Village of Somers
7511 12th Street
Somers, WI 53171

Somers Stormwater Utility
Commission Agenda
Tuesday, May 23rd, 2023
Immediately Following the 5:30 pm Village of Somers Board Meeting

Water Commission Meeting:	
Item#	
1	Call to order
2	Update on Stormwater Management Plan and Public Informational Meeting Scheduled for June 14th, 2023
3	Action on Root, Pike Win's proposed Stormwater Culvert Replacement Project on Tax Parcel #82-4-222-103-0102
4	Adjourn

I hereby certify that as the designee of the chief elected official of the Village of Somers, I posted this notice of the May 23rd, 2023 Somers Water Utility Commission Agenda in 1 public place & on the Village website.

Dated this 19th day of May 2023 Brandi Baker, Clerk-Treasurer

Requests from person with disabilities who need assistance to participate in this meeting should be made to the Clerk's Office at 262-859-2822 with as much notice as possible. **Notice is hereby given that members of the Commission may participate telephonically. Notice is hereby given that members of the Town Board may be in attendance for the sole purpose of gathering information. A quorum may be present. However, no Board action will be taken.**

Established 1843
Somers
VILLAGE & TOWN
www.somers.org
P.O. Box 197, Somers, WI 53171 • PH: (262) 859-2822 • FAX: (262) 859-2331

VILLAGE OF SOMERS
STORM WATER UTILITY
MEETING ITEM MEMORANDUM

MEETING DATE: May 23rd, 2023

TO: Chairman and Storm Water Commissioners

PREPARED BY: Jason J. Peters, Administrator

AGENDA ITEM: #2 Update on Stormwater Management Plan and Public Informational Meeting Scheduled for June 14th, 2023

BACKGROUND:

At the May 16th Village Board Work Session, the Board was provided the following update.

State Statute 66.0821 allows municipalities to create a Stormwater Utility to fund the operations and maintenance of the municipal separate storm sewer system. The Village created a Stormwater Utility in 2018. Per Ordinance, the Village Board shall manage and act as commissioners of all utility, sanitary sewer, or stormwater management districts.

Each year the Village has included projects in the Stormwater Utility to aid in the control of stormwater. Funds have been used for the following projects: Neumiller Woods, Gitzlaff Park, 56th Avenue and 12th Avenue. In the original 2023, Stormwater CIP funds were allocated to Neumiller Woods Phase II and Gitzlaff Park Phase II.

In the past the Village has relied on Root-Pike WIN studies to help determine which projects to include in the Stormwater CIP. No cohesive study/plan has ever been created for the Village to help decide what areas should be prioritized to maximize our stormwater dollars. In February, Administrator Peters requested funds be allocated in the Stormwater CIP to hire a firm to conduct a study to help prioritize projects. A sample of a proposal that was received from the Sigma Group was provided at that time.

On February 14th, the Board amended the Stormwater CIP through Resolution 2023-002 to include $30,000 to hire an Engineering firm to create a Stormwater Management Plan. After these funds were allocated, Administrator Peters reached out to several other possible firms. The Board was informed of this in the March 2023 Administrator's Report. In April, Administrator Peters selected Strand Associates proposal. The Board was informed of this in April's Administrator's Report. Said report also informed the

Board that a project "kick off" meeting had been scheduled and that a public information meeting will also be held at some point in the near future.

The staff level "kick off" meeting was held on May 3rd with Strand Associates. Administrator Peters, Assistant to the Administrator Poirier, President Stoner, Root Pike Win Executive Director Giordano, Plan Commissioner Grimes, Strand Engineer Wood, and Strand Engineer Sadowski were in attendance. We discussed the history of the Stormwater Utility, our reasoning for hiring Strand, the Village's relationship with Root Pike Win, areas of concern, and scheduling of a public informational meeting.

A public informational meeting has been scheduled for Wednesday, June 14th from 5:30 pm to 7:30 pm. The public will be invited to come meet representatives of Strand Associates, Inc. and help identify and locate known stormwater issues. Boards will be provided to let citizens know where we are in the process, what the current goals are, and what areas they feel need to be addressed. Since May 3rd, Staff has worked to create a mailer for every parcel owner in the Village of Somers. Staff has created the mailing list and worked with a printing company to get these created.

UPDATE:

On May 18th, Staff received the above referenced mailer from the printers. The attached mailer will be mailed on June 1st. Staff will also promote the informational meeting on our website, our message board, future Board Meetings, and sent to the media.

ATTACHMENTS:

Mailer

YOU ARE INVITED TO THE SOMERS STORMWATER UTILITY CAPITAL IMPROVEMENT OPEN HOUSE

FIRST CLASS MAIL
PRESORTED
U.S. POSTAGE PAID
SOMERS, WI
PERMIT NO. 6

WHO: Village staff, Strand Associates, Inc representatives, Root-Pike WIN

WHAT: Open House

WHEN: June 14, 2023
5:30 to 7:30 p.m.

WHERE: Somers Auditorium
7511 12th Street
Somers, WI 53144

The Village of Somers wants your input to help identify current stormwater issues, such as flooding. The Village has a Stormwater Utility — a designated fund where fees are collected and must be spent on stormwater issues.

To help prioritize and budget projects for the next several years, the Village has hired Strand Associates, Inc. engineers.

You are invited to meet representatives during a public information meeting open house June 14 from 5:30 to 7:30 p.m. This is one of the first steps in this process because we want to hear from you.

Representatives from Root-Pike WIN, a nonprofit organization that studies and funds local watershed issues, will also be on hand to explain larger watershed issues and initiatives that impact Somers.

Established 1843
Somers
VILLAGE & TOWN

STRAND ASSOCIATES®

Established 1843
Somers
VILLAGE & TOWN
www.somers.org
P.O. Box 197, Somers, WI 53171 • PH: (262) 859-2822 • FAX: (262) 859-2331

VILLAGE OF SOMERS
STORM WATER UTILITY
MEETING ITEM MEMORANDUM

MEETING DATE: May 23rd, 2023

TO: Chairman and Storm Water Commissioners

PREPARED BY: Jason J. Peters, Administrator

AGENDA ITEM: #3 Action on Root, Pike Win's proposed Stormwater Culvert Replacement Project on Tax Parcel #82-4-222-103-0102

BACKGROUND:

Root Pike Win had requested that the Board consider a potential Stormwater Culvert Replacement Project on Tax Parcel #82-4-222-103-0102. This parcel is owned by the Davis family and is located East of the Union Pacific Railway line and northwest of Hawthorn Creek Subdivision. The project would serve to upsize an existing culvert on the property to alleviate the flows that are forced through said culvert. Root Pike Win had previously secured the money that funded the design of the project and now is trying to secure additional grants for construction.

The amount requested from the Stormwater Utility is $40,000. If Root Pike Win was to receive these additional monies from the Stormwater Utility, they may be able to obtain additional grant funds. They have also received a commitment of "in-kind" contributions from the property owners. This project has been forwarded to Strand Associates which the Village has hired for our Stormwater CIP.

PRIOR ACTION TAKEN:

The Village Board reviewed and discussed this request at our May 16th Work Session. The general consensus of the Board was to move forward with the proposed project. The Board will take action on this matter at their May 23rd meeting. If approved by the Board, they will also need to amend the CIP to commit the $40,000 from the Storm Water Fund.

SUGGESTED ACTION/ACTION REQUESTED/COMMENTS:

Staff would recommend approval of the proposed Stormwater Project. In the event that the Commission agrees with the suggested action, a suggested motion to approve would be as follows:

"*Motion to approve Root, Pike Win's proposed Stormwater Culvert Replacement Project on Tax Parcel #82-4-222-103-0102"*

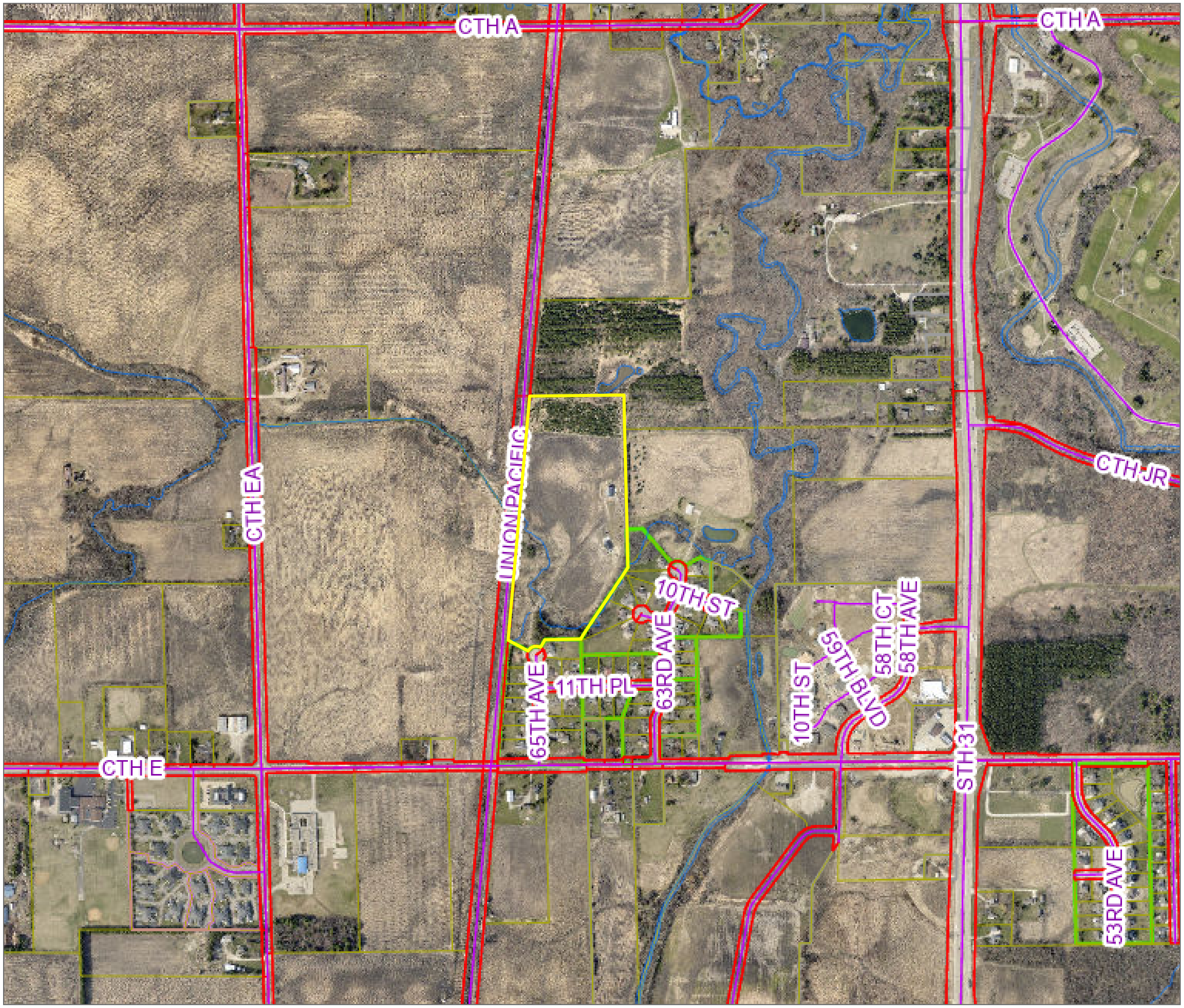
ATTACHMENTS:

Map of Davis Parcel

Root Pike Win Explanation

Root Pike Win Information on Lower Somers Branch

Design of Project



KENOSHA COUNTY
INTERACTIVE MAPPING

Legend

N
S

1 Inch =1,062 Feet

Date Printed: 5/12/2023

May 3, 2023

Why Replace this Somers Branch Culvert?


