BE SEEDED IN ACCORDANCE WITH NRCS FOTG STANDARD FOR CRITICAL AREA PLANTING (342). THESE VEGETATED AREAS WILL BE PROPERLY MANAGED TO PREVENT GRAZING DAMAGE. BORROW AREAS SHALL BE SEEDED AS NEEDED, ACCORDING TO LAND USE PRACTICES.
3. A CUTOFF OF RELATIVELY IMPERVIOUS MATERIAL SHALL BE PROVIDED UNDER THE EMBANKMENT TO REDUCE SEEPAGE THROUGH THE FOUNDATION, THE CUTOFF SHALL BE LOCATED AT OR UPSTREAM FROM THE CENTERLINE OF THE EMBANKMENT. IT SHALL EXTEND UP THE ABUTMENTS AS REQUIRED AND BE DEEP ENOUGH TO EXTEND INTO A RELATIVELY IMPERVIOUS LAYER OR PROVIDE FOR A STABLE EMBANKMENT.
4. THE CUTOFF TRENCH SHALL HAVE A BOTTOM WIDTH ADEQUATE TO ACCOMODATE THE EQUIPMENT USED FOR EXCAVATION, BACKFILL AND COMPACTION OPERATIONS. TRENCH SIDE SLOPES SHALL NOT BE STEEPER THAN 1:1

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.



Sheet 3 of X	Date 06/14	Drawing Name WI-018 color	USDA United States Department of Agriculture Natural Resources Conservation Service	PLAN VIEW – PROJECT LOCATION OWNER: Deer Lake Conservancy COUNTY: Polk

		Date
Designed	SEG	10/2017
Drawn		
Checked		
Approved		

CHANNEL PROTECTION
10' X 35' X 2' RIPRAP (34 TONS) D50=12"
50 SQ YD GEOTEXTILE FABRIC
PLACE ALONG CHANNEL CENTERLINE AND POND SIDE. EXTEND TO BOTTOM OF POND

BENCH MARK

cp#4
N: 273232.7
E: 487969.6
Elev: 1152.7

CHANNEL CENTERLINE – UNNAMED TRIBUTARY

BENCHMARK NAIL IN FENCE POST

cp#3
N: 273163.9
E: 487891.0
Elev: 1142.5

POND DETAILS
NOMINAL DIMENSION: 140 FT X 90 FT
OHWM: 1120.5
BOTTOM ELEV: 1115.0
SIDES: 3:1 WITH 10' WIDE SAFETY BENCH @ 10:1 SLOPE ALONG TOP

POND CROSS SECTION SEE PROFILE VIEWS NEXT PAGE

SOIL TEST #1

CENTERLINE OF OUTLET EMBANKMENT SEE PROFILE VIEWS

STA 22+00
N: 273103.0
E: 488093.8
Elev: 0.0

STA 9+00
N: 273095.5
E: 487944.4
Elev: 0.0

STA 9+28
N: 273086.1
E: 487971.8
Elev: 0.0

SLOPE BOTTOM OF POND @ 1% ALONG FLOW CENTERLINE

LOWER ROCK CREEK CHANNEL CENTERLINE

8" X 40' PERFORATED 'TRICKLE TUBE' OUTLET SEE DETAILS

OUTLET PROTECTION
10' X 20' X 2' RIPRAP (20 TONS) D50=12"
24 SQ YD GEOTEXTILE FABRIC
EXTEND 10 FEET ALONG SLOPE FROM TOP CENTERLINE OF BERM.

BENCH MARK NAIL IN FENCE POST

cp#2
N: 272986.8
E: 487890.0
Elev: 1135.9

SOIL TEST #2

STA 20+50
N: 273001.5
E: 487983.4
Elev: 0.0

STA 10+50
N: 272998.5
E: 488054.0

N00°10'52"E
375.44'

1:120.0002

Date	10/2017
Designed	SEG
Drawn	
Checked	
Approved	

PLAN VIEW

Deer Lake Conservancy

OWNER:

Polk

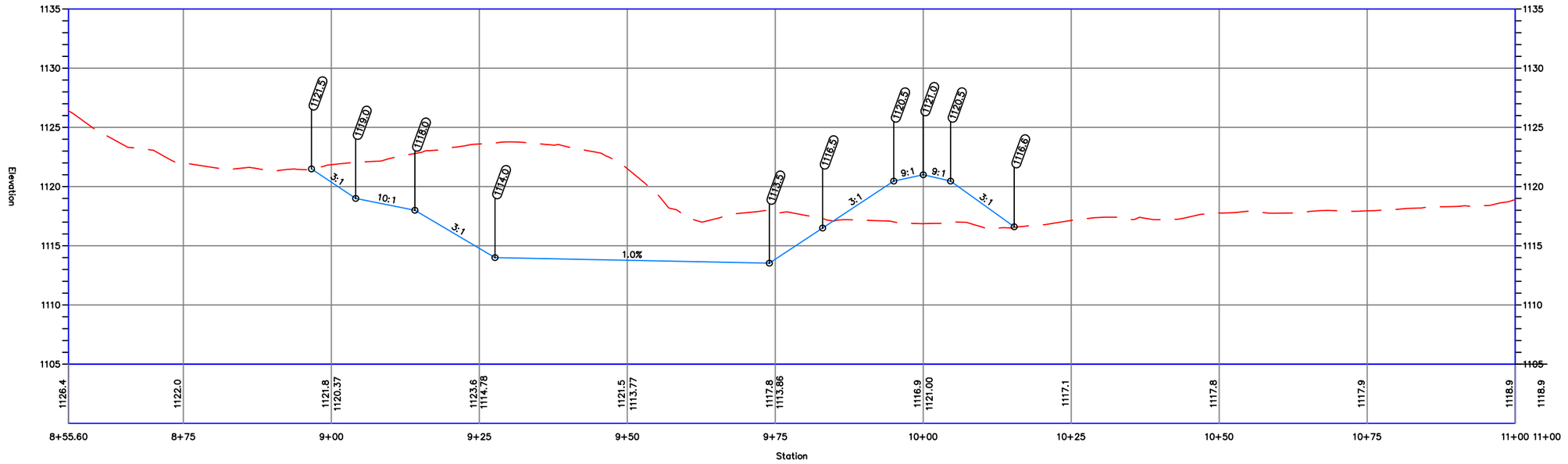
COUNTY:

