DOUGLAS COUNTY LAND CONSERVATION COMMITTEE
Tuesday, September 10, 2019, 2:30 p.m.
Courthouse, Room 207C
1313 Belknap Street, Superior, Wisconsin

Please call the Chair or County Clerk’s Office (715-395-1569) if you are unable to attend.

MEMBERS:  Sue Hendrickson, Chair  Mary Lou Bergman, Vice Chair
Kathryn McKenzie   Larry Luostari
Jim Soyring, FSA   Wendy Bong

A G E N D A
(Committee to maintain a two-hour meeting limit or take action to continue meeting beyond that time.)

1. Roll call.
2. Approval of minutes from the August 20, 2019, meeting (attached).
3. Action items:
   a. Mary Jo Olsen Life Estate Project:
      1. Approval for Douglas County to fund 50% of approved riprap repairs (with or
         without landowner contribution for additional project area) (attached);
      2. Approval to repair existing riprap to meet performance standards or perform
         complete reconstruction of riprap (attached); and
      3. Approval of additional items or requests related to the completion of project.
4. Future agenda items.
5. Adjournment.

cc: Ann Doucette  Ashley Vande Voort  Zach DeVoe
    Cameron Bertsch  Sue Sandvick  Douglas County Website
    County Board Supervisors  Gary Haughn  Shelley Nelson (Telegram)
    Amy Eliot  Dave Schultz  Coreen Fallat
    Jane Anklam  Sue O’Halloran  Ramona Shackleford
    Carolyn Pierce  Mary Jo Olsen

NOTE: Attachments to agenda are available in County Clerk’s Office for review or copying. Action may be taken on any item listed on the agenda. The County of Douglas complies with the Americans with Disabilities Act of 1990. If you are in need of an accommodation to participate in the public meeting process, please contact the Douglas County Clerk’s Office at (715) 395-1341 by 4:00 p.m. on the day prior to the scheduled meeting. Douglas County will attempt to accommodate any request, depending on the amount of notice we receive.

Posted: Courthouse, Government Center, Telegram Copied

Name  Date

9-4-19
Meeting called to order by Chair Sue Hendrickson.


**APPROVAL OF MINUTES:** Motion by McKenzie, second Bong, to approve minutes from the May 21, 2019, meeting. Motion carried.

**ACTION ITEMS:**
- **Proposed 2020 Budget:** Start up mining permit fee reduced; implemented fee for review at renewal to allow more consistent income throughout years. Budget decrease primarily due to personnel costs.
- **ACTION (REFERRAL):** Motion by McKenzie, second Bong, to approve 2020 proposed Land Conservation budget as presented, with potential for changes after meeting with Administrator, and refer to Zoning and Administration Committees. Motion carried.
- **Wildlife Damage and Abatement Program - Report:** Distributed.
- **Budget:** Included with agenda; slight budget increase due to salary and fencing material.
- **ACTION:** Motion by Bong, second Soyring, to approve budget as presented. Motion carried.
- **Approval of Contracts:** Deer donation program contract distributed.
- **ACTION:** Motion by McKenzie, second Bong, to approve contract as presented. Motion carried.

**INFORMATIONAL ITEMS:**
- **2019 Final Department of Agriculture, Trade and Consumer Protection (DATCP) Allocations:** $20,000 was thought to be original allocation; actual amount awarded was $13,400. One cost-share project referred for other funding source.
- **Cost-share Project Status:** Original project for Mary Jo Olsen was to be 100% funded by DATCP. A qualified state engineer never reviewed, so funding was declined. County is now responsible for funding 50% of project, which needs to be redone per state engineer standards. Land Conservation Department currently approved to use up to $3,000 (accrued interest) out of Environmental Reserve Fund for project. Estimates provided by new contractors do not guarantee work, due to negligent completion from previous contractor. Corporation Counsel to review entire process and provide options so county is not liable for project after completion.
- **Potential Balloon Release Resolution:** Remnants of balloons and paper lanterns are found in fields and can cause damage; potential resolution to be presented next meeting.
Department Brochure: Forestry Department may provide assistance with printing.

Dredge Material Placement: Hearing Island and Interstate Island and Soo Line: Open water placement opposed by state due to impact on fisheries.

Water Quality Task Force Hearing: Hearing will be held September 5th at the Yellowjacket Union; time to be determined.

Land and Water Conservation Board Election Policy: Included with agenda for anyone interested in serving on board.

Outstanding Conservation Awards: Nominations for outstanding leaders in conservation are open.

Next Generation Leadership Institute Training: Included with agenda; available to anyone interested.

Land and Water Resource Management Plan Review: Final approval with state will be October 1st.

Groundwater Testing: Testing will occur November 18th. Capital funds were received and promotional cards and social media posts have been created to encourage participation.

Lake and Stream Organization Meeting: Meeting will be held to promote collaboration between DNR, county and those involved with lakes and streams in the area.

Brule Family Fun Day: Flyer included with agenda; will be August 24, 2019, at the Brule State Fish Hatchery from 10 a.m. to 3 p.m.

2019 Sand Lake Youth Camp: Thank you note from attendee and camp included with agenda.

2019 Invasive Species Poster Contest: Several winners from Douglas County.

In-lieu of Fee Program: Liebaert and Vande Voort will meet with Army Corps in October about how to move forward.

FUTURE AGENDA ITEMS: Balloon resolution; Mary Jo Olsen cost-share project.

ADJOURNMENT: Motion by McKenzie, second Bong, to adjourn. Motion carried. Meeting adjourned at 11:41 a.m.

Submitted by,

Kaci Lundgren, Committee Clerk
Thank you for the response.

I will continue to work with Stacy to receive additional feedback on the project. As additional background information, probably most pertinent to Stacy regarding the contractor’s “guarantee”, I have attached the contractor’s contract. The contract lacks a guarantee to repair his work if it would fail. Aesthetic concerns relating to vegetation growth were identified in his email regarding his inability to guarantee his work (attached), which is not a concern of the county conservation department. I trust Stacy as the Certified Engineer to determine the necessary work to complete this project in a way that will meet performance standards and be sufficient shoreline stabilization more than I trust a contractor who stands to make a profit from the project. Therefore, I am uncertain why Stacy’s redesign recommendations are being considered secondary to the contractors design recommendations.