Figure 1: Davis Property Culvert (Source: DNR)

Undersized, collapsed, or poorly designed road crossings fragment natural stream pattern and ecosystems, contribute to erosion, and exacerbate flooding. High flows forced through undersized culvert pipes or bridges increase water velocities, eroding the bed and banks at their outlets, and in some cases, creating large drop-offs to the streams below. Even though a watershed receives the same amount of precipitation, it is transported through the system much more quickly, thus resulting in higher peak discharges and resultant increases in stream power. This increased stream power can more effectively erode the streambed and banks. Because the total amount of water remains relatively constant, base flows decrease because the rapid runoff reduces the total amount of water that can infiltrate and be stored in the soil.

Debris builds up quickly at the upstream ends of undersized culvert pipes, backing up natural flows, flooding roads, and requiring ongoing maintenance by local road crews. Undersized bridges may allow the passage of most debris, but still back up flows, impounding water upstream, eroding banks and widening the channel. Streambanks at either end of undersized road crossings are often eroded. Stripped of plants and the root systems that stabilize them, the banks collapse, adding more sediment and compromising the habitat of fish and other wildlife essential to a healthy stream.

The stream balance equation indicates that if available stream power is augmented by an increase in discharge or the gradient of the stream, there would be an excess amount of stream power relative to the discharge of bed-material sediment whose resistance is a measure of particle diameter. Additional sediment would be eroded from the channel resulting in: (1) an increase in bed-material discharge to an amount commensurate with the heightened stream power, and (2) a decrease in channel gradient and, consequently, stream power as the elevation of the channel bed is lowered.

Assuming, for illustrative purposes, that the streambed and banks are composed of the same material, the streambed will erode first. This is due to the higher shear stresses exerted on the bottom of the stream channel by the flowing water. The streambed will continue to erode until (1) the critical bank height is exceeded resulting in bank failure and channel widening which may restore the sediment/water balance, (2) a control point is encountered such as bedrock, buried wood, pipelines, bridge aprons, fords, or culverts, (3) deposits of coarse sediment armor the channel bed, or (4) there is a significant change n valley type (i.e. alluvial with floodplain to confined with hillslope interaction) and/or gradient (i.e. low gradient to a much steeper gradient). If the channel bed is more resistant to erosion than the banks (i.e. cobble bed with sand banks), then bank erosion will be the likely mode of adjustment.

Source: U.S. Fish and Wildlife Service

(262) 883-4018
4116 12th St
Kenosha, WI 53144-1106
www.rootpikewin.org

Prepared for:

Somers Branch

Channel Stabilization on Alternatives Plan and for Lower Somers Branch

November 30th, 2021

Channel Stabilization Concept Alternatives

Lower Somers Branch (Somers, WI)

Introduction

Root-Pike WIN contracted with Interfluve to conduct a geomorphic reconnaissance of the lower Somers Branch from the railroad to the confluence of the South Branch of the Pike River (Figure 1). Interfluve conducted site visits in September and October of 2021, including a windshield survey of the entire watershed and a ground geomorphic assessment of the downstream 0.7 miles. The results of the geomorphic reconnaissance are detailed in the Existing Conditions section below, and recommendations are described separately and refer to Concept Plans 1 and 2 for location. Note that channel locations are given as river stationing in hundreds of feet starting at 0 for the channel mouth. For instance, the failed culvert structure 90 feet upstream of the mouth is located at Station 0+90, and an eroding bank 1750 feet from the mouth would be at Station 17+50.

Figure 1. Somers Branch showing both north and south forks in the upper watershed. The white box denotes the concept alternatives focus area. The north-south railroad crosses the channel on the far left side of the white box area.

General Stream Geomorphology

Low to moderate gradient rivers like the Somers Branch have a energy and momentum that comes from water originating at a higher elevation and wanting to get to a lower elevation (i.e. gravity). This energy gets released along the way, and nature tends to distribute that energy in the most efficient manner possible, in this case a sine wave or S-shape. Skiers apply this principle in moving down the steep slope of a mountain (Figure 2). Skiing back and forth lengthens the distance and thus lowers the slope, and also dissipates energy through the carving of snow. Streams and rivers thus dissipate energy in the form of meanders that are created through the erosion of sediment on the outsides of those meanders. The material that is eroded forms bars on the inside of those meanders, and this is the process that creates the fertile agricultural floodplains of the Midwest.

Figure 2. A skier can release his potentially energy through a straight line and collision with the trees, or he can spread that energy out evenly by carving out a sinuous path in snow. This action mimics that of streams and rivers, which carve out a sinuous planform (and thus lower slope) in sediment.

As we've mentioned, streams have a strong tendency to meander. They erode the outside of bends, while depositing sediment on the inside of meander bends. This process results in a channel size that remains relatively constant, yet moves around in the floodplain. This process is called *dynamic equilibrium*, as the channel size remains in equilibrium with incoming flows, but the channel location changes. This equilibrium gets upset when agriculture and development cause water to enter streams faster and in higher volumes. Streams respond in two ways, by down cutting or incising, and by widening. The Somers Branch is in the beginning stages of this process of channel evolution, where incision typically occurs first (Figure 3). As the stream becomes deeper and deeper, the floodwater depth in the channel gets deeper, and that water then becomes much more erosive. Imagine a small bulldozer versus a much heavier bulldozer. Fortunately, the Somers Branch has cohesive clays and large gravels in the bed and banks, and these have limited the amount of incision. The incision is still occurring, however, and will worsen with each flood. Eventually, the banks will become taller as the channel cuts down, and gravity will combine with water erosion to widen the channel. The section below describes in more detail the existing conditions observed. Following that, Interfluve offers recommen-

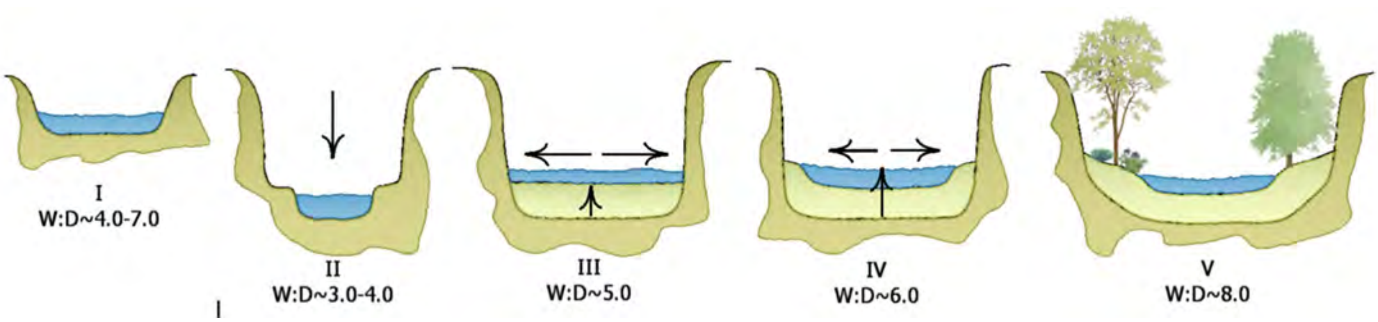


Figure 3. Channel evolution proceeds typically by downcutting (II) of a stable channel, followed by widening (III), and formation and stabilization of a new, lower elevation floodplain (IV, V). Lower Somers Branch is in stage II of this process and if left unchecked, will deepen and continue to the widening stage III. (From Schumm 1977)

dations to help prevent extensive erosion problems in the future.

Existing Conditions

Figure 4. Opposing black willows form extensive root masses along channel banks in lower Somers Branch. These root masses are superior at holding soil in place.

The Somers Branch originates in two tributaries near 88th Street roughly 2.5 miles west of the South Branch of the Pike River. The north fork originates just south of 7th Street (County A) west of 88th Avenue, while the south fork originates west of 88th Avenue and just south of Somers Road in Somers, WI (Figure 1). The stream runs approximately 2.7 miles through row crop agricultural land to its confluence with the South Branch of the Pike River. The Somers Branch is channelized for the upper 2.0 miles of its length, but has some meanders remaining in the downstream 0.7 miles. This lower Somers segment is the focus of this detailed reconnaissance and concept plan.

Downstream of the railroad crossing at River Mile 0.7 (Station 37+00), the channel drops roughly 15 feet over 3600 feet for an average bed slope of 0.46%. This slope is consistent with a meandering riffle-pool channel form. The lower Somers winds through a terraced alluvial valley comprised of glacial outwash and glacial-lacustrine sediments. Banks are 2.5 feet high in the upper reach downstream of the railroad, and the channel deepens to riffle bank heights of 5-6 feet in the downstream subreach. Channel bankfull width varies from 15-25 feet. The channel is stabilized by cohesive clays in the channel bed and by extensive root masses from black willow and cottonwood trees in the floodplain and on the inside of meander bends (Figure 4). Erosion is noted on the outside of meander bends, with banks composed of clay, glacial outwash and till, and loam. Channel erosion is occurring episodically during larger flood events. Upstream of Station 23+00, channel banks are consistent with the lower half composed of light brown clays and the upper banks of sandy loam. Upstream of the grade controlling crossing at Station 28+00, the channel is more typical of a stable bed channel (i.e. not incising or aggrading), with active point bar formation and floods accessing the floodplain regularly. Channel erosive energy is lessened in this subreach due to the decrease in channel depth.

The channel shows approximately 3-4 feet of incision likely over the past 50 years. The channel bed is relatively stable currently under bankfull conditions, with grade controlling riffles and two road crossings. Active incision of the channel bed was noted at Station 11+00 and 21+00, and large pronounced pools are present from 12+00 to 23+00. Channel incision is likely occurring only during the larger floods capable of mobilizing riffle material. Grade is controlled at the failed culvert at Station

0+90 (Figure 5) and also at the driveway crossings at Station 9+70 and 28+80. Upstream of Station 20+00, the channel bed is resistant, but still vulnerable, to incision due to the presence of hard pan clay. In several locations, channel spanning root systems from black willow and cottonwood are acting as grade control by holding the channel bed material in place.

Figure 5. This culvert at Station 0+90 has lost the surrounding backfill and road surface, but remains in place.