United States Department of Agriculture

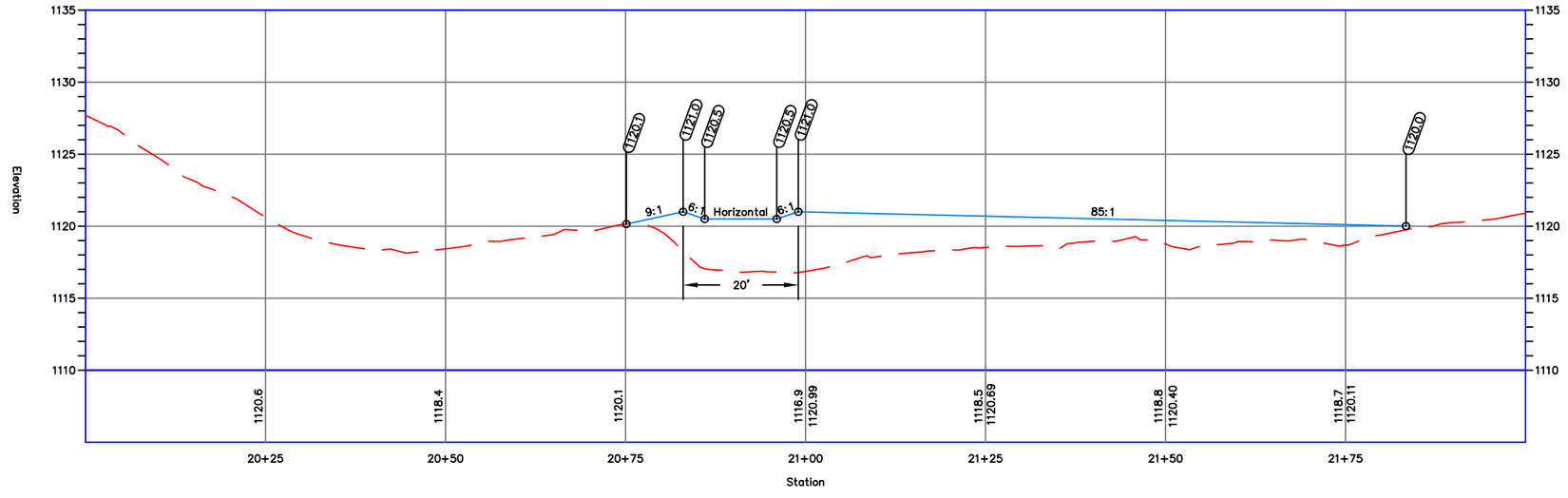
Natural Resources Conservation Service

Drawing Name	WI-018 color
Date	06/14
Sheet	4 of 8

Pond_Section Profile



Pond Outlet Berm Profile



Date 10/17

Designed SEG

Drawn

Checked

Approved

PLAN VIEW

OWNER: DEER LAKE CONSERVANCY – LOWER ROCK CREEK

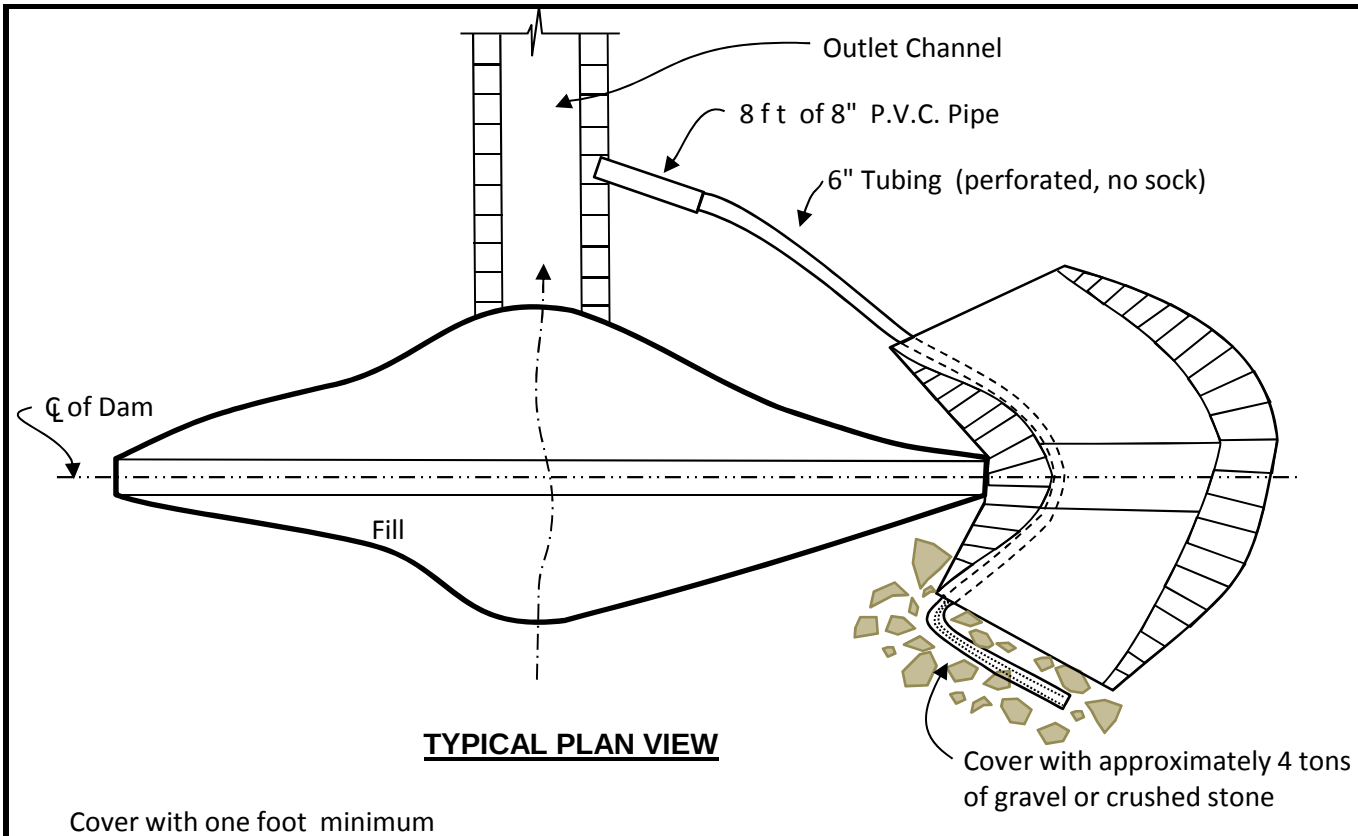
COUNTY: POLK

United States Department of Agriculture

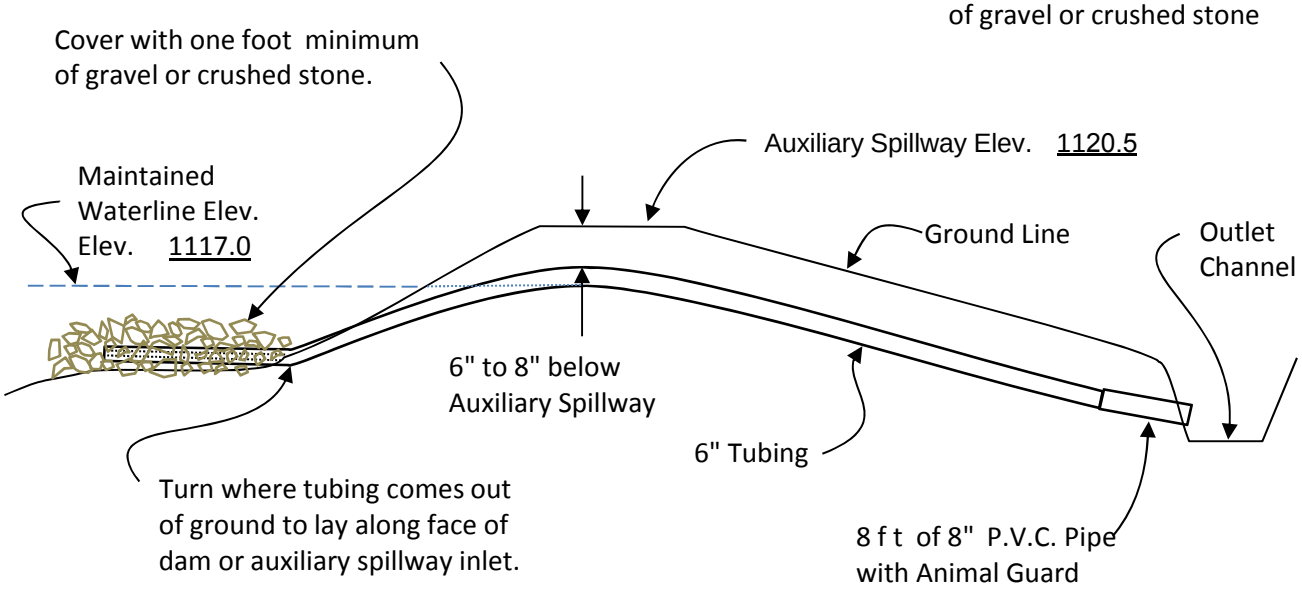
Natural Resources Conservation Service

Drawing Name
WI–018 color

Date
06/14



TYPICAL PLAN VIEW



TUBING PROFILE

BILL OF MATERIALS		
ITEM	Quant.	
P.V.C. Pipe 8 in. Dia.	8	Ft
Perforated Plastic Tubing 6 in. Dia.	50	Ft
Gravel or Crushed Stone	4	Tons

Not to Scale

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

PERFORATED TRICKLE TUBE FOR EMBANKMENT POND

Landuser: Deer Lake Conservancy
Location: Lower Rock Creek
Polk *County LWRD, Wisconsin*
Section 25 T 34N R 18W

Designed
Drawn
Checked
Approved
Title
Date

Sheet of

DRAWING NO. IN-ENG-41.XLS (REV. 6/81)

SEEDING DATES

TIME PERIOD	DATES			TYPE OF SEEDING
Spring	APRIL 15	through	JUNE 1	Permanent
Summer	JUNE 2	through	JULY 31	Temporary *
Late Summer	AUG 1	through	AUG 21	Permanent
Fall	AUG 22	through	OCT 14	Temporary *
Late Fall	OCTOBER 15	through	snow cover	Dormant