That being said, I do want to see this project completed in a way which meets standards and will last. However I am not willing to spend excessive state and county funds unless a certified engineer determines the additional cost is necessary for the project to meet performance standards. Stacy, it may be best for you to meet with the contractor to discuss what revisions are necessary for the project to meet performance standards. I do wish I was having this conversation with you in May, but because the landowner had to work very hard to find a contractor, we are now functioning under the time restraint of fall. I greatly appreciate you making time to discuss this project with me at your earliest convenience. I definitely understand this is only one of the many counties you have work to perform in.

Thank you for everyone’s time.

Ashley Vande Voort
Douglas County Land Conservationist
Ashley.VandeVoort@douglascountywi.org
Office: 715-395-1266
Cell: 218-591-0586

Ashley,  

Thanks for the email and the phone call discussion this week.

As we discussed on the phone, I’m glad you were able to get your corporation counsel’s opinion on the liability questions you posed as we cannot provide any legal advice as to liability the county might assume. The satisfaction documents provided by Bayfield and Outagamie County looked like good examples to meet item #2, below. Again, the
only issue I had with your corporation counsel’s advice was having the landowner pay a portion of the reconstruction. Since the issue of the practice needing to be reconstructed is entirely due to the County’s technician’s conduct in not obtaining the proper engineering certification for the practice, the landowner should not be responsible for any additional payments. That said, if the appropriate remedy to this situation includes additional linear feet of rip-rap that was not constructed during the initial project, it would be ok to have the landowner pay for a portion of that additional footage only.

I can confirm that DATCP’s funding and contract for the reconstruction of the project will function in the same way an original cost-share agreement.

As for the reconstruction/repair question, I defer to our agricultural engineer, Stacy Dehne. After talking to her on the phone this week, I confirmed that as an engineer, she felt it was fine to modify the existing structure to meet technical standards instead of doing a complete replacement. However, with the information that the contractor will not stand behind his work if there is not a complete replacement, she said she feels it is important that you need to have whoever does the project stand behind his or her work. The options then would be 1) to find a different, less expensive contractor to do a complete replacement so the county’s portion does not exceed the funds available or 2) Pay the additional amount required to cover half of the full replacement with the preferred contractor.

As a final note, If you would like to have Stacy’s assistance and oversight with this project, please make sure to contact her as soon as possible. She may be able to provide additional thoughts related to the repair vs reconstruction options as well.

Jenni

******************************************************************************

Jennifer Heaton-Amrhein  
Chief, Land Management Section/Land and Water Resources Bureau  
Wisconsin Department of Agriculture, Trade and Consumer Protection  
2811 Agriculture Drive  
P.O. Box 8911  
Madison, WI 53708-8911  
Phone: (608)224-4634  
Fax: 608-224-4656  
Jennifer.heatonamrhein@wisconsin.gov

Please complete this brief survey to help us improve our customer service. Thank you for your feedback!

From: Vande Voort, Ashley <Ashley.VandeVoort@douglascountywi.org>  
Sent: Friday, August 23, 2019 10:41 AM  
To: Heaton-Amrhein, Jennifer A - DATCP <Jennifer.HeatonAmrhein@wisconsin.gov>  
Cc: Carlson, Kim O - DATCP <Kim.Carlson@wisconsin.gov>  
Subject: FW: Mary Jo Olsen Life Estate Reconstruct

Hello Jennifer,

Kim mentioned she sent the information about Douglas County’s cost-share project for Mary Jo Olsen along to you. I see Kim is out of the office right now, so I just wanted to send along the information I discussed with Corporate Council today. See the information below.
Thank you,

Ashley Vande Voort
Douglas County Land Conservationist
Ashley.VandeVoort@douglascountywi.org
Office: 715-395-1266
Cell: 218-591-0586

From: Vande Voort, Ashley
Sent: Friday, August 23, 2019 10:30 AM
To: 'Carlson, Kim O - DATCP'
Subject: RE: Mary Jo Olsen Life Estate Reconstruct

Good morning Kim,

I spoke with the County’s Corporate Council this morning. She has limited knowledge of how the DATCP grants function, but here were her recommendations:

1. Make sure DATCP’s funding and contract for the reconstruction of the project will function in the same way as an original project which is installed to ensure DATCP’s partnership in the project
2. Possibly have landowner sign contract to ensure county is not liable for project into the future
3. Have landowner fund a portion of project, to ensure there is landowner buy-in for reconstruction in-case any future projects with other landowners have need of reconstruction

I am sure this is only one of many things you have going on right now, but when you get a chance I would appreciate knowing what DATCP’s recommendations are for this situation. Also, while speaking with Corporate Council, we came to the agreement that it is appropriate to follow Stacy Dehne’s recommendations for modifying the existing project and not the contractor’s recommendations for redoing the entire project. If you have any further guidance as to which reconstruct of the project is advisable with consideration to future liability, please let me know.

Thank you,

Ashley Vande Voort
Douglas County Land Conservationist
Ashley.VandeVoort@douglascountywi.org
Office: 715-395-1266
Cell: 218-591-0586

From: Carlson, Kim O - DATCP [mailto:Kim.Carlson@wisconsin.gov]
Sent: Tuesday, August 20, 2019 4:19 PM
To: Vande Voort, Ashley
Subject: RE: Mary Jo Olsen Life Estate Reconstruct

Hi Ashley,

Thanks for sharing your concerns with the Olsen project. I will forward your email to my boss, Jeni Heaton-Amrhein, and one of us will get back to you.

Kim Carlson
SWRM Grant Program / Land and Water Resources Bureau
Wisconsin Department of Agriculture, Trade and Consumer Protection
(608) 224-4610
kim.carlson@wisconsin.gov
Please complete this brief survey to help us improve our customer service. Thank you for your feedback!