Floodplain vegetation consists of shrubs such as dogwood, common elderberry, with an overstory of colonizing boxelder, sugar maple and silver maple, cottonwood and black willow. Some buckthorn and reed canarygrass were noted as invasive species.

The South Branch of the Pike River has a significant influence on the hydraulics of the lower Somers Branch. When flows are high in the South Branch, water backs up as far as 1,000 feet upstream into the Somers Branch. This slows water velocity in Somers Branch and has resulted in sediment dropping out and accumulating in the lower 500 feet of the stream. This hydraulic effect also reduces erosive energy in the lower Somers, but the effect only pertains to when flows in the South Branch are above bankfull elevation. When Somers Branch is at high flow and the South Branch is at low flow, there is no significant backwater effect.

Recommendations

Stabilization of the lower segment of the Somers Branch can be done inexpensively because the problems have not yet magnified. If no action is taken, channel incision and widening will continue, and will continue to input fine sediment into the South Branch of the Pike River. Once extensive widening begins, costly bank stabilization treatments will be required to protect residential properties. The landowners and Root Pike WIN have demonstrated valuable foresight in addressing the problem in the early stages. Interfluve recognizes this and recommends the following low cost treatments as shown in the Concept Plans (see attached):

1) Remove defunct culvert at Station 0+90

2) Install grade control riffles at Station 11+00, 19+00, 23+00, 27+00. Upstream of 28+00, channel is aggraded and shows what grade control can do for the channel stability.

3) Replace the driveway crossing at 28+00 with a culvert or small bridge that can accommodate flood flows. This crossing will require channel bed stabilization to prevent upstream incision, and will require removal of concrete rubble and bank stabilization.

4) Expand forested buffer from 17+00 to 23+00 by 15-20 feet min

5) Expand forested buffer from 4+00 to 15+00 to 40 ft min

6) Grade banks and stabilize with stone toe and bioengineering (Black Willow based) at 4+00 to 5+00 and from 7+50 to 8+30

Grade Control

To prevent incision from getting worse, or alternatively to raise the bed elevation of a stream channel, grade control can be established by installing weirs, check dams or more natural riffles. Grade control riffles are similar in appearance to natural riffles, but grade control riffles are constructed of stone sizes that will not move under the design flood conditions. These are constructed with a slope similar to the existing channel, but the bed is excavated to a depth of 1-2 feet and then replaced with a mixture of boulder, cobble, and gravel. Grade control riffles typically extend under the banks for a certain depth, sometimes extending the entire valley width. This prevents the river from migrating off of the grade control and resuming incision (Figure 6).

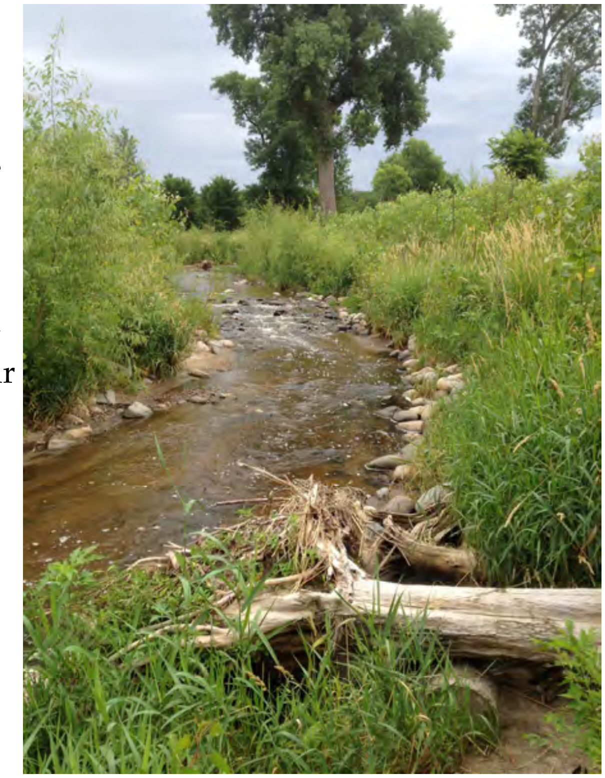


Figure 6. Constructed grade control riffle

Bank Stabilization

Where the channel is currently eroding into forested buffer land, Interfluve recommends no action. Bank erosion is part of normal geomorphic process, and the slow rate of bank erosion in lower Somers Branch does not warrant immediate action for most of the channel. In some areas identified in the plan, however, bank erosion is threatening to erode private property. To prevent this, we recommend the installation of a stone toe composed of a mixture of boulders, cobble and gravel. These natural materials offer protection but are still traversable by riparian wildlife, whereas angular riprap is not. The upper banks would be reconstructed using bioengineering techniques and revegetated with native plants (Figure 7). Bioengineering requires woody plants such as shrubs and trees, and Interfluve recommends the use of black willows and various native shrubs. These plants have deep roots with extensive masses of root hairs that provide protection that only gets stronger over time.

Buffer Expansion

Southern Wisconsin was historically a mix of prairie patches and the Big Woods ecosystem, a massive oak-maple-basswood old growth forest that stretched from the Central Minnesota through the

Figure 7. Left—A constructed stone toe and bioengineered bank after 2 years of growth. Right—A constructed stone toe and bioengineered upper bank after 10 years of growth. Neither bank requires long term maintenance.

Mississippi valley and southeast to the Appalachians. These ecosystems harbored hundreds of different native plants, and played host to large populations of migratory songbirds, game birds and wildlife. As these forests were replaced by agriculture and development, the animals that occupied those spaces disappeared, in some cases becoming regionally or globally extinct. For example, red headed woodpeckers were once common throughout Wisconsin, but are now extremely rare, as they require large areas of undisturbed forest. Remnants of these historic ecosystems remain, mostly along steep slopes and in river and stream valleys. Although agriculture and urban development make it difficult to restore those areas, patches of prairie and forest habitat can be restored along river and stream corridors to provide valuable migratory habitat. These streamside, or *riparian* corridors are extremely important migration corridors for birds and wildlife and can be managed as zones of variable management intensity (Figure 8).

Row crops and turf grass (lawns) are relatively impervious to water compared to prairie and forest systems, so water tends to run off of these surfaces into drains, tiles or ditches and then quickly into streams. This water is often warm and full of pollutants in the form of fertilizer, herbicides and pesticides. These chemicals upset the nutrient balance in streams and are toxic to fish, wildlife and humans. The warm water can cause fish kills and can contribute to low oxygen in stream systems.

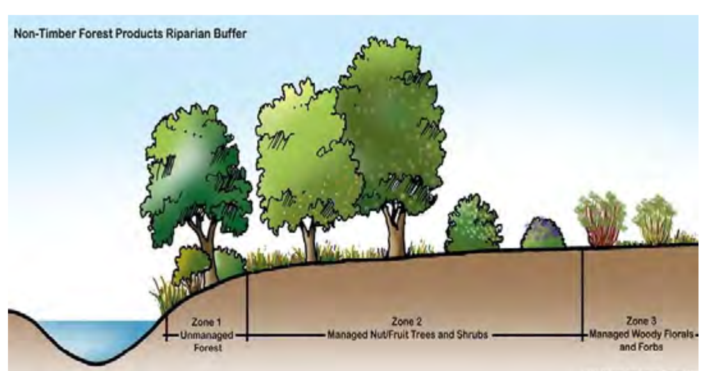


Figure 8. Forested riparian buffer schematic

Native forested and prairie buffers slow the precipitation from entering streams, encourage infiltration and raise groundwater levels, filter out nutrients from farm and lawn runoff, and provide important shade for streams and wetland habitats. Deep rooting trees and shrubs also provide unmatched stabilization of streambanks. Where turf grass is encroaching on channel banks, Interfluve recommends expanding a native plant dominated buffer that features deep rooting shrubs and trees (See Concept Plans for locations). Examples of upland shrub species would be common elderberry, serviceberry, ninebark, nannyberry and high bush cranberry. Canopy trees could include silver maple, white oak, sugar maple, spruce and white pine. Figure 9 below shows that for significant water quality improvements and wildlife population improvements to be realized, large buffer widths are

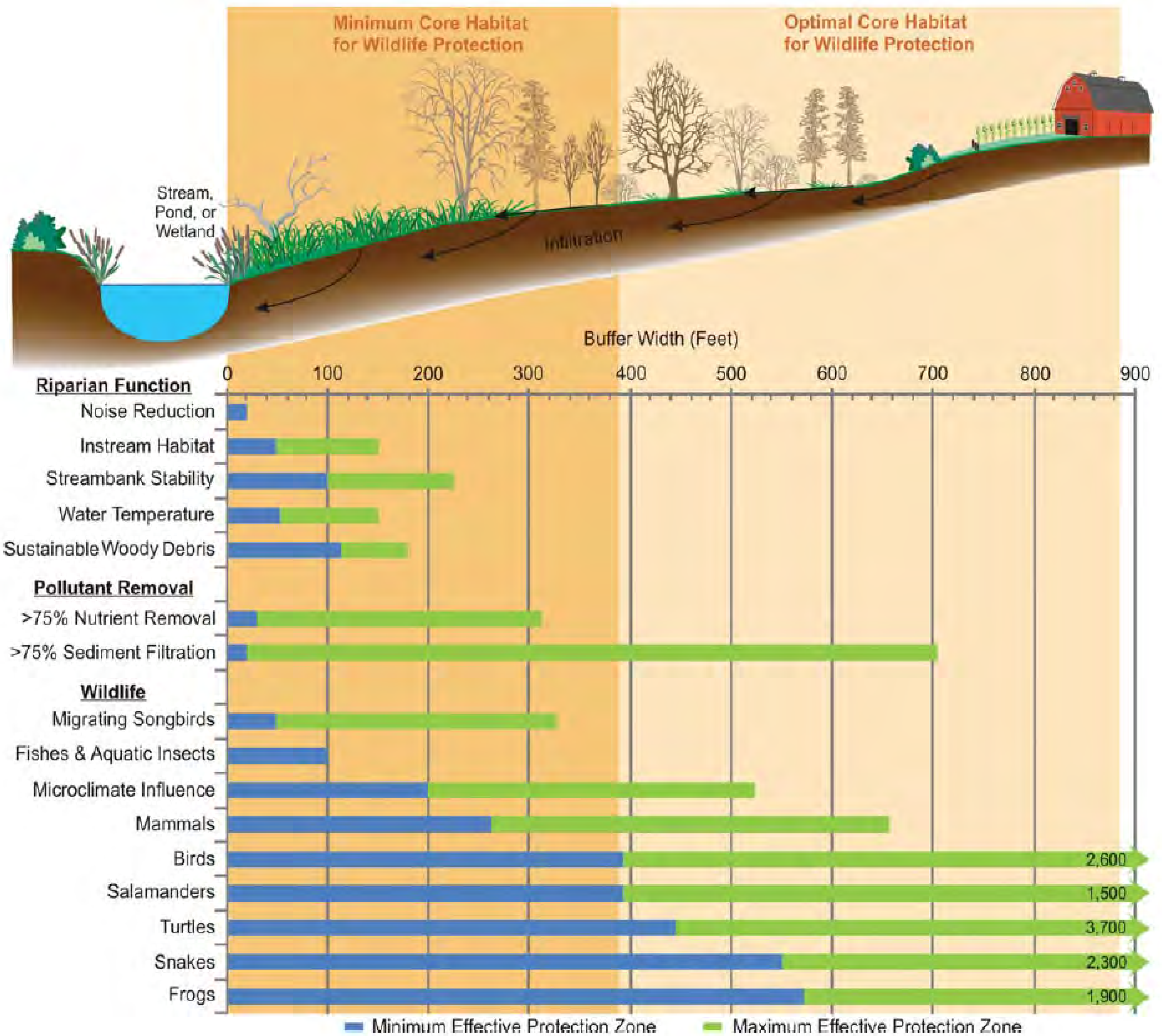


Figure 9. Recommended buffer widths for riparian function, pollutant removal and wildlife habitat restoration (courtesy Southeast Wisconsin Regional Planning Commission)