Winter	snow cover	through	Spring Seeding	Frost Seed 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 (K20) per acre. Apply two tons/ac of 80–89 lime or equivalent. (see page 2 for equivalent)

* Seed a temporary cover crop of _____ at a rate of _____ pounds/acre. (_____ Bushels/acre)
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 327–5 BASIC WET PRAIRIE		LOCATION SLOPES, POND ACRES 0.6		SEEDING MIX _____		LOCATION _____ ACRES _____	
SPECIES		RATE	POUNDS	SPECIES		RATE	POUNDS
COMMON IRONWEED		1 OZ/AC	0.1				
BLUE VERVAIN		1	0.1				
SWITCHGRASS		16	0.6				
PRAIRIE CORDGRASS		8	0.3				
BIG BLUESTEM		16	0.6				
INDIANGRASS		16	0.6				
VIRGINIA WILDRYE		20	0.75				

1. PLS = (% Germination X % Purity)

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.
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.

USDA United States Department of Agriculture
Natural Resources Conservation Service

INTRODUCED SPECIES SEEDING ESTABLISHMENT

CLIENT: DEER LAKE CONSERVANCY
COUNTY: POLK

Designed SEG Date 10–2017
Drawn
Checked
Approved

File Name WI–710
Date 02/15

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 is required.) ~~(Mulching is not required.)~~

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.

Operation and Maintenance Plan
Water and Sediment Control Basin

Cooperator: Deer Lake Conservancy _____ Date: _____

By: _____ Title: _____

Project Location: Lower Rock Creek, unnamed tributary

I agree to the following for the life of the structure.