From: Vande Voort, Ashley <Ashley.VandeVoort@douglascountywi.org>
Sent: Tuesday, August 20, 2019 3:52 PM
To: Carlson, Kim O - DATCP <Kim.Carlson@wisconsin.gov>
Subject: Mary Jo Olsen Life Estate Reconstruct

Hello Kim,

Please forward this along to any person you feel may have input on the matter. In the attachment I have summarized the Mary Jo Olsen Life Estate Project, and listed the questions I have regarding potential legal liability for the county. I will also be sending this to the Douglas County Corporate Counsel for input on the matter.

Thank you,

Ashley Vande Voort
Douglas County Land Conservationist
Ashley.VandeVoort@douglascountywi.org
Office: 715-395-1266
Cell: 218-591-0586
1313 Belknap St., Room 206
Superior, WI 54880
www.douglascountywi.org
Hi Ashley:

Just to clarify, the contractor (highlighted in the email below) is the one who stated that he would not guarantee his work over the old stuff so I made the assumption that he WILL guarantee his work starting completely over…

Agree that we don’t care about the soil and/or vegetation growing in the cross section and rather welcome it in our program though!

Let me know what else I can do for you!

Thanks
Stacy

-------- Forwarded message --------
From: Jason Hammond <jason@hle.services>
Date: Thu, Aug 15, 2019 at 3:19 PM
Subject: Hi Jo,
To: jolsen@css.edu <jolsen@css.edu>

Hi Jo,

I sent two estimates for your project/property located at 8261 S. Cty Rd P, Bennett, WI. One is to topcoat with crushed rock and repair your lakeshore Rip-Rap. The second is to remove all of the existing Rip-Rap and start from scratch. I think that we could achieve roughly the same look going either route. The reason I would recommend going with the complete redo is because I cannot guarantee my work when it’s going on top of the existing base. When we do a Rip-Rap project, we make sure there’s no dirt in the rock on top of the fabric, amongst other small but vital components. When waves come in, they wash through the dirt and loosens it up. Ultimately, eventually causing gaps which also allow vegetation to grow in the rock ruining the look of the project.

Thank you,

Jason Hammond
Hammond Landscaping & Excavating
715-919-0895

Sent from my iPad
I think it must be apparent to every thinking mind that the noblest of all professions is that of teaching, and that upon the effectiveness of that teaching hangs the destiny of nations. - David O. McKay
Hammond Landscaping & Excavating (this "Agreement") is made as of this 21 day of August, 2019, (the “Effective Date”) by and between Jo Olsen located at 8261 S. Cty Rd P, Bennett, WI 54873 (“Client”) and Hammond Landscaping & Excavating located at 7465 E. Cty Rd A, Solon Springs, WI 54873 (“Independent Contractor”). Client and Hammond Landscaping & Excavating may each be referred to in this Agreement as a “Party” and collectively as the “Parties.”

1. Services. Hammond Landscaping & Excavating shall provide the following services to Client (the “Services”): 100’ of lakeshore repair Remove existing rock, crushed stone, and fabric. Replace with new heavy grade landscaping fabric, crushed stone, and add to existing stone. Approximately 18-30 yards of crushed stone 3” - 6”. In addition, 10 feet to the north was added. Remove then grade and lower shoremax 12”. Install topsoil seed and erosion control (clean up). . In addition, Independent Contractor shall perform such other duties and tasks, or changes to the Services, as may be agreed upon by the Parties.

2. Compensation. Inconsideration for Hammond Landscaping & Excavating’s performance of the Services, Client shall pay Hammond Landscaping & Excavating 50% down upon contract acceptance to cover materials and the remaining 50% paid upon completion of the project.

3. Term and Termination. Hammond Landscaping & Excavating’s engagement with Client under this Agreement shall commence on a date set after confirmation of bid acceptance and down payment if 50% is paid. The Parties agree and acknowledge that this Agreement and Hammond Landscaping & Excavating engagement with Client under this Agreement shall terminate upon the completion by Hammond Landscaping & Excavating of the project.

4. Insurance. For the term of this Agreement, Hammond Landscaping shall obtain and maintain a policy of insurance, with appropriate and adequate coverage and limits, to cover any claims for bodily injury, property damage or other losses which might arise out of any negligent act or omission committed by Hammond Landscaping & Excavating’s employees or agents, if any, in connection with the performance of the Services under this Agreement.
5. Mutual Representations and Warranties. Both Client and Hammond Landscaping & Excavating represent and warrant that each Party has full power, authority and right to execute and deliver this Agreement, has full power and authority to perform its obligations under this Agreement, and has taken all necessary action to authorize the execution and delivery of this Agreement. No other consents are necessary to enter into or perform this Agreement.

6. Hammond Landscaping & Excavating Representation and Warranties. Hammond Landscaping & Excavating represents and warrants that it has all the necessary licenses, permits and registrations, if any, required to perform the Services under this Agreement in accordance with applicable federal, state and local laws, rules and regulations and that it will perform the Services according to the Client’s guidelines and specifications and with the standard of care prevailing in the industry.

7. Governing Law. The terms of this Agreement and the rights of the Parties hereto shall be governed exclusively by the laws of the State of Wisconsin, without regarding its conflicts of law provisions.

8. Entire Agreement. This Agreement constitutes the entire agreement between the Parties hereto with respect the subject matter hereof, and supersedes all prior negotiations, understandings and agreements of the Parties.
   . Amendments. No supplement, modification or amendment of this Agreement will be binding unless executed in writing by both of the Parties.
9. Notices. Any notice or other communication given or made to either Party under this Agreement shall be in writing and delivered by hand, sent by overnight courier service or sent by certified or registered mail, return receipt requested, to the address stated above or to another address as that Party may subsequently designate by notice, and shall be deemed given on the date of delivery.
10. Waiver. Neither Party shall be deemed to have waived any provision of this Agreement or the exercise of any rights held under this Agreement unless such waiver is made expressly and in writing. Waiver by either Party of a breach or violation of any provision of this Agreement shall not constitute a waiver of any subsequent or other breach or violation.
11. Further Assurances. At the request of one Party, the other Party shall execute and deliver such other documents and take such other actions as may be reasonably necessary to effect the terms of this Agreement.
12. Severability. If any provision of this Agreement is held to be invalid, illegal or unenforceable in whole or in part, the remaining provisions shall not be affected and shall continue to be valid, legal and enforceable as though the invalid, illegal or unenforceable parts had not been included in this Agreement.