required. However, every little bit helps, and even a narrow buffer can provide some canopy shading and root stabilization for streambanks. A minimum buffer width of 90 feet is typically recommended for streams, but more is always better in the case of buffers, so whatever maximum can be achieved is preferred. We recommend an inexpensive seed mix that includes a few native grasses and possibly a few forbs. If a forested canopy is desired, expensive native seed mixes with a diverse wildflower mix are not warranted. Cover crops should be included, such as annual rye, oats and winter wheat. Management plans can focus on the elimination of invasive exotic understory vegetation such as garlic mustard, buckthorn, Japanese knotweed and bush honeysuckle.

More information and a short video on buffers can be found here: https://www.cleanlakesalliance.org/buffer-strips/

Future Buildout and Climate Change Impact Considerations

It is important to note that stabilization of lower river segments is important in reducing incision upstream, but that major changes in hydrology (the rate and volume of water) coming into this reach can still have impacts. Climate change is also predicted to continue to increase the frequency of large storms and thus flooding. The residents of the lower watershed can prevent extensive damage from flooding by advocating for riparian buffers and for requirements that limit the rate and volume of runoff coming from upstream developments. Best management practices such as sediment and stormwater detention storage and infiltration ponds should be used with any additional development. Increased or expanded native prairie, wetland and forest habitat in the headwaters and tributaries will also decrease rate and volume of runoff and improve base flow in downstream reaches.

Project Costs

Estimated ballpark costs for the various recommended treatments are given in the table below. Note that because final design for these elements has not been completed, the costs are plus or minus 50% for each, and the costs are given as a unit cost with units identified in the right hand column. Based on these numbers, we have projected construction costs for discreet *channel* elements in the list below, starting downstream to upstream:

- Culvert removal at Station 100 = $1,500
- Bank stabilization (Station 390 to 500 and 770 to 820) = $24,000
- Grade control at Station 1100 = $6,000
- Grade control at Station 1900 = $6,000

- Grade control at Station 2350 = $6,000
- Grade control at Station 2650 = $6,000
- Bank stabilization at station 2350 to 2400 = $7,500
- Culvert replacement at 2900, including bank stabilization = $28,000
- Bank stabilization at 3500 to 3550 = $7,500

Costs for native buffer management and establishment are not given, as those costs can vary greatly dependent on the plan details. If native buffer establishment or invasive plant management is desired, Interfluve recommends working with a specialist in upland and floodplain vegetation management to develop plans.

Channel stabilization components

Item	Description	Cost per	Unit
Bioengineered bank	Stone toe and grading/fabric upper banks (includes access, staging, excavation, stone, grading, fabric, seeding and planting)	$150	LF
Grade control riffle	Excavate to subgrade, install gravel and cobble rounded stone mixture, bank stabilization	$6,000	Each
Culvert replacement	Single lane driveway, assumes partially buried squash pipe or precast box culvert 14 ft wide, includes excavation, prep, backfill (no guardrails) and 50 feet of bank stabilization	$28,000	Each
Culvert removal	Remove failed culvert at Station 1+00. Assumes no channel or bank stabilization work needed.	$1,5000	Each
Riparian buffer management	Invasive plant removal	$2000 - $5000	Acre
Riparian buffer expansion	Planting trees, shrubs and native plants	$500 - $2000	Acre

* Costs are ballpark (+/- 50%)

inter·fluve

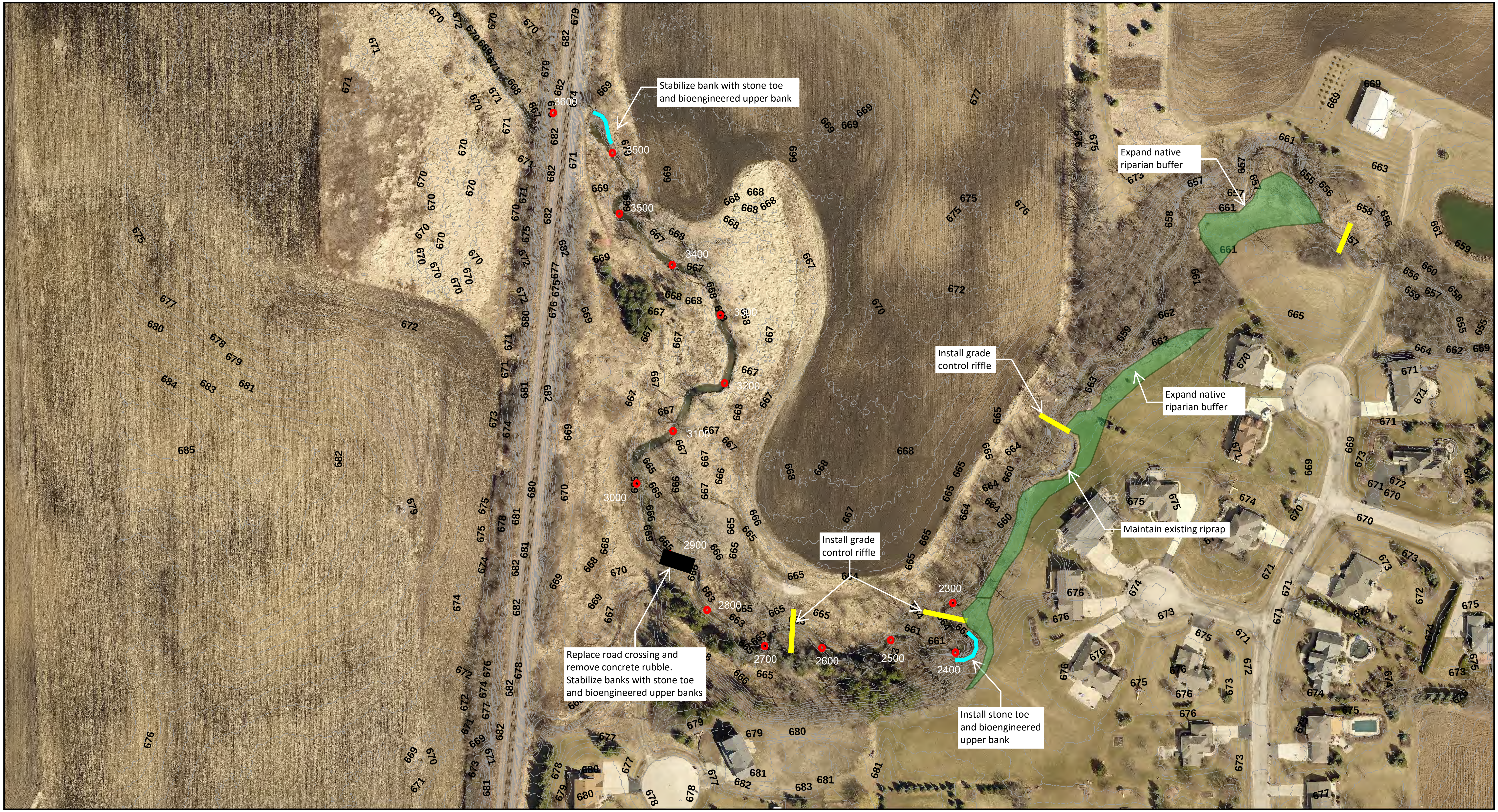
Feet
0 100 200

N

Concept Plan - Channel stabilization alternatives for Lower Somers Branch Station 0+00 to 23+00

Somers Branch
Somers, WI

2023-05-19



Feet
0 100 200

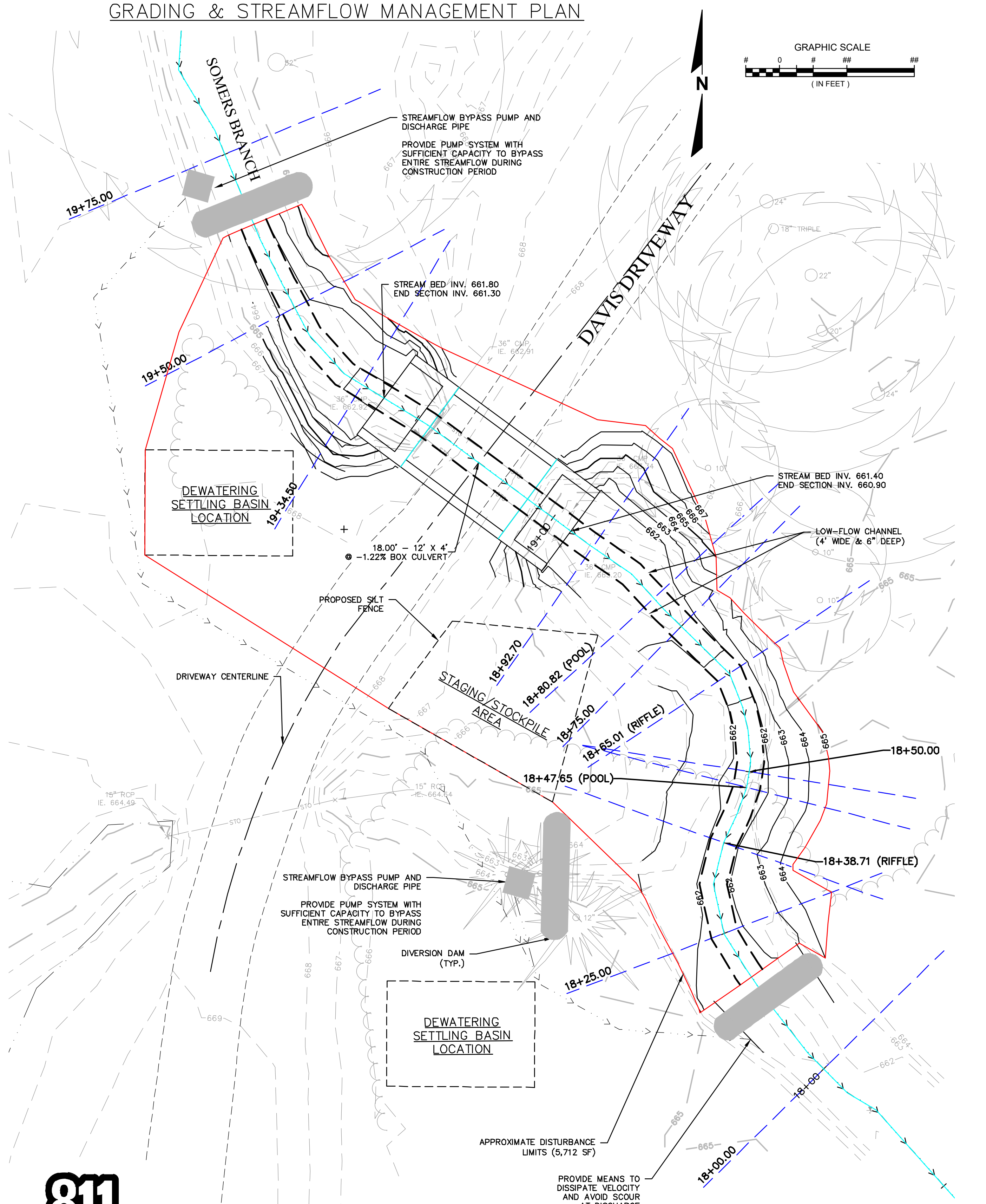
N

Concept Plan - Channel stabilization alternatives Lower Somers Branch Station 23 +00 to 37+00