1. Remove debris from the tile inlet to prevent clogging of the underground outlet system.
2. Correct and maintain the embankment to its original cross section and top elevation.
3. Remove excessive accumulated sediment in the storage area.
4. Remove any trees, brush, sediment, or other obstructions from the outlet pipe area.
5 Replace damaged or missing animal guards.
6. Inspect the downstream toe of the embankment annually. If there are wet areas or seeps at the downstream toe of the embankment, it could be a serious problem. Ask for assistance to evaluate the seepage.
7. Check tile inlet, embankment, and pipe outlet after heavy rains for possible damage. Inspect annually for damage from normal use.
8. Replace or repair any component of the underground outlet system that may be damaged by equipment or storm events.
9. Maintain vegetative cover as outlined in Wisconsin Job Sheets 134, How to Establish and Maintain Introduced Grasses and Legumes, and 135, How to Establish and Maintain Native Grasses, Forbs and Legumes.
10. Eliminate all burrowing rodents.
11. Additional Recommendations:

Cooperator's signature: _____ Date: _____

I have discussed the maintenance guidelines with the above cooperator.

Conservationist's signature: _____ Date: _____

Construction Quality Assurance Plan
Water and Sediment Control Basin

LANDOWNER: Deer Lake Conservancy ENGINEERING JOB CLASS: III

LOCATION OF PRACTICE OR PLAN ID: Water and Sediment Control Basin (638)

INSPECTOR: _____ APPROVER: _____

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.) Document proper installation with photographs or diary notation.

MATERIALS

_____ INLET STRUCTURE. Verify the inlet diameter, type and size of holes, and orifice size; Attach a copy of the manufacturer's material specifications. Record observations in the job diary and take photographs.

_____ PIPE MATERIALS. Verify that the material meets the requirements in Wisconsin Construction Specification 15 – Plastic Pipe Conduits or Wisconsin Construction Specification 44 – Corrugated Polyethylene Tubing; Verify the pipe diameter. Document the pipe markings in the job diary. Take photo of pipe and markings.

_____ FERTILIZER. Place tag in construction documentation file. Document quantity. Verify meets drawing WI-710 requirements. 150 lbs. of 20-10-10 per acre 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.

_____ MULCH. Document type used and quantity.

_____ EROSION CONTROL blanket material. Obtain a tag from the material or an invoice or product brochure from the supplier.

CONSTRUCTION

_____ STAKE the clearing limits and set flags or stakes to mark the footprint for topsoil stripping.

_____ STAKE the location and elevation of the embankment at each end.

_____ STAKE the location and grades of the INLET STRUCTURE AND PIPE. Be familiar with SECTION 4 OF WISCONSIN CONSTRUCTION SPECIFICATION 2. Record the staking notes in the engineering field notes.

_____ OBSERVE that topsoil stripping and stockpiling is accomplished according to plans / Wisconsin Construction Specification 2. Document the observation in the job diary.

_____ Verify that EXCAVATED MATERIALS are used / disposed of according to sections 2 and 3 of Wisconsin Construction Specification 2. Document the observation in the job diary.

_____ OBSERVE THE INSTALLATION AND BACKFILL OF THE INLET STRUCTURE AND PIPE. Verify the requirements of Wisconsin Construction Specification 14 or 44 are met. Document method of backfill, lift thickness, and compaction. Obtain photographs or record observations with text in engineering field book.

_____ OBSERVE EMBANKMENT CONSTRUCTION**.** Verify that the requirements of Wisconsin Construction Specification 3 are met. Document method of fill placement. Lift thickness and equipment used to compact lift. Check that method is specified in Table 1 of the Earthfill Specification.

_____ Observe the INSTALLATION OF THE EROSION CONTROL blanket material; verify that installation follows the construction specification, record observations in the job diary.

FINAL INSPECTION

_____ Obtain final PROFILE AND CROSS-SECTIONS of completed embankment. Minimum is one cross-section over the pipe and profile along centerline of embankment. Verify correct:

- □ Top Width – Planned top width is _____ .
- □ Top Elevation – Planned top elevation is _____.
- □ Side Slopes – Planned upstream slope (left) is _____: 1
- □ Planned downstream slope (right) is ____ : 1.
- □ Final Length of embankment. Record the information in engineering field book.

_____ Obtain FINAL SHOTS ON STRUCTURE. Record:

- □ Pipe Inlet Invert – Planned elevation is _____ .
- □ Pipe Outlet Invert – Planned elevation is _____
- □ Riser Diameter and Elevation – Planned diameter / elevation is _____.
- □ Orifice Diameter and Elevation – Planned diameter/elevation is _____
- □ Other pertinent dimensions and elevations. Record the information in engineering field book.

_____ Verify a stable, adequate OUTLET. Document in the job diary. Photographs are recommended.

_____ Verify that all disturbed areas not to be cropped are SEEDED, FERTILIZED AND MULCHED. Document seeding date.

_____ Verify that the ANIMAL GUARD is installed. Take photograph.

_____ 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: _____

WISCONSIN CONSTRUCTION SPECIFICATION

1. Clearing

1. SCOPE

The work shall consist of the clearing and disposal of trees, snags, logs, brush, shrubs, stumps, and rubbish from the designated areas.

2. MARKING

The limits of the areas to be cleared will be marked by means of stakes, flags, tree markings, or other suitable methods. Trees to be left standing and uninjured will be designated by special markings placed on the trunks at a height of about 6 feet above the ground surface.

3. PROTECTION OF EXISTING VEGETATION

Trees and other woody vegetation designated to remain undisturbed shall be protected from damage throughout the entire construction period. Any damage resulting from the Contractor's operations or neglect shall be repaired by the Contractor.

Earthfill, stockpiling of materials, vehicular parking, and excessive foot or vehicular traffic shall not be allowed within the dripline of vegetation designated to remain in place. Vegetation damaged by any of these or similar actions shall be replaced with viable vegetation of the same species.

Any cuts, skins, scrapes, or bruises to the bark of the vegetation shall be carefully trimmed and local nursery accepted procedures used to seal damaged bark.

Any limbs or branches 0.5-inch or larger in diameter that are broken, severed, or otherwise seriously damaged during construction shall be cut off at the base of the damaged limb or branch flush with the adjacent limb or tree trunk.

All roots 1 inch or larger in diameter that are cut, broken, or otherwise severed during construction operations shall have the end smoothly cut perpendicular to the root. Roots exposed during excavation or other operations shall be covered with moist earth and/or backfilled as soon as possible to prevent them from drying.