IN WITNESS WHEREOF, this Agreement has been executed and delivered as of the date first written above.

Client Signature
Jo Olsen __________________________

Contractors signature
Hammond Landscaping & Excavating ________________________________
Satisfaction of Cost-Share Agreement

The Douglas County Land Conservation Committee, by its authorized representatives, represents the following with respect to the Cost-Share Agreement/Contract # 2019-01-LWRM-D entered into by and between the Douglas County Land Conservation Committee and landowner(s) Mary Jo Olsen and Ryan Gould, dated _________.

1. Douglas County Land Conservation Committee will make all payments obligated under the Cost-Share Agreement.

2. Upon making payment obligated by the Cost-Share Agreement, Douglas County is not responsible for any addition payments for maintenance, repairs or other costs associated with the project completed under the Cost-Share Agreement.

3. The practices shall be designed and installed according to the standards in ch. ATCP 50, Wis. Adm. Code and the contract.

4. Upon completion of the project under the Cost-Share Agreement, the commitments made in the Cost-Share Agreement will be fully satisfied.

5. This satisfaction does not release the landowners, and their successors, from other legal obligations related to the cost-shared practices covered in the above-referenced Cost-Share Agreement/contract.

Agency Name & Return Address:
Douglas County Land and Water Conservation
1313 Belknap St, Room 206
Superior, WI 54880

Parcel Identification Number(s):
BE-004-00126-00
SEE ATTACHED PROPERTY DESCRIPTION
Legal Description of Property to be Satisfied

Provide the legal description below of the property to be satisfied as listed in the CSA recorded at the County Register of Deeds office. Attach additional sheets if necessary.

Legal Description
Parcel No.: BE-004-00126-00

That part of the Southwest Quarter (SW¼) of Section Fifteen (15), Township Forty-six (46), Range Eleven (11) West, Douglas County, Wisconsin, described as follows: Commencing at the West Quarter corner of said Section Fifteen (15); thence south along the West line of said Section a distance of 565.05 feet; thence in a straight line Southeasterly at a deflection angle of 45 degrees - 37' left onto and along the centerline of the right-of-way of County Trunk Highway “P” for a distance of 175.00 feet to the point of beginning; thence Southerly, at a deflection angle of 90 degrees - 44' to the right, to the shore line of Lake Minnesuing; thence back Northeasterly along said last mentioned line to the point of beginning; thence continuing Southeasterly along said centerline of the right-of-way of C.T.H. “P” for a distance of 383.00 feet to the point of curvature of a 15 degree curve to the right (Data for said curve being: Angle of intersection equals 63 degrees - 35', Degree of curvature equals 15 degrees, tangent distance equals 236.76', length of curve equals 423.89'); thence Southerly along the centerline of said curve for an arc distance of 250.60 feet to a point; thence Southwesterly, on a line making an included angle of 79 degrees - 50' with the line forming the chord between last mentioned point and the said P.C. of the curve, to the shore line of said Lake Minnesuing; thence Northwesterly and Northerly along said shore line of said Lake to a point thereon where the first mentioned line going Southwesterly thereto intersects said shore line of said Lake; said parcel containing 3.50 acres, more or less, exclusive of the right-of-way of County Trunk Highway “P”.

Subject to easements, exceptions, and reservations of record.
2019 Reconstruction Plan

PRACTICE  580—Streambank and Shoreline Protection

LANDOWNER  Jo Olsen

ADDRESS  8261 S County Road P

LANDOWNER PHONE NO.  COUNTY  Douglas

TOWNSHIP  Town of Bennet  T. 46  N, R 11W  E/W, Sec. 15

FIELD OFFICE  Douglas Co., LWCD  TELEPHONE NO. 715-395-7266

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

LOCATION MAP

NOTICE TO LANDOWNERS AND EXCAVATORS

Any representation made by the USDA, Natural Resources Conservation Service, or the Douglas County LCD, as to the approximate location or nonexistence of above or underground 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 assure 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.

Signed:  

Designed by:  

Checked by:  

Approved by:  

Date: 7-3-19  

Date: 7-12-19  

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:  

Job Approval Class  

Date:  

Sheet 1 of 7
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<th>Item</th>
<th>Description</th>
<th>Units</th>
<th>Quantity</th>
<th>Spec</th>
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<td>Mobilization</td>
<td>$400.00</td>
<td>1</td>
<td>7</td>
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<td>2</td>
<td>Erosion control - silt curtain</td>
<td>$800.00</td>
<td>1</td>
<td>5</td>
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<tr>
<td>3</td>
<td>Install Class I Nonwoven Geotextile (7.5' Width)</td>
<td>$450.00</td>
<td>100</td>
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<td>4</td>
<td>Remove existing Shoremax and reinstall 12&quot; lower</td>
<td>$480.00</td>
<td>1</td>
<td>Per mfr.</td>
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<td>5</td>
<td>Place riprap (3&quot; - 6&quot; crushed stone)</td>
<td>$577.50</td>
<td>15</td>
<td>3</td>
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<td>6</td>
<td>Place riprap (d50=6&quot;) and Class I Nonwoven Geotextile at north end of project</td>
<td>$329.00</td>
<td>1</td>
<td>3.9</td>
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<td>7</td>
<td>Place riprap (d50=6&quot;) at south end of project</td>
<td>$164.00</td>
<td>1</td>
<td>3</td>
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<tr>
<td>8</td>
<td>Erosion control - Install single net erosion control blanket on disturbed surfaces</td>
<td>$262.50</td>
<td>150</td>
<td>Per mfr.</td>
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**Total:** $3,463.00