Somers Branch
Somers, WI

2023-05-19

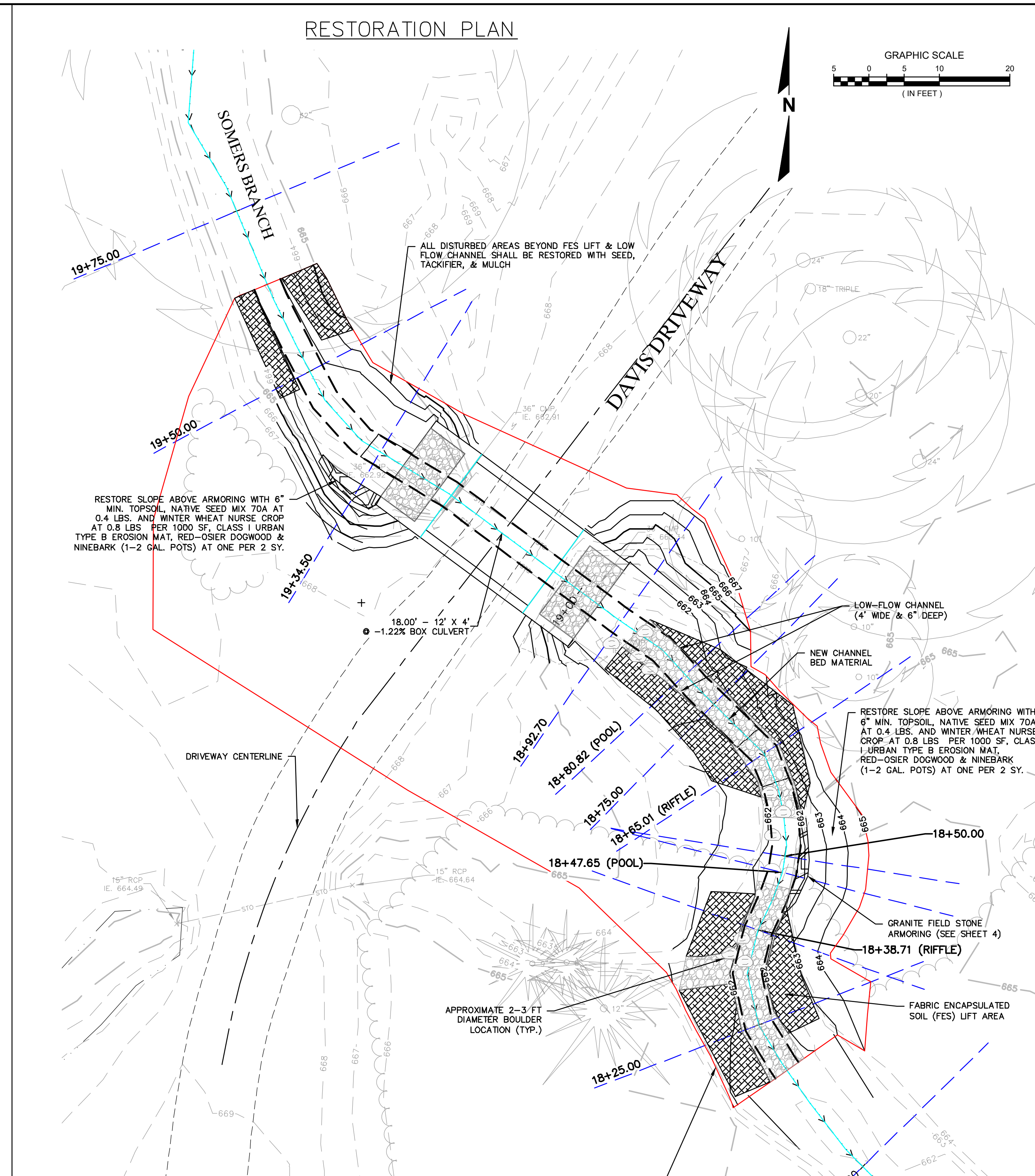
GRADING & STREAMFLOW MANAGEMENT PLAN



811
Know what's below. Call before you dig.

R.A.SMITH, INC. ASSUMES NO RESPONSIBILITY FOR DAMAGES, LIABILITY OR COSTS RESULTING FROM CHANGES OR ALTERATIONS MADE TO THIS PLAN WITHOUT THE EXPRESSED WRITTEN CONSENT OF R.A.SMITH, INC.

RESTORATION PLAN



APPROXIMATE QUANTITIES		
ITEM	UNIT	QUANTITY
EXCAVATION	CY	49
2-3 FT DIA. BOULDER	EA	10
CHANNEL BED MATERIAL	TON	50
FABRIC ENCAPSULATED SOIL LIFT	SY	60
GRANITE FIELD STONE	TON	5
MULCH, TACKIFIER, & SEED MIX	SY	367
EROSION CONTROL MAT (CLASS 1 URBAN TYPE B)	SY	30
SILT FENCE	LF	242

NOTE: BOULDERS AND LOW FLOW CHANNEL GRADING ARE FIELD SET ITEMS TO BE DETERMINED AT THE TIME OF CONSTRUCTION. OWNER/ENGINEER MAY ADJUST THE DISTRIBUTION AND ORIENTATION DEPENDING ON MATERIALS AVAILABLE.

DATE	DESCRIPTION

raSmith
CREATIVITY BEYOND ENGINEERING
16745 W. Bluemound Road
Brookfield, WI 53005-5938
(262) 781-1000
rasmith.com
Brookfield, WI | Milwaukee, WI | Appleton, WI | Madison, WI
Cedarburg, WI | Naperville, IL | Irvine, CA

DAVIS DRIVEWAY CULVERT
VILLAGE OF SOMERS, WI

GRADING & RESTORATION PLAN

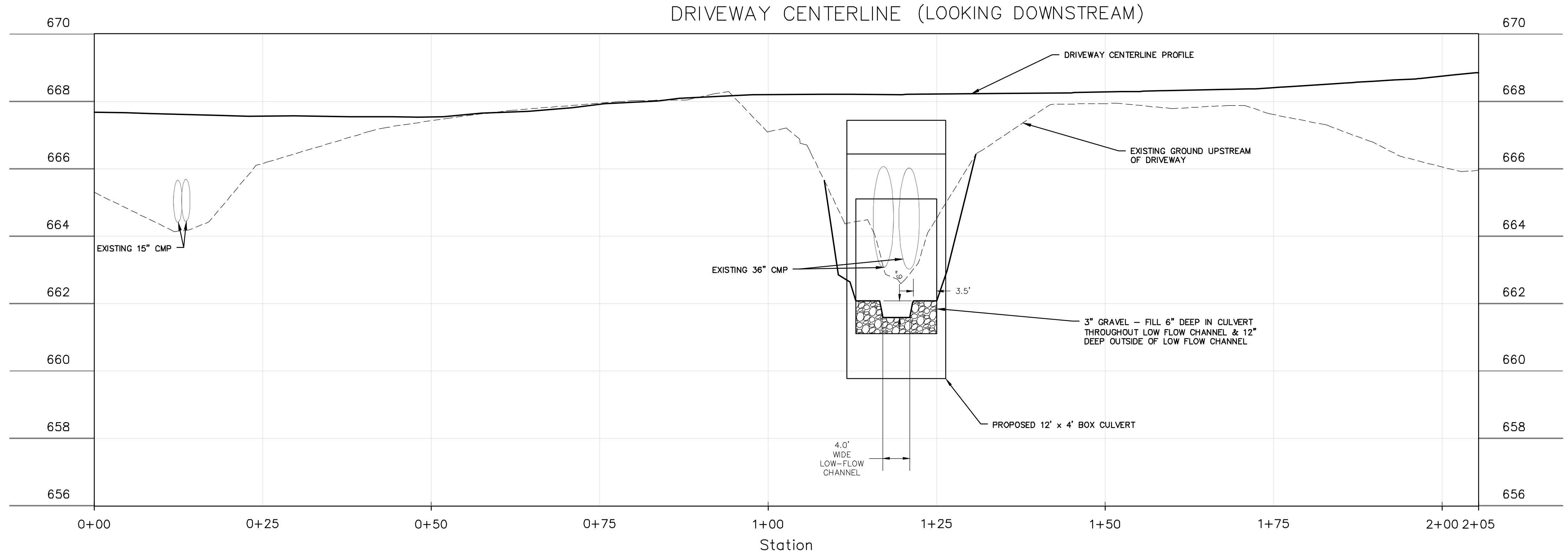
DATE: 07/15/22
SCALE: 1" = 10'
JOB NO. 2210213
PROJECT MANAGER: GARY E. RAASCH, P.E.
DESIGNED BY: RRS
CHECKED BY: GER