4. CLEARING

Trees, brush, shrubs, stumps, and other woody growth shall be cleared to a height not exceeding 12 inches above the ground surface. Such growth may be cleared by cutting, pulling, grubbing, or other approved methods.

Trees shall be felled in such a manner as to avoid damage to trees that are to be left standing, existing structures, utilities, and with regard for the safety of persons.

When the designated areas to be cleared include borrow areas and/or areas upon which improvements are to be constructed, the required grubbing of stumps, roots, and other objectionable material in these areas shall be a part of this specification. The grubbing shall consist of the removal of all stumps,

roots of 1 inch in diameter or larger, buried logs, and other objectionable material to a minimum depth of 2 feet below a structure subgrade and 1 foot below an embankment foundation.

5. SITE EROSION CONTROL

Measures shall be installed, or the work performed in a manner that will minimize site erosion, and the production of sediment. Protective measures shall include but are not limited to diversions, waterways, seeding, mulching, sediment basins, and silt fences.

6. DISPOSAL

All materials cleared from the designated areas shall be burned or buried at approved locations or otherwise removed from the site. Buried materials shall be covered with a minimum of 2 feet of earthfill (including any topsoil added for seeding).

The Contractor is responsible for complying with all rules and regulations for disposal at locations away from the construction site or for the burning of cleared materials.

WISCONSIN CONSTRUCTION SPECIFICATION

2. Excavation

1. SCOPE

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

2. 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.

3. 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.

Material placed in designated waste disposal areas shall be left in a neat and 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.

4. 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.

5. 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.

6. 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 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 pits shall be left in a neat and 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

3. Earthfill

1. SCOPE

The work shall consist of placing the earthfill required by the drawings. This specification does not apply to the earthfill required for waste storage facilities.

2. MATERIALS

All fill materials shall be obtained from required excavations and designated borrow areas. The selection, blending, routing, and disposition of materials in the various fills shall be subject to approval by Technician.

Fill materials shall contain no sod, brush, roots, frozen soil, or other perishable materials. Stones larger than two-thirds of the uncompacted layer thickness shall be removed from the materials prior to compaction of the fill.

3. FOUNDATION PREPARATION

The foundation area shall be cleared of trees, stumps, roots, brush, rubbish, and stones having a maximum dimension greater than six (6) inches. Foundations shall be stripped to remove vegetation and other unsuitable materials or to the depth shown on the drawings, whichever is greater. Topsoil shall be stripped from the foundation area and stockpiled for use as a top dressing for vegetation establishment unless otherwise shown on the drawings.

Earth foundations shall be graded to remove surface irregularities and slopes steeper than 1:1.

The foundation surfaces shall be scarified parallel to the centerline of the fill to a minimum depth of 2 inches. The moisture content of the scarified materials shall be maintained as specified for the earthfill. The surface materials of the foundation shall be compacted and bonded with the first layer of earthfill as specified for subsequent layers of earthfill.

4. PLACEMENT

Fill shall not be placed until the required excavation and preparation of the underlying foundation is completed and inspected and approved by the Technician. No fill shall be placed upon a frozen surface nor shall snow, ice, or frozen material be incorporated in the fill.

Fill shall be placed in approximately horizontal layers beginning at the lowest elevation of the foundation. The thickness of each layer of fill prior to compaction shall be as specified in Table 1. Materials placed by dumping in piles or windrows shall be spread uniformly to not more than the specified layer thickness prior to compaction.

Adjacent to structures, earthfill shall be placed in 4-inch lifts (prior to compaction) in a manner adequate to prevent damage to the structure and to allow the structure to gradually and uniformly assume the backfill loads.

The height of the fill shall be increased at approximately the same rate on all sides of the structure.

Placement of fill adjacent to concrete structures may begin after the concrete has cured for the minimum time specified.

Earthfill in dams, levees, and other structures designed to impound water shall be placed to meet the following additional requirements:

a. The distribution of materials throughout each zone shall be essentially uniform, and the fill shall be free from lenses, pockets, streaks, or layers of material differing substantially in texture, moisture content, or gradation from the surrounding material.

b. The embankment top shall be maintained approximately level during construction except for sectional construction as described in Section 7.

c. Dam embankments shall be constructed in continuous layers from abutment to abutment, except where openings to facilitate construction or to allow passage of stream flow during construction are specified.

d. If the surface of any layer becomes too hard and smooth to achieve a suitable bond with the succeeding layer, it shall be scarified parallel to the axis of the fill to a depth of not less than 2 inches before the next layer is placed.

5. CONTROL OF MOISTURE CONTENT

Fill materials shall have a moisture content sufficient to insure the required compaction. When kneaded in the hand, the soil will form a ball which does not readily separate and will not extrude out of the hand when squeezed tightly. The adequacy of the moisture content will be determined by the Technician.

Fill material or the top surface of the preceding layer of compacted fill that becomes too dry to permit suitable bond shall either be removed or scarified and wetted by sprinkling to an acceptable moisture content prior to placement of the next layer of fill.

Fill material that is too wet when deposited or the top surface of the preceding layer of compacted fill that becomes too wet shall be either removed or allowed to dry to an acceptable moisture content before compaction or placing additional layers of fill.

6. COMPACTION

The Contractor shall furnish and operate the types and kinds of equipment necessary to compact the fill materials.

Unless otherwise specified on the plans or approved by the Technician, compaction requirements for each layer of fill material are as shown in Table 1.

Each pass shall consist of at least one complete coverage by the wheel, track, or roller over the entire surface of the fill layer in a direction parallel to the main axis of the fill.

Adjacent to structures or in confined areas, compaction of the fill shall be accomplished by means of manually directed power tampers or plate vibrators or hand tamping, unless otherwise specified. The Technician shall determine if adequate compaction is being achieved. Heavy equipment shall not be

operated within 2 feet of any structure. Compaction by means of drop weights operating from a crane or hoist of any type will not be permitted.