Quantities are estimated to the nearest 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.
Hammond Landscaping & Excavating

7465 E Cty Rd A
Solon Springs, WI 54873
Jason (715) 919-0895
Email: Jason@hle.services
Website: hle.services

Bill To
Jo Olsen
8261 S county Road P
Bennet Wi

Estimate # 250
Estimate Date 08/13/2019

<table>
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<th>UNIT PRICE</th>
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<tbody>
<tr>
<td>1</td>
<td>100’ of lakeshore Remove rock and fabric Replace fabric and replace the crushed stone and add to existing stone approximately 18-30 yards of crushed stone 3”- 6”</td>
<td>7,500.00</td>
<td>7,500.00</td>
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<td>Remove then grade and lower shore max 12”</td>
<td>250.00</td>
<td>250.00</td>
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<tr>
<td>1</td>
<td>Crushed stone</td>
<td>845.00</td>
<td>845.00</td>
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<tr>
<td>1</td>
<td>Topsoil</td>
<td>545.00</td>
<td>545.00</td>
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<tr>
<td>1</td>
<td>Single net erosion blankets</td>
<td>265.00</td>
<td>265.00</td>
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<tr>
<td>1</td>
<td>Install topsoil seed and erosion control (clean up)</td>
<td>650.00</td>
<td>650.00</td>
</tr>
<tr>
<td>1</td>
<td>Mobilization</td>
<td>250.00</td>
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</tr>
<tr>
<td>1</td>
<td>Fabric</td>
<td>225.00</td>
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**TOTAL** $10,530.00

Terms & Conditions

We appreciate your business Thank you!
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<tr>
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<td>Fabric</td>
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<tr>
<td></td>
<td><strong>TOTAL</strong></td>
<td><strong>$10,930.00</strong></td>
<td></td>
</tr>
</tbody>
</table>

Terms & Conditions

We appreciate your business Thank you!
Hammond Landscaping & Excavating

7465 E Cty Rd A
Solon Springs, WI 54873
Jason (715) 919-0895
Email: Jason@hle.services
Website: hle.services

Bill To: Jo Olsen
8261 S county Road P
Bennet Wi

<table>
<thead>
<tr>
<th>QTY</th>
<th>DESCRIPTION</th>
<th>UNIT PRICE</th>
<th>AMOUNT</th>
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<td>Mobilization</td>
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<td>Silt curtain (If needed ) $3,000</td>
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<td>Remove then grade and Lower shoremax 12&quot;</td>
<td>250.00</td>
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<tr>
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<td>Place 3&quot; to 6&quot; crushed stone</td>
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<td>845.00</td>
<td>845.00</td>
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<td>1</td>
<td>Topsoil</td>
<td>545.00</td>
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<tr>
<td>1</td>
<td>Single net erosion blankets</td>
<td>265.00</td>
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<tr>
<td>1</td>
<td>Install topsoil, seed and erosion control</td>
<td>550.00</td>
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<td><strong>TOTAL</strong></td>
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Terms & Conditions

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**Hammond Landscaping & Excavating**

7465 E Cty Rd A  
Solon Springs, WI 54873  
Jason (715) 919-0895  
Email: Jason@hle.services  
Website: hle.services

---

**Bill To**
Jo Olsen  
8261 S county Road P  
Bennet Wi

**Estimate #** 249  
**Estimate Date** 08/12/2019

<table>
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<tr>
<th>QTY</th>
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<tbody>
<tr>
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<td>Mobilization</td>
<td>250.00</td>
<td>250.00</td>
</tr>
<tr>
<td>1</td>
<td>Silt curtain (If needed) $3,000</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>1</td>
<td>Remove then grade and Lower shoremax 12”</td>
<td>250.00</td>
<td>250.00</td>
</tr>
</tbody>
</table>
| 1   | Place 3” to 6” crushed stone  
The 10 feet to the north was added onto this estimate | 3,750.00   | 3,750.00|
| 1   | 3” - 6” crushed stone                                  | 845.00     | 845.00  |
| 1   | Topsoil                                               | 545.00     | 545.00  |
| 1   | Single net erosion blankets                           | 265.00     | 265.00  |
| 1   | Install topsoil, seed and erosion control             | 550.00     | 550.00  |

**TOTAL** $6,455.00

**Terms & Conditions**

We appreciate your business Thank you!
2019 Reconstruction Plan

PRACTICE 580—Streambank and Shoreline Protection
LANDOWNER Jo Olsen
ADDRESS 8261 S. County Road P
LANDOWNER PHONE NO. COUNTY Douglas
TOWNSHIP Town of Bennet T 46 N, R 11W E/W, Sec. 15
FIELD OFFICE Douglas Co. LWCD TELEPHONE NO. 715-395-7266

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

NOTICE TO LANDOWNERS AND EXCAVATORS

Any representation made by the USDA, Natural Resources Conservation Service, or the County LCD, as to the approximate location or nonexistence of above or underground 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.

Signed: ___________________________ Date: __________
Designed by: ___________________________ Date: 7-3-19
Checked by: ___________________________ Date: 7-12-19
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 II ___________________________ Sheet 1 of 7
1. This practice was designed and is to be constructed in accordance with the Natural Resources Conservation Service Conservation Practice Standard 580 Streambank and Shoreline Protection.

2. It is the responsibility of the landowner to solicit and receive bids for the project. All bidding processes will be completed in accordance with agency guidelines and policy. The landowner will be responsible for the selection of the project contractor and insure that the project is completed within the received bid.

3. All change orders will be discussed with the landowner, contractor and project inspector prior to their implementation in the project. Decisions on change order request shall be made within 24 hours of the request. Any work completed prior to this process may delay the project and affect cost share payments.

4. A pre construction meeting shall be scheduled with NRCS/LCD personnel, contractor and the landowner prior to construction start-up.

5. The contractor and/or landowner shall notify NRCS/LCD at least 3 working days prior to the commencement of any construction activities.