SHEET NUMBER
1

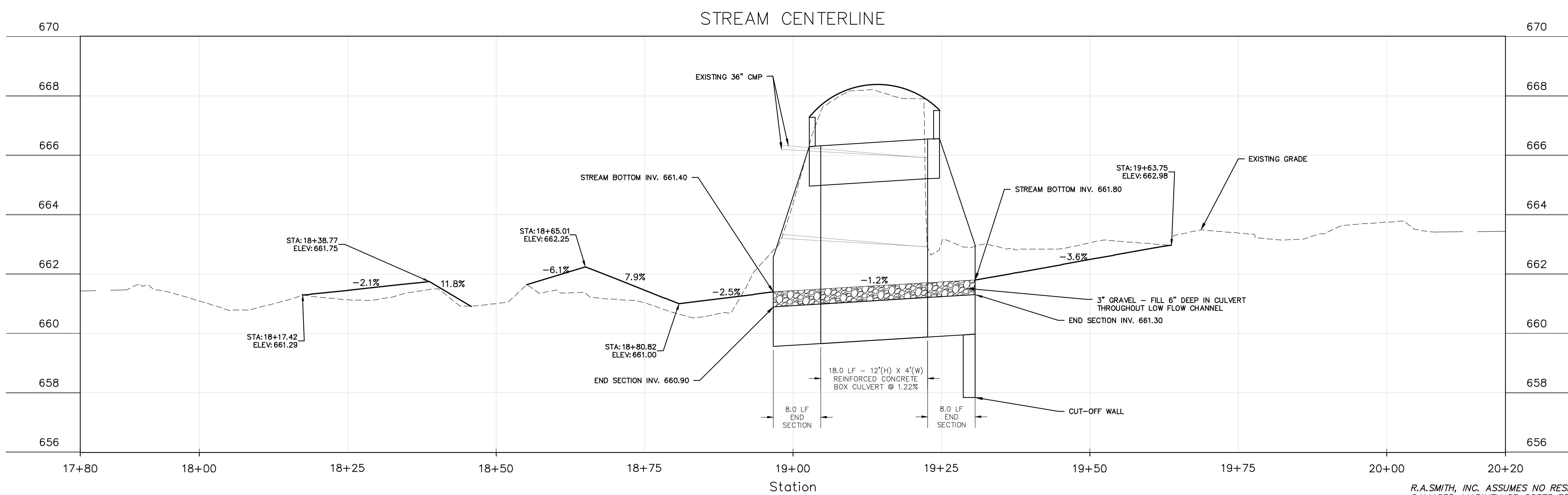
Know what's below.
Call before you dig.

GRAPHIC SCALE
5 0 5 10 20
(IN FEET)

DRIVEWAY CENTERLINE (LOOKING DOWNSTREAM)



STREAM CENTERLINE



R.A.SMITH, INC. ASSUMES NO RESPONSIBILITY FOR DAMAGES, LIABILITY OR COSTS RESULTING FROM CHANGES OR ALTERATIONS MADE TO THIS PLAN WITHOUT THE EXPRESSED WRITTEN CONSENT OF R.A.SMITH, INC.

DESCRIPTION

DATE

raSmith CREATIVITY BEYOND ENGINEERING
16745 W. Bluemound Road
Brookfield, WI 53005-5938
(262) 781-1000
rasmith.com
Brookfield, WI | Milwaukee, WI | Appleton, WI | Madison, WI
Cedarburg, WI | Naperville, IL | Irvine, CA

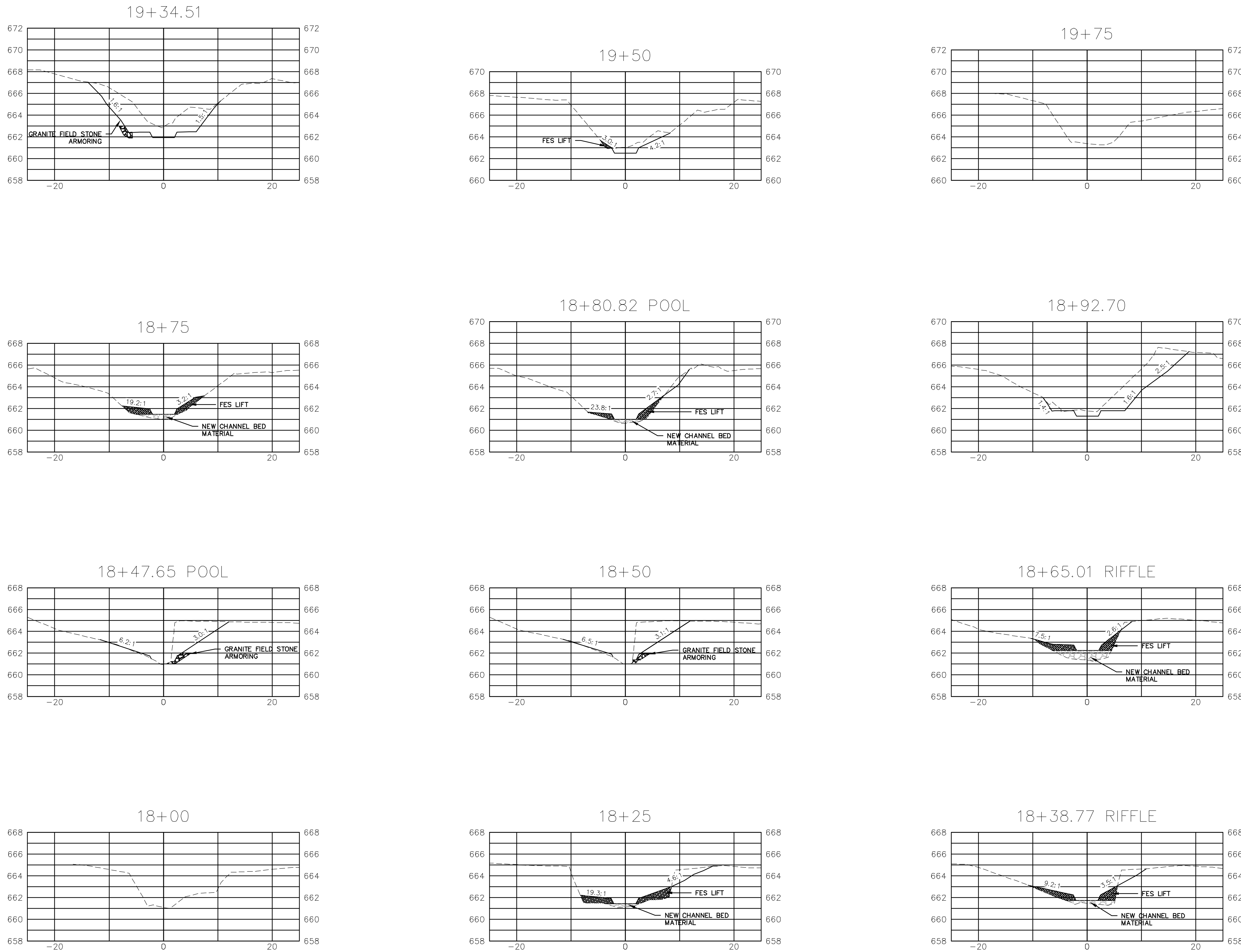
DAVIS DRIVEWAY CULVERT
VILLAGE OF SOMERS, WI

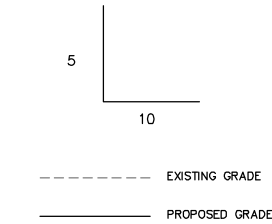
DRIVEWAY & STREAM PROFILES

DATE: 07/15/22
SCALE: 1" = 10'
JOB NO. 2210213
PROJECT MANAGER: GARY E. RAASCH, P.E.
DESIGNED BY: RRS
CHECKED BY: GER

SHEET NUMBER
2

Know what's **below.**
Call before you dig.





NOTE: SECTION VIEWS ARE DISPLAYED LEFT TO RIGHT WHILE LOOKING UPSTREAM.

R.A.SMITH, INC. ASSUMES NO RESPONSIBILITY FOR DAMAGES, LIABILITY OR COSTS RESULTING FROM CHANGES OR ALTERATIONS MADE TO THIS PLAN WITHOUT THE EXPRESSED WRITTEN CONSENT OF R.A.SMITH, INC.

DESCRIPTION	DATE

raSmith CREATIVITY BEYOND ENGINEERING

16745 W. Bluemound Road
Brookfield, WI 53005-5938
(262) 781-1000
rasmith.com

Brookfield, WI | Milwaukee, WI | Appleton, WI | Madison, WI
Cedarburg, WI | Naperville, IL | Irvine, CA

DAVIS DRIVEWAY CULVERT
VILLAGE OF SOMERS, WI

SECTION VIEWS

DATE: 07/15/22
SCALE: 1" = 10'
JOB NO. 2210213
PROJECT MANAGER: GARY E. RAASCH, P.E.
DESIGNED BY: RRS
CHECKED BY: GER
SHEET NUMBER
3

H:\2210213\Dwg\2210213G0.dwg, Section Views-1, 7/15/2022 7:58:07 AM, rrs

2023-05-19

INSTREAM CONSTRUCTION NOTES:

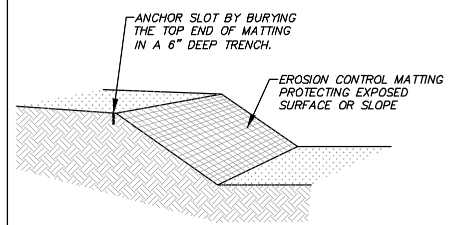
1. THE FOLLOWING DOCUMENTS SHALL BE SUBMITTED BY THE CONTRACTOR AND APPROVED BY VILLAGE & WDNR PRIOR TO CONSTRUCTION:
   A. COFFERDAM DESIGN AND STREAM DIVERSION PLAN PREPARED BY A PROFESSIONAL ENGINEER LICENSED IN WISCONSIN, THAT ADDRESSES COFFERDAM CONSTRUCTION METHODS, STABILITY OF THE COFFERDAM, PUMPING CAPACITY AND CONFIGURATION, AND PROCEDURES TO BE FOLLOWED IF A STORM EVENT CAUSES STREAM WATER LEVELS TO RISE.
   B. FINAL EROSION CONTROL PLAN INCLUDING CONSTRUCTION SEQUENCE AND DEWATERING PLAN.
2. SUGGESTED CONSTRUCTION SEQUENCE:
   A. INSTALL COFFERDAMS TO ISOLATE WORK AREA.
   B. PROVIDE AND OPERATE PUMP SYSTEM WITH SUFFICIENT CAPACITY TO BYPASS STREAM FLOW AROUND ENTIRE WORK AREA.
   C. REMOVE CULVERTS AND EXCAVATE FOR NEW CULVERTS.
   D. INSTALL CULVERT AND BACKFILL.
   E. PLACE RIPRAP, FINISH GRADING BANKS, AND RESTORE STREAM BANKS WITH TOPSOIL, SEED & EROSION CONTROL MAT. NO RESTORATION NEEDED BELOW NORMAL WATER LEVEL.
   F. REMOVE COFFERDAMS AND BYPASS PUMP SYSTEM.

EROSION CONTROL NOTES:

1. CONTRACTOR SHALL PROVIDE EROSION CONTROL FACILITIES IN ACCORDANCE WITH THE VILLAGE OF SOMERS EROSION CONTROL ORDINANCE AND THE WISCONSIN DEPARTMENT OF NATURAL RESOURCES TECHNICAL STANDARDS.
2. EXCAVATION AND GRADING ACTIVITIES SHALL BE SEQUENCED TO MINIMIZE EXPOSURE FOR EROSION.
3. ANY DEWATERING SHALL BE DONE IN ACCORDANCE WITH WDNR CONSERVATION PRACTICE STANDARD 1061.
4. WORK ADJACENT TO STREAM SHALL BE DONE DURING DRY WEATHER WHEN STREAMFLOW IS MINIMAL. WORK SHALL BE COMPLETED AND RESTORED AS QUICKLY AS POSSIBLE AFTER STARTING.