7. SPECIAL REQUIREMENTS FOR SECTIONAL CONSTRUCTION OF EMBANKMENTS

When sectional (or phase) construction of embankments is authorized, the work shall be accomplished in the following manner:

Each section of the embankment that is constructed in the first phase shall be so placed that a slope not steeper than 3 feet horizontal to 1 foot vertical is maintained at the end of the embankment section adjacent to the gap in construction or closure section.

Prior to placement of the closure sections, the surfaces of completed fills and excavations that will be in contact with the closure shall be stripped of all loose material, scarified, moistened, and recompacted as necessary.

Table 1 - Equipment Compaction Requirements

Equipment Type		Applicable Soils[1]	Maximum Fill Height[2] (feet)	Layer Thickness[3] (inches)	Minimum Passes[4]
Sheepsfoot roller (10,000 lb. min. operating weight)		ML, MH, CL, CH or SM, SC, GM, GC with >20% fines	None	9	1
Vibratory tamping roller (9,000 lb. min. operating weight)		SM, SC, GM, GC	None	9	2
Rubber-tired scraper (fully loaded)		GM, GC, SM, SC, ML, MH, CL, CH	20	9	1
Rubber-tired front end loader (fully loaded)		GM, GC, SM, SC, ML, MH, CL, CH	20	6	1
Track-type crawler (standard tracks)	30,000 lb. min.	GM, GC, SM, SC, ML, CL	10**	6	2
		SP, SW, GP, GW	6**	12	4
		CL, ML, SC, SM	15##	3	2
	less than 30,000 lb.	GM, GC, GP, GW, SM, SC, SP, SW, ML, CL	6**	6	2
Farm tractor (2,400 lb. min.)		GM, GC, SM, SC, ML, MH, CL, CH	15	6	2
Steel drum vibratory roller (10,000 lb. min.)		SP, SW, GP, GW	None**	12	2

[1] Unified Soil Classification System.

[2] Measured from the top of the fill to the lowest point along the centerline of the fill.

[3] Prior to Compaction.

[4] The Technician shall determine if adequate compaction is being achieved. Additional passes may be required.

** The fill shall not have a permanent body of water stored against it.

This method may only be used for embankments that will not have the potential for a permanent body of water stored against it that is greater than 1/4 acre in surface area or more than 6 feet deep.

WISCONSIN CONSTRUCTION SPECIFICATION

9. ROCK RIPRAP

1. 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.

2. 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 (Job Class II and above) 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. 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.

3. 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.

Equivalent AASHTO testing specifications may be substituted for ASTM testing specifications.

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.

4. 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 (Job Class II and above) 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.

5. 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.

6. 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.

7. PLACING ROCK RIPRAP

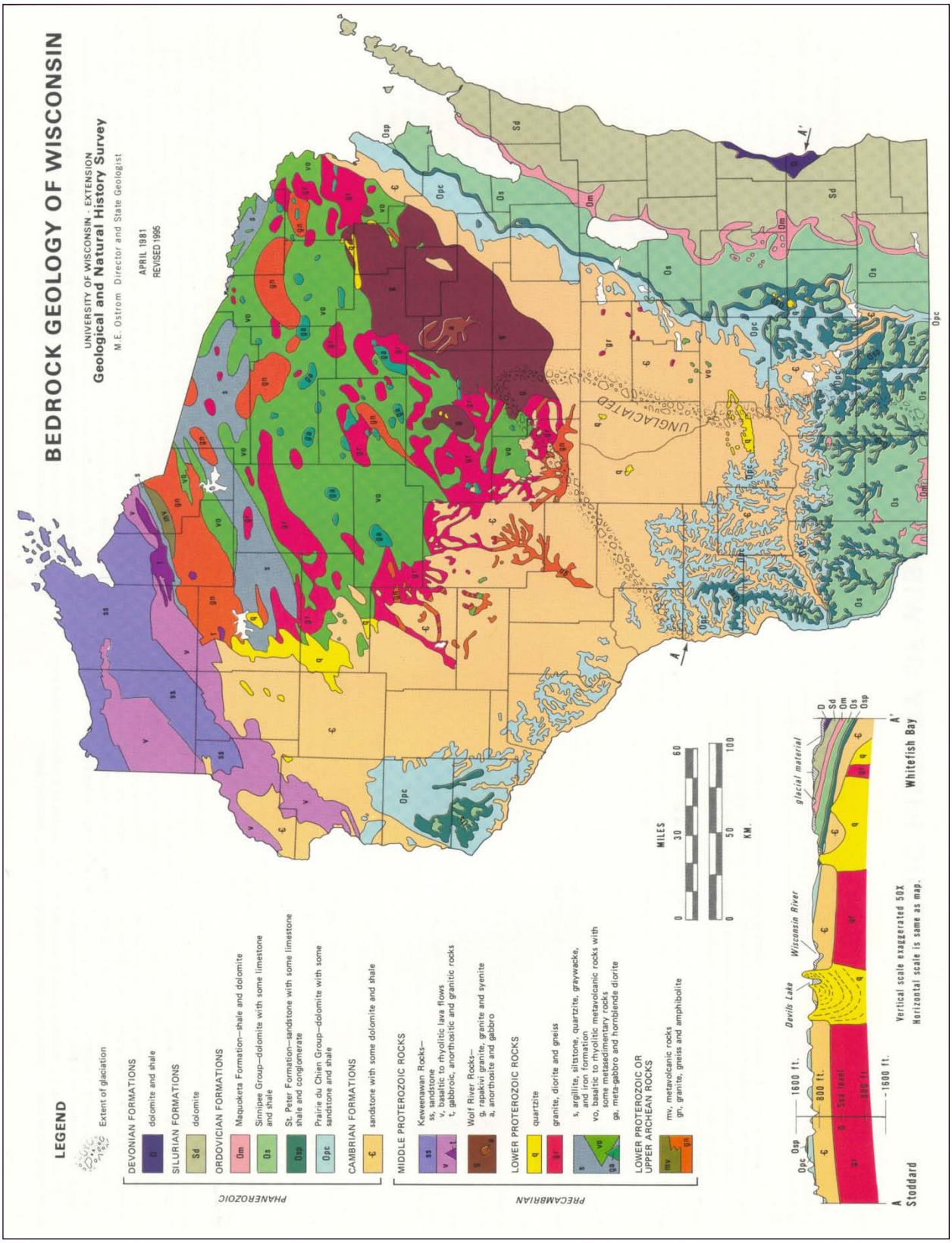
The rock riprap shall be placed by equipment on the surfaces and to the depths specified. The rock riprap shall be installed to the full course thickness in one operation and in such a manner as to avoid displacement of underlying materials. The rock for riprap shall be delivered and placed in a manner 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.