6. All work is to be performed in accordance with Wisconsin NRCS construction specifications (included with this plan).

7. It is the responsibility of the landowner or their representative to secure any needed local, state or federal permits necessary for the completion of this project.

8. Erosion and sediment control measures and works shall be installed to prevent or minimize sediment production and transport offsite. All pollution control measures and temporary works shall be adequately maintained in a functional condition for the duration of the construction period. All temporary measures shall be removed and the site restored to near original condition.

9. It is the responsibility of the contractor/landowner, prior to the start of construction to notify all involved utilities and those utilities will be located by an authorized representative of that utility.

10. The initial layout will be performed by NRCS/LCD staff. It is the contractor’s responsibility to provide additional survey and quality assurance work during construction, as is necessary for completion.

11. All assistance and required inspections will be scheduled 24 hour in advance with the project inspector. All required inspections are outlined in the inspection plan that is included with the construction packet.

12. All materials used in the construction of this project shall be submitted to the technical agency as outlined in the submittals process and approved by the project inspector prior to their use in the project.

13. Upon completion of the project all areas disturbed during construction shall be restored in accordance with the seeding recommendations and specifications included with this plan. All erosion control measures shall be maintained until the site is fully vegetated and stabilized.

14. If a significant archaeological or historical site is found, cease construction immediately and relocate, redesign or delete the cost-share practice, as needed, to prevent damage to the archaeological or historical site.

15. To stop the spread of invasive species and viruses from one public waterway to another public waterway, all equipment or portions of equipment used for constructing, operating, or maintaining the project will be decontaminated for invasive species and viruses before and after use or prior to use within another public waterway.
<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Units</th>
<th>Quantity</th>
<th>Spec</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mobilization</td>
<td>Lump Sum</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>Erosion control - silt curtain</td>
<td>Lump Sum</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>Install Class I Nonwoven Geotextile (7.5' Width)</td>
<td>L.F.</td>
<td>100</td>
<td>9</td>
</tr>
<tr>
<td>4</td>
<td>Remove existing Shoremax and reinstall 12&quot; lower</td>
<td>Lump Sum</td>
<td>1</td>
<td>Per mfr.</td>
</tr>
<tr>
<td>5</td>
<td>Place riprap (3&quot; - 6&quot; crushed stone)</td>
<td>Cu. Yds.</td>
<td>15</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>Place riprap (d50=6&quot;) and Class I Nonwoven Geotextile at north end of project.</td>
<td>Lump Sum</td>
<td>1</td>
<td>3, 9</td>
</tr>
<tr>
<td>7</td>
<td>Place riprap (d50=6&quot;) at south end of project.</td>
<td>Lump Sum</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>Erosion control - install single net erosion control blanket on disturbed surfaces</td>
<td>Sq. Yds.</td>
<td>150</td>
<td>Per mfr.</td>
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</table>

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.
TYPICAL CROSS SECTION

GRADATION OF ROCK

<table>
<thead>
<tr>
<th>PERCENT PASSING</th>
<th>SIZE (INCHES)</th>
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<tbody>
<tr>
<td>100</td>
<td>12.5</td>
</tr>
<tr>
<td>50-84</td>
<td>5-12</td>
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<tr>
<td>25-50</td>
<td>3-5</td>
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<tr>
<td>5-20</td>
<td>0-3</td>
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QUANTITY ESTIMATE

<table>
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<tr>
<th></th>
<th>JOB</th>
</tr>
</thead>
<tbody>
<tr>
<td>SITE PREPARATION</td>
<td>JOB</td>
</tr>
<tr>
<td>CLEARING</td>
<td>JOB</td>
</tr>
<tr>
<td>ROCK FOR RAPID (WI CONSL. SPEC. 8)</td>
<td>190 YD.</td>
</tr>
<tr>
<td>GEOTEXTILE (WI CONSL. SPEC. 13)</td>
<td>60 SQ. YD.</td>
</tr>
<tr>
<td>CLASS I (WOVEN/CONVWOVEN/PLANT MATERIALS</td>
<td>1 PA.</td>
</tr>
</tbody>
</table>

*ESTIMATED TO THE NEAR LINES AND GRADE

NOTES:

1. DOUBLED THE ROCK THICKNESS FOR A DISTANCE OF 5 FEET AT THE ENDS OF THE
RIPRAP. BLEND THE ROCK SURFACE TO MATCH THE EXISTING GRADE.

THIS STANDARDIZED DESIGN MUST BE ADAPTED TO THE SPECIFIC SITE.
1. Prepare soil before installing erosion control products, including any necessary application of lime, fertilizer, and seed (when installing TRMs or ECBs underlayment).
2. Install turf reinforcement mat above the waterline following manufacturer's recommendations. Note that a bottom anchor trench is not required when using ShoreMax mat in conjunction with a TRM or geotextile.
3. In areas below the normal water elevation, an appropriate geotextile should be installed beneath the ShoreMax mat.
4. Place ShoreMax mat over the installed TRM or geotextile (figure 1). When using multiple panels, connect the panels using the Integrated Panel Interlock System (figure 3). ShoreMax mats can be laid in either direction (figures 1 & 2).
5. Extend the ShoreMax mat to cover the transitional range where scour is predicted based on typical water level fluctuations and wave lap.
6. Place staples/anchors in the appropriate pattern. Perimeter stakes can be shared between two adjacent panels. In soft or highly erodible soils, percussion earth anchors may be required.

Disclaimer:
The information presented herein is general design information only. For specific applications, consult an independent professional for further design guidance.
Jo Olsen Project Site Visit

May 6, 2019

Summary of Additional Work Needed to Meet Standards and Specs

Stacy Dehne (DATCP Engineer) visited the site with Ashley VandeVoort (Douglas Co Conservationist) and Mary Jo Olsen (Landowner) on the afternoon of May 6, 2019. Prior to the site visit, Stacy had reviewed the design plan and documentation from Cameron Bertsch (Douglas Co Technician). The after-the-fact general permit was granted from the WDNR on April 15, 2019 complete with reviews of NHI and cultural resources. The permit number is GP-NO-2019-16-01007.