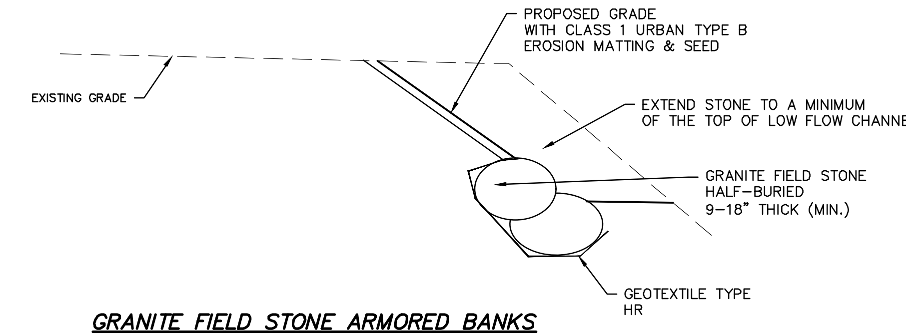
EROSION CONTROL MAINTENANCE PLAN

1. ALL MAINTENANCE IS TO BE IN ACCORDANCE WITH APPLICABLE WISCONSIN DEPARTMENT OF NATURAL RESOURCES TECHNICAL STANDARD.
2. ALL EROSION AND SEDIMENTATION CONTROL PRACTICES SHALL BE, AT A MINIMUM, INSPECTED WEEKLY AND WITHIN 24 HOURS AFTER EVERY PRECIPITATION EVENT THAT PRODUCES 0.5 INCHES OF RAIN OR MORE DURING A 24-HOUR PERIOD. NEEDED REPAIRS WILL BE MADE IMMEDIATELY TO MAINTAIN ALL PRACTICES AS DESIGNED.
3. SEDIMENT WILL BE REMOVED FROM BEHIND THE STAKED WATTLE AND EROSION BALES (IF USED) WHEN IT REACHES HALF THE HEIGHT OF THE FENCE/BALE. THE STAKED WATTLE AND EROSION BALES WILL BE REPAIRED AS NECESSARY TO MAINTAIN A BARRIER.
4. ALL SEEDED AREAS WILL BE FERTILIZED, RESEEDED AS NECESSARY, AND MULCHED ACCORDING TO PROJECT SPECIFICATIONS TO MAINTAIN A VIGOROUS DENSE VEGETATIVE COVER.
5. ANY SEDIMENT TRACKED ONTO A PUBLIC OR PRIVATE ROAD SHOULD BE REMOVED BY STREET CLEANING, NOT FLUSHED, BEFORE THE END OF EACH WORKING DAY.

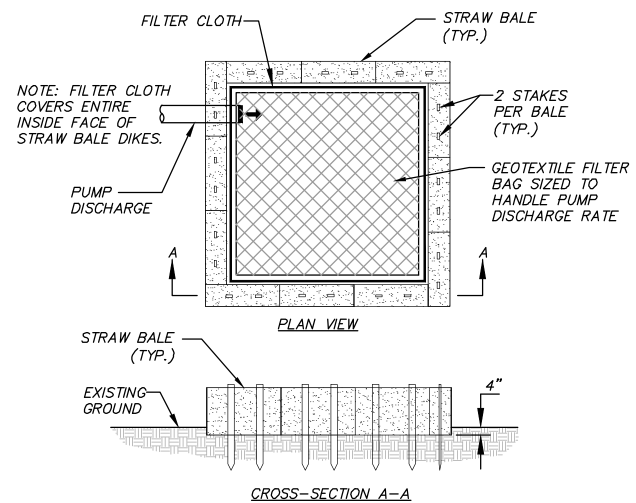


NOTES:
1. PRIOR TO THE INSTALLATION OF ANY EROSION CONTROL MATTING, ALL ROCKS, DIRT CLODS, STUMPS, ROOTS, TRASH AND ANY OTHER OBSTRUCTIONS WHICH WOULD PREVENT THE MAT FROM LAYING IN DIRECT CONTACT WITH THE SOIL SHALL BE REMOVED.
2. EROSION CONTROL MATTING SHALL BE INSTALLED IN ACCORDANCE WITH SECTION 628 OF THE WISCONSIN DOT STANDARD SPECIFICATIONS, DNR TECHNICAL STANDARD 1052 (NON CHANNEL APPLICATIONS), DNR TECHNICAL STANDARD 1053 (CHANNEL APPLICATIONS), AND LATEST MANUFACTURER SPECIFICATIONS, ESPECIALLY NOTING REQUIRED STAPLE PATTERNS AND ANCHOR TRENCH REQUIREMENTS.
3. INSTALLATION PROCEDURES MUST INSURE THAT THE MAT WILL REMAIN IN CONTACT WITH THE SOIL.
4. THE MATTING SHALL BE ANCHORED ALONG ITS ENTIRE PERIMETER WITH A 6"x6" ANCHOR TRENCH. AFTER MATTING IS LAID IN TRENCH, THE TRENCH SHALL BE BACKFILLED AND COMPACTED WITH SOIL OR GRAVEL.
5. THE MATTING SHALL BE ANCHORED TO THE GROUND USING 10 GAUGE WIRE STAPLES, 6" IN LENGTH BY 1" WIDE WITH A COVERAGE NOT LESS THAN 1 STAPLE PER EVERY 4 SQUARE FEET OF MATTING.
6. EROSION CONTROL MATTING SHALL BE CLASS I, URBAN TYPE B.
7. MATTED AREAS MUST BE INSPECTED ON A WEEKLY BASIS, AND AFTER EACH SIGNIFICANT RAINFALL. BARE SPOTS, MISSING OR LOOSENED MATTING MUST BE IMMEDIATELY REPLACED AND/OR RE-ANCHORED.

EROSION CONTROL MATTING
NOT TO SCALE



GRANITE FIELD STONE ARMORED BANKS
NOT TO SCALE



TEMPORARY DEWATERING SETTLING BASIN
NOT TO SCALE

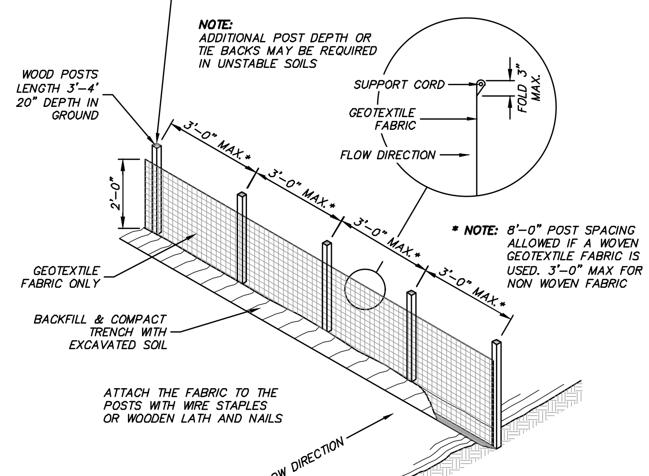
NOTES:
1. SILT FENCE INSTALLATION AND MATERIALS SHALL CONFORM TO WDNR CONSERVATION STANDARD 1056
2. SILT FENCE SHALL BE PLACED ON THE CONTOUR AND NOT PERPENDICULAR TO THE CONTOUR. THE ENDS SHALL BE EXTENDED UPSLOPE TO PREVENT WATER FROM FLOWING AROUND THE ENDS OF THE FENCE.
3. WHEN SILT FENCE IS INSTALLED ON A SLOPE, THE PARALLEL SPACING SHALL NOT EXCEED THE REQUIREMENTS IN THE TABLE BELOW:

SLOPE	FENCE SPACING
< 2%	100 FEET
2 TO 5%	75 FEET
5 TO 10%	50 FEET
10 TO 33%	25 FEET
> 33%	20 FEET

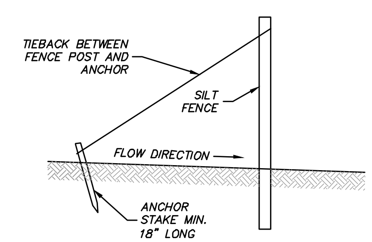
4. INSTALLED SILT FENCES SHALL BE MINIMUM 14 INCHES HIGH AND A MAXIMUM OF 28 INCHES IN HEIGHT MEASURED FROM THE INSTALLED GROUND ELEVATION.
5. A MINIMUM OF 20 INCHES OF THE POST SHALL EXTEND INTO THE GROUND AFTER INSTALLATION.
6. SILT FENCE SHALL BE ANCHORED BY SPREADING AT LEAST 8 INCHES OF THE FABRIC IN A 4-INCH TRENCH WIDE BY 6-INCH DEEP TRENCH, OR 6-INCH V-TRENCH ON THE UPSLOPE SIDE OF THE FENCE. TRENCH SHALL BE BACKFILLED AND COMPACTED. TRENCHES SHALL NOT BE EXCAVATED WIDER THAN NECESSARY FOR PROPER INSTALLATION.
7. CONSTRUCT SILT FENCE FROM A CONTINUOUS ROLL IF POSSIBLE BY CUTTING LENGTHS TO AVOID JOINTS. IF A JOINT IS NECESSARY USE ONE OF THE FOLLOWING TWO METHODS:
   A) TWIST METHOD--OVERLAP THE END POSTS AND TWIST, OR ROTATE, AT LEAST 180 DEGREES.
   B) HOOK METHOD--HOOK THE END OF EACH SILT FENCE LENGTH.
8. SILT FENCE SHALL AT A MINIMUM BE INSPECTED WEEKLY AND WITHIN 24 HOURS AFTER EACH PRECIPITATION EVENT THAT PRODUCES 0.5 INCHES OF RAIN OR MORE DURING A 24-HOUR PERIOD.
9. DAMAGED OR DECOMPOSED FENCES, UNDERCUTTING, OR FLOW CHANNELS AROUND THE END OF BARRIERS SHALL BE REPAIRED OR CORRECTED.
10. SEDIMENT SHALL BE PROPERLY DISPOSED OF ONCE THE DEPOSITS REACH ONE HALF THE HEIGHT OF THE FENCE.
11. SILT FENCES SHALL BE REMOVED ONCE THE DISTURBED AREA IS PERMANENTLY STABILIZED AND IS NO LONGER SUSCEPTIBLE TO EROSION.