8. 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 1995
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
Є 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, siltstone, 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
A'
Stoddard
Devils Lake
Wisconsin River
glacial material
Whitefish Bay
1600 ft.
800 ft.
Sea level
Vertical scale exaggerated 50X
Horizontal scale is same as map.

WISCONSIN CONSTRUCTION SPECIFICATION

11. Small Rock Aggregate (Non-Concrete)

1. SCOPE

The work shall consist of furnishing, transporting, and placing small rock aggregate, where specified, in the construction of stream crossings, access roads, heavy use area protection, and other similar structures.

2. MATERIALS

The small rock aggregate material shall be virgin, clean, hard, and durable particles free from organic matter or other deleterious substances that would interfere with free-draining properties. No reclaimed concrete or asphalt is allowed.

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

3. DEFINITIONS

- Virgin materials – mineral materials in a native or raw form, not previously used.
- Sand and fine gravel – a mixture of sand and gravel granular material with 100% passing ½-inch sieve and 5% maximum passing the #200 sieve.
- Fine aggregate – 100% passing ⅜-inch sieve and 10% maximum passing the #200 sieve.
- Crushed stone – 100% passing ¾-inch sieve and 10% maximum passing the #200 sieve.
- Graded rock – 100% passing the base course thickness dimension and a maximum of 10% passing the ¾-inch sieve. All sizes between the limits shown on the drawings are to be represented.
- Breaker run: aggregate resulting from the mechanical crushing of quarried stone not screened or processed after primary crushing and 10% maximum passing the #200 sieve (typically 2 to 5 inches average diameter).

4. GRADATION

The gradation of the aggregate material shall be in accordance with one of the following:

- The gradation of the material shall be as shown on the drawings.
- If the gradation is not shown on the drawings, refer to definitions for graded rock, crushed stone, fine aggregate, and sand and fine gravel.

5. SUBGRADE PREPARATION

Required excavations shall be accomplished as shown on the drawings and in accordance with Wisconsin Construction Specification 2, Excavation.

Foundation surfaces shall be clean and free of organic matter, loose soil, and foreign substances when aggregate is placed.

Aggregate shall not be placed on the subgrade until it has been inspected and approved by the Technician.

6. PLACEMENT

The aggregate shall be placed in a manner to avoid segregation of particle sizes. No foreign materials will be allowed to become intermixed with or otherwise contaminate the material.

Any damage to the foundation surface occurring during placement of aggregate material shall be repaired before proceeding with the work.

Aggregate shall be placed in uniform layers not more than 12 inches in thickness and machine worked, to the depths specified on the drawings, so as to create a dense aggregate layer.

7. COMPACTION

Unless otherwise stated on the drawings, no compaction will be required beyond that resulting from the placing, spreading, and consolidating operations.

Compaction, when required, shall meet the requirements specified in Wisconsin Construction Specification 3, Earthfill, Table 1, Equipment Compaction Requirements.

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

15. Plastic Pipe Conduits

1. SCOPE

The work shall consist of furnishing and installing polyvinyl chloride (PVC), acrylonitrile-butadienestyrene (ABS), and polyethylene (PE) plastic pipe and the necessary fittings as shown on the drawings. **This specification does not apply to corrugated polyethylene tubing used for subsurface drainage systems.**

2. MATERIALS

Polyvinyl chloride (PVC) pipe and fittings shall conform to the requirements of the following ASTM and AWWA specifications unless otherwise stated on the drawings.

Pressure Rated:

a. ASTM D-1785 PVC Plastic Pipe, Schedules 40, 80, and 120.
b. ASTM D-2241 PVC Pressure-Rated Pipe (SDR Series).
c. ASTM D-2464 Threaded PVC Plastic Pipe Fittings, Schedule 80.
d. ASTM D-2466 PVC Plastic Pipe Fittings, Schedule 40.
e. ASTM D-2467 Socket-Type PVC Plastic Pipe Fittings, Schedule 80.
f. ASTM D-2855 Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets.
g. ASTM D-3139 Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
h. AWWA C 900 Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 in. through 12 in.

Non-Pressure Rated:

i. ASTM D-2729 PVC Sewer Pipe and Fittings.
j. ASTM D-2855 Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets.
k. ASTM D-3034 Type PSM PVC Sewer Pipe and Fittings.
l. ASTM D-3212 Joints for Drain and Sewer Plastic Pipes using Flexible Elastomeric Seals.
m. ASTM F-679 PVC Large-Diameter Plastic Gravity Sewer Pipe and Fittings.
n. ASTM F-794 PVC Profile Gravity Sewer Pipe and Fittings, Based on Controlled Inside Diameter.
o. ASTM F-949 PVC Corrugated Sewer Pipe with a Smooth Interior and Fittings.
p. ASTM F-1760 Coextruded Poly (Vinyl Chloride) (PVC) Non-Pressure Plastic Pipe having Reprocessed-Recycled Content.

Acrylonitrile-butadiene-styrene (ABS) plastic pipe and fittings shall conform to the requirements of the following ASTM specifications unless otherwise stated on the drawings.

Non-Pressure Rated:

a. ASTM D-2661 Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings.

Polyethylene (PE) plastic pipe and fittings shall conform to the requirements of the following ASTM specifications unless otherwise stated on the drawings.

Pressure Rated:

a. ASTM D-2239 PE Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.
b. ASTM D-2683 Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing.
c. ASTM D-3035 PE Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter.
d. ASTM D-3261 Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
e. ASTM F-714 Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.
f. ASTM F-2620 Heat Fusion Joining of Polyethylene Pipe and Fittings.

Non-Pressure Rated:

g. ASTM F-667 Large Diameter Corrugated PE Tubing and Fittings.
h. ASTM F-2306 PE Plastic Pipe and Fittings - Annular Corrugated Profile Walled - Based on Inside Diameter

The pipe shall be homogeneous throughout and free from visible cracks, holes, foreign matter, or other defects. The pipe shall be as uniform in color, opacity, density, and other physical properties as is commercially practicable.