Also prior to site visit, materials documentation was reviewed and approved for the Geotextile material. A tag collected by Camreon during construction indicated a Propex GEOTEX 801, which meets the Wisconsin Construction Specification 13 for a Class I Nonwoven material. Photographs indicated the Shoremax material met typical manufacturer’s material type. Rock was an angular blasted quarry rock, but gradation was unknown and photos appeared to indicate larger than necessary without the smaller precentages of the gradation.

SITE VISIT VERIFICATIONS AND **REQUIRED CORRECTIONS**:

A laser level was set up and the temporary benchmark in the plan (top of well casing Elev 103.36) was used to establish grade checks. The required design lower limit for rock protection as well as the lower limit for Shoremax protection was not achieved. Field measurements indicated a base elevation of 96.44 to 96.53 and the requirement in the design was 95.5. **Therefore, the rock toe and the Shoremax both need to be keyed in to the lakebed base elevation of 95.5 along the entire 100 foot length of protection.**

Shoremax (or equivalent) was called for in the design plan with appropriate manufacturer’s recommendations and installation techniques/specifications included in the plan sheets. Upon observation in the field, it is clear that the installation did not follow manufacturer’s recommendations as far as attaching the tiles or anchoring them. The tiles/mats are not physically connected with the
“buttons” along the edges. The mats do not have intimate contact with the soils beneath – there are bulges and voids throughout the area. Therefore, the Shoremax mats will need to be removed and the necessary grading done to prepare the subgrade prior to replacing the mats, connecting each individual piece, and keying the edge of the mats one foot lower into the lakebed substrates.

Additionally, the rock riprap needs to start and end at stabilized or controlled points according to the 580 Streambank and Shoreline Protection standard. On the north end of the project, an additional 10 feet of riprap protection to the design requirements shall be installed to taper at the existing tag alder vegetative root mass area. At the south end of the project, with no nearby tree or shrub root mass, rock will just be added with a thickening to double the minimum 12 inch thickness, and tapering in the last 5 feet of protection to match into the remaining ice ridge area.
Rockgradation was not field verified because it was visibly evident that additional smaller rocks would need to be brought in to meet the necessary gradation. Additional rock, sized 3 – 6 inches, shall be brought in to augment the existing rock in the field in order to achieve a D50 gradation between 6 and 12 inches. Further requirements of the design of riprap include a thickness minimum of 12 inches or two times the D50 of the rock size. The design minimum called for 6 inch D50 rock size, but Cameron chose to increase the D50 to a 12 inch size. This being the case, the thickness of rock placed should reflect 24 inches. Given the need for additional rock and smaller rock to meet the gradation requirements, rock thickness shall be adjusted to achieve a minimum of 12 inches but due to the rock size present already on the bank will most likely result in closer to 18 inches in thickness. Ultimately, the rock thickness must be corrected (with the addition of the 3-6 inch sizes) to achieve more than one rock laying on top of the geotextile fabric – ensuring that the minimum 12 inches is met.

Though the geotextile fabric meets material specifications, it needs some adjustments as to its placement. The top of the fabric needs to be either anchored into the bank above/behind it or wrapped in on itself in a “dutch curl”. With the additional rock necessary, an additional piece of material will be needed in the northern 10 feet section as well as the southern 5 foot end section. The easiest way to prepare the upper portion may be to add an entirely new strip of material along the entire upper limit of protection for the anchoring purpose.

See the photos included and the attached typical riprap drawing for reference to the corrections necessary throughout the shoreline rock riprap protection project. Also see the attached example of a 6 inch D50 rock gradation to achieve when planning for augmented rock sizes.
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

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

\(^1\) 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

5. Construction Site Pollution Control

1. SCOPE

The work shall consist of installing measures or performing work to control erosion and minimize the production of sediment and other pollutants to water and air from construction activities.

2. MEASURES

Erosion and sediment control measures and works shall be installed to prevent or minimize sediment production and transport offsite. The measures and works shall include, but are not limited to, the following:

a. Diversions - Divert water from work areas and collect water from work areas for treatment and safe disposition. Temporary diversions shall be removed and the area restored to its near original condition when the diversions are no longer required or when permanent measures are installed.

b. In-Channel Sediment Control - Sediment produced within the stream channel during construction will be retained in the work area. Sediment retention will be accomplished by using a temporary, excavated sediment trap and/or a barrier constructed of geotextile and hay bales. Turbid water in the retention area may be pumped to a well-vegetated area away from the stream. The vegetation will serve to filter the sediments before the flow returns to the stream. Discharge areas from all pump hoses shall be stabilized. At no time shall the pump discharge be allowed to cause erosion at the discharge point.

c. Mulching - Mulch provides temporary protection of the soil surface from erosion. The method of application is specified on the construction drawings

d. Sediment Basins - Sediment basins collect, settle, and eliminate sediment from eroding areas from impacting properties and streams below the construction site(s). These basins are temporary and shall be removed and the area restored to its original condition when they are no longer required or when permanent measures are installed.

e. Sediment Filters - Straw bale filters or geotextile sediment fences (silt fence) trap sediment from areas of limited runoff. Sediment filters shall be properly anchored to prevent erosion under or around them. These filters are temporary and shall be removed and the area restored to its original condition when they are no longer required or when permanent measures are installed. The method is shown on the construction drawings.

f. Seeding - Seeding to protect disturbed areas shall occur as soon as reasonably possible following completion of that earthwork activity. All seeding operations shall be performed in such a manner that the seeds are applied in the specified quantities uniformly in the designated areas. The method and rate of seed application are specified on the construction drawings.

g. Silt Curtain or Turbidity Barrier - Silt Curtain and Turbidity Barriers can be used to minimize the transport of sediment from an area where construction activities are occurring within or directly adjacent to a waterway or waterbody. The fabric shall be removed after the construction activities have ceased and the sediment has settled. Care should be taken to prevent the re-suspension of sediment during removal.

h. Staging of Earthwork Activities - The excavation and moving of soil materials shall be staged to minimize the area disturbed and the time these locations are vulnerable to erosion.
i. Stockpiling Material - The stockpiled materials shall be protected from concentrated flows and/or flooding, to minimize sediment movement offsite.

j. Stream Crossings - Culverts or bridges should be used where equipment crosses streams. They are temporary and shall be removed and the area restored to its near original condition when the crossings are no longer required or when permanent measures are installed.

k. Waterways - Waterways shall be used to safely dispose of runoff from fields, diversions, and other structures or measures. These works are temporary and shall be removed and the area restored to its original condition when they are no longer required or when permanent measures are installed.

l. It is the responsibility of the contractor or their designee for the cleanup or removal of sediment transported offsite due to failure to maintain erosion control measures during all phases of the construction.

3. **CHEMICAL POLLUTION**

   The contractor shall safely dispose of chemical pollutants (such as drained lubricating or transmission fluids, grease, soaps, concrete mixer washwater, or asphalt, produced as a byproduct of the construction activities) off site. The contractor is responsible for reporting and clean up of all accidental spills and leaks.

   In the event a piece of equipment develops a leak during the construction work, the leak shall be repaired before work continues. All excess fluids will be cleaned from the machine prior to its return to the work area.

   If a leak occurs when equipment is working in or near a waterbody, the machine shall be immediately moved a safe distance away from the waterbody.

4. **AIR POLLUTION**

   The burning of brush or slash and the disposal of other materials shall adhere to state and local regulations.

   Fire prevention measures shall be taken to prevent the start or spreading of wildfires that may result from project activities. Firebreaks or guards shall be constructed and maintained.

   All public access or haul roads used by the contractor during construction of the project shall be treated to fully suppress dust. All dust control methods shall ensure safe construction operations at all times. If chemical dust suppressants are applied, the material shall be a commercially available product specifically designed for dust suppression and the application shall follow manufacturer's requirements and recommendations. A copy of the product data sheet and manufacturer's recommended application procedures shall be provided to the technician before the first application.

5. **MAINTENANCE, REMOVAL, AND RESTORATION**

   All pollution control measures and temporary works shall be adequately maintained in a functional condition for the duration of the construction period. All temporary measures shall be removed and the site restored to near original condition.

   All equipment used within the construction site shall be well maintained. All equipment lines and fittings shall be checked on a daily basis to ensure that they are in good working order.
WISCONSIN CONSTRUCTION SPECIFICATION

7. Mobilization and Demobilization

1. SCOPE

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

2. 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 offices, buildings, and other necessary general facilities for the Contractor's operations at the site;
   • Premiums paid for performance and payment bonds including coinsurance and reinsurance agreements as applicable;
   • 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 offices, buildings, and other 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 house keeping 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

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

LEGEND

DEVONIAN FORMATIONS
- dolomite and shale

SURIAN FORMATIONS
- dolomite

ORDOVICIAN FORMATIONS
- Maquoketa Formation—shale and dolomite
- Sinnepe Formation—dolomite with some limestone and shale
- Brule Formation—sandstone with some limestone, sandstone, and conglomerate
- Prairie du Chien Formation—dolomite with some limestone and shale

CAMBRIAN FORMATIONS
- sandstone with some dolomite and shale

MIDDLE PROTEROSIC ROCKS
- Keweenawan Ranges
  - sandstone
  - bedrock to pyritic lava flows
  - t. gabbro, anorthosing and granitic rocks
- Wolf River Rocks
  - g. rapakivi granite, granite and syenite
  - a. anorthosite and gabbro

LOWER PROTEROSIC ROCKS
- quartzite
  - granitic, diorite and gneiss
  - a. argillite, schist, quartzite, graywacke, and iron formation
  - e. banded and metasedimentary rocks with some metamorphic rocks
  - g. meta-gabbro and hornblende diorite

LOWER PROTEROSIC OR UPPER ARCHAEAN ROCKS
- metasedimentary rocks
  - g. granitic, gneiss and amphibolite

Vertical scale exaggerated 50X
Horizontal scale is same as map.
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 restraint 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>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Slope Protection</th>
<th>Road Stabilization</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Unprotected (Class I)</td>
<td>Protected (Class II)</td>
</tr>
<tr>
<td>Tensile Strength (lbs.)(^1)</td>
<td>ASTM D 4632 Grab Test</td>
<td>≥ 250 in any principal direction</td>
<td>≥ 120 in any principal direction</td>
</tr>
<tr>
<td>Elongation at failure (Percent)(^1)</td>
<td>ASTM D 4632 Grab Test</td>
<td>≤ 20</td>
<td>≤ 35</td>
</tr>
<tr>
<td>Puncture (lbs.)(^1)</td>
<td>ASTM D 6241</td>
<td>≥ 900</td>
<td>≥ 350</td>
</tr>
<tr>
<td>Ultraviolet Light (percent residual tensile strength)</td>
<td>ASTM D 4355 150 hours exposure</td>
<td>70 minimum</td>
<td>70 minimum</td>
</tr>
<tr>
<td>Apparent Opening Size (AOS)</td>
<td>ASTM D 4751</td>
<td>≥ #100 (.150 mm) and ≤ #70 (.212 mm)(^3)</td>
<td>≥ #100 (.150 mm) and ≤ #70 (.212 mm)(^3)</td>
</tr>
<tr>
<td>Percent Open Area (POA)</td>
<td>CW-02215 (^2)</td>
<td>4.0 min.</td>
<td>4.0 min.</td>
</tr>
<tr>
<td>Permittivity (1/seconds)</td>
<td>ASTM D 4491</td>
<td>0.20 minimum</td>
<td>0.10 minimum</td>
</tr>
<tr>
<td>Water Flow (gal/sq. ft./minute)</td>
<td>ASTM D 4491</td>
<td>15 minimum</td>
<td>7.5 minimum</td>
</tr>
</tbody>
</table>

\(^1\)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

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

¹minimum 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.

²U. S. Standard Sieve Size.

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