3. JOINTS AND FITTINGS

Joints and fittings shall be of the same or similar materials as the pipe and equal to or exceeding that specified for the pipe to which it is attached.
Joints may be bell and spigot type with elastomeric gaskets, coupling type with elastomeric gaskets on each end or solvent cemented. The joints shall be installed according to the manufacturer's recommendations unless otherwise specified.

When a lubricant is required to facilitate joint assembly, it shall be a type having no detrimental effect on the gasket or pipe material.

4. HANDLING AND STORAGE

Pipe shall be delivered to the job site and handled by means which provide adequate support to the pipe and does not subject it to undue stresses or damage. When handling and placing plastic pipe, care shall be taken to prevent impact blows, abrasion damage, and gouging or cutting. All special handling requirements of the manufacturer shall be strictly observed. Special care shall be taken to avoid impact when the pipe must be handled at temperatures of 40°F or less.

Pipe shall be stored on a relatively flat surface so that the barrels are evenly supported. Unless the pipe is specifically coated to withstand exposure to ultraviolet radiation, it shall be covered with an opaque material when stored outdoors for a period of 15 days or longer.

5. LAYING AND BEDDING THE PIPE

The pipe shall be laid to the lines and grades as shown on the drawings and specified herein. The pipe shall be laid so that there is no reversal of grade between joints, unless otherwise shown on the drawings. The pipe shall not be dropped or dumped on the bedding or into the pipe trench. The ground surface near the pipe trench shall be free of loose rocks and stones greater than 1 inch in diameter. This ensures that rock will not be displaced and impact the pipe.

Just before placement, each pipe section shall be inspected to ensure that all foreign material is removed from inside the pipe. The pipe ends and the couplings shall be free of foreign material when assembled. At the completion of a work shift, all open ends of the pipeline shall be temporarily closed off using a suitable cover or plug.

Care shall be taken to prevent distortion and damage during unusually hot (over 90°F) or cold weather (under 40°F). After the pipe has been assembled in the trench, it shall be allowed to reach ground temperature before backfilling to prevent pull out of joints due to thermal contraction.

Bell and spigot pipe shall be laid with the bell pointed upstream. The pipe ends and couplings shall be free of foreign material when assembled.

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 pipe is laid and before the pipe is approved for backfill.

The pipe shall be firmly and uniformly bedded throughout its entire length. The bedding depth and materials to be used will be as shown on the drawings. For pipe with bell joints, the bedding material shall be excavated at the locations of the bells to prevent the pipe from being supported by the bells.

6. PIPE EMBEDMENT

Earth bedding – The pipe shall be firmly and uniformly placed on compacted earthfill bedding or an in-place earth material bedding of ample bearing strength to support the pipe without noticeable settlement. The earth material on which the pipe is placed shall be of uniform density to prevent differential settlement.

Unless otherwise specified, a groove that closely conforms to the outside surface of the pipe shall be formed in the bedding. The depth of the groove shall be equal to or greater than 0.3 of the pipe diameter.

Earth bedding shall be compacted to a density not less than adjacent undisturbed in-place earth material or be compacted earth backfill. Earthfill material used for compacted earth bedding shall be free of rocks or stones greater than 1 inch in diameter and earth clods greater than 2 inches in diameter. The pipe shall be loaded sufficiently during the compaction of bedding under the haunches and around the sides of the pipe to prevent displacement from its final approved placement.

Sand, gravel, or crushed rock bedding – When sand, gravel, or crushed rock bedding is specified, the pipe shall be firmly and uniformly placed on the bedding material. Material for bedding shall not exceed 1 inch in diameter. Unless otherwise shown on the drawings, the coarse-grained bedding material shall be carefully placed and compacted to a depth equal to or greater than 0.3 of the

diameter of the pipe above the bottom of the pipe. The pipe shall be loaded sufficiently during backfilling and compaction around the sides to prevent displacement of the pipe from its final approved placement.

Pipe encased in drainfill – The pipe shall be firmly and uniformly placed on bedding of specified drainfill. Drainfill shall be placed and compacted as specified in Wisconsin Construction Specification 8, Drainfill or as shown on the drawings. The pipe shall be loaded sufficiently during backfilling around the sides and during compaction to prevent displacement of the pipe.

Pipe encased in concrete – Concrete encasement shall be carefully placed to form a continuous uniform support around the entire circumference of the pipe or as shown on the drawings. Pipes encased in concrete shall be securely anchored to prevent movement of the pipe during concrete placement. A clear distance of 1.5 inches shall be maintained between the pipe and any reinforcing steel.

7. BACKFILL

Initial backfill – Unless otherwise specified or shown on the drawings, initial backfill to 6 inches above the top of the conduit is required. Earth haunching and initial backfill material shall consist of soil material that is free of rocks, stones, or hard clods more than 1 inch in diameter. Coarse backfill material shall be the specified sand, gravel, crushed rock, or drainfill material.

Initial backfill shall be placed in two stages. In the first stage (haunching), backfill is placed to the pipe spring line (center of pipe). In the second stage, it is placed to 6 inches above the top of the pipe.

The first stage material shall be worked carefully under the haunches of the pipe to provide continuous support throughout the entire pipe length. The haunching backfill material shall be placed in layers that have a maximum thickness of about 6 inches and are compacted as shown on the drawings or as stated in the Wisconsin Construction Specification appropriate for the backfill material. During compaction operations, care shall be taken to ensure that the tamping or vibratory equipment does not come in contact with the pipe and the pipe is not deformed or displaced.

Final backfill – Final backfill shall consist of placing the remaining material required to complete the backfill from the top of the initial backfill to the ground surface, including mounding at the top of the trench. Final backfill material within 2 feet of the top of the pipe shall be free of debris or rocks larger than 3 inches nominal diameter. Coarse backfill material shall be the specified sand, gravel, crushed rock, or drainfill. Final backfill shall be placed in approximately uniform, compacted layers. Final backfill compaction and layer thickness requirements shall be as shown on the drawings or as stated in the Wisconsin Construction Specification appropriate for the backfill material.