NOTE:
SILT FENCE SHALL BE SUPPORTED BY EITHER WOOD OR STEEL SUPPORTS AS SPECIFIED BELOW:
A. WOOD – 1 1/8" X 1 1/8" AIR OR KILN DRIED OAK OR HICKORY; FABRIC SHALL BE STAPLED USING 1/2-INCH MINIMUM STAPLES TO THE UPSLOPE SIDE OF THE FENCE IN AT LEAST 3 PLACES; POSTS SHALL BE A MINIMUM OF 3 FEET LONG FOR 24-INCH FENCE AND 4 FEET LONG FOR 36-INCH FENCE.
B. STEEL – MINIMUM 5 FEET IN LENGTH WITH STRENGTH OF 1.33 LBS/FT AND HAVE PROJECTIONS FOR FASTENERS; FABRIC SHALL BE ATTACHED IN AT LEAST THREE PLACES ON THE UPSLOPE SIDE WITH 50LB. PLASTIC TIE STRAPS OR WIRE FASTENERS.

NOTE:
ADDITIONAL POST DEPTH OR TIE BACKS MAY BE REQUIRED IN UNSTABLE SOILS

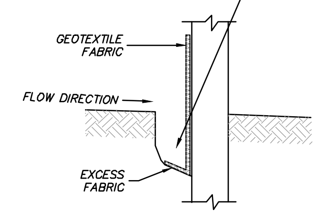


*** NOTE:** 8'-0" POST SPACING ALLOWED IF A WOVEN GEOTEXTILE FABRIC IS USED. 3'-0" MAX FOR NON WOVEN FABRIC

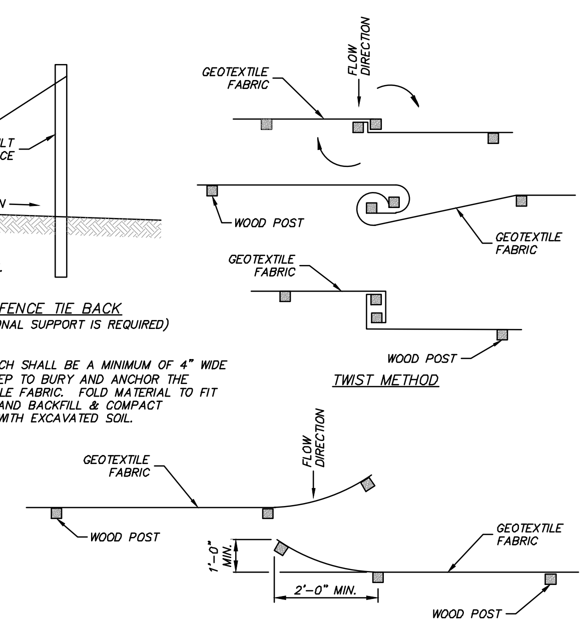


SILT FENCE TIE BACK
(WHEN ADDITIONAL SUPPORT IS REQUIRED)

NOTES:
1. TRENCH SHALL BE A MINIMUM OF 4" WIDE & 6" DEEP TO BURY AND ANCHOR THE GEOTEXTILE FABRIC. FOLD MATERIAL TO FIT TRENCH AND BACKFILL & COMPACT TRENCH WITH EXCAVATED SOIL.



TRENCH DETAIL



JOINING TWO LENGTHS OF SILT FENCE

SILT FENCE
(NOT TO SCALE)

DESCRIPTION

DATE

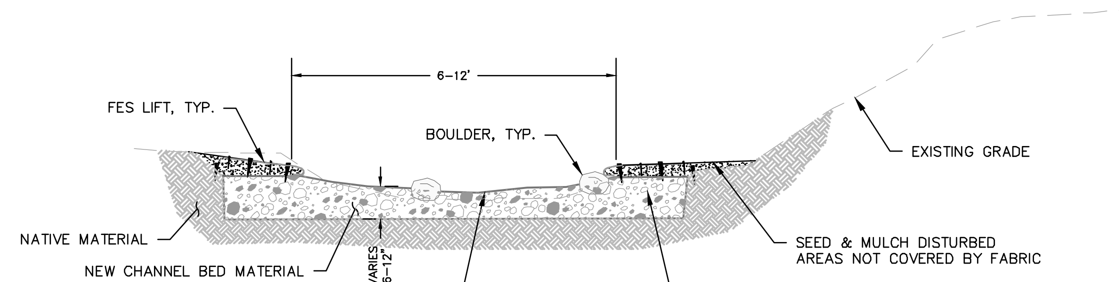
raSmith
CREATIVITY BEYOND ENGINEERING
16745 W. Bluemound Road
Brookfield, WI 53005-5938
(262) 781-1000
rasmith.com
Brookfield, WI | Milwaukee, WI | Appleton, WI | Madison, WI
Cedarburg, WI | Naperville, IL | Irvine, CA

DAVIS DRIVEWAY CULVERT
VILLAGE OF SOMERS, WI

DETAILS
EROSION CONTROL

DATE: 07/15/22
SCALE: N.T.S.
JOB NO. 2210213
PROJECT MANAGER: GARY E. RAASCH, P.E.
DESIGNED BY: RRS
CHECKED BY: GER
SHEET NUMBER
4

H:\2210213\Dwg\Plan Set\2210213DT01.dwg, DETAILS - 2, 7/15/2022 7:58:16 AM, rrs



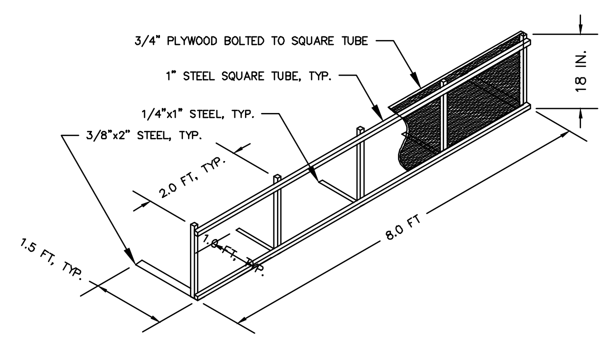
NOTES:

BOULDERS SHALL BE EMBEDDED AT LEAST 1/2 DIAMETER INTO THE NEW CHANNEL BED MATERIAL.

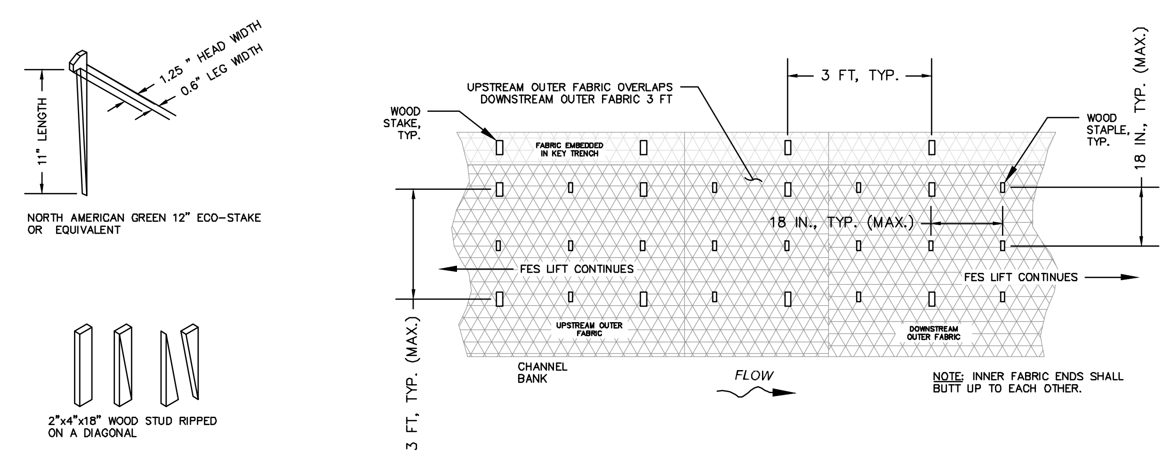
BOULDERS ARE FIELD SET ITEMS DUE TO VARIABILITY IN STONE SIZES AND CHANNEL BED MATERIAL. LOCATIONS TO BE DETERMINED AT THE TIME OF CONSTRUCTION BY THE OWNER'S REPRESENTATIVE.

CHANNEL BED MATERIAL GRADATION TABLE	
PERCENT FINER	MEDIAN (B-AXIS) DIAMTER (FT)
100%	3.00
84%	2.50
50%	1.50
30%	0.30
16%	0.025 (0.3 INCHES, MEDIUM GRAVEL)
5%	0.001 (0.02 INCHES, VERY FINE GRAVEL)

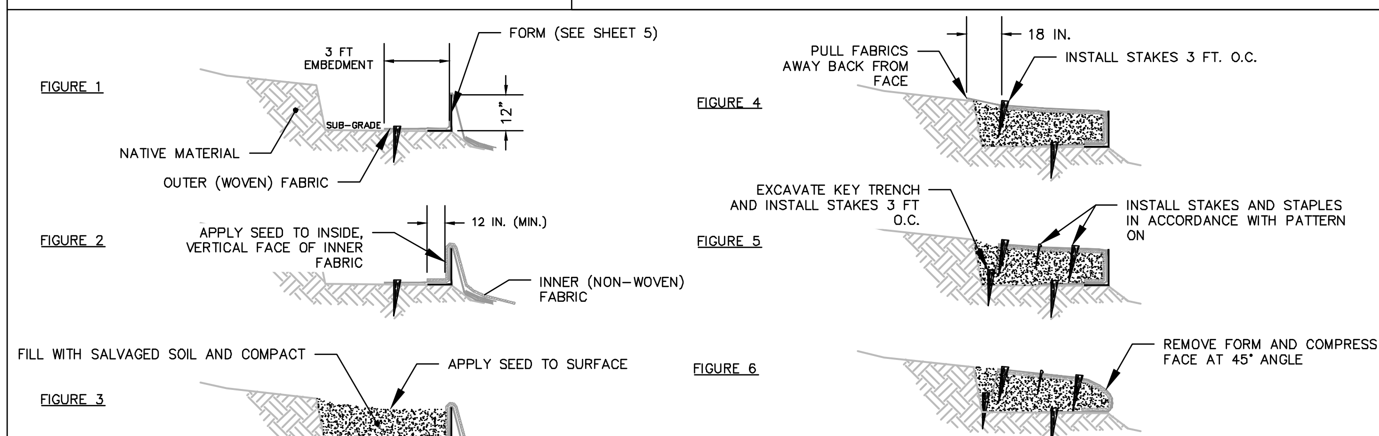
TYPICAL CROSS SECTION (NEW CHANNEL BED AND BANKS)
NOT TO SCALE



FES LIFT FORM
NOT TO SCALE



OUTER FABRIC, STAKE AND STAPLE
NOT TO SCALE



TYPICAL SEQUENCE FES LIFT INSTALLATION
NOT TO SCALE

FABRIC ENCAPSULATED SOIL LIFT SEQUENCING

1. EXCAVATE SUB-GRADE AT LEAST 3 FT FROM FINISH CHANNEL BANK FACE AS DEPICTED IN FIGURE 1.
2. PLACE FES LIFT FORM AT CHANNEL BANK FACE AND DRAPE OUTER (WOVEN) COIR FABRIC OVER THE TOP. EMBED 3 FEET OF THE FABRIC WIDTH.
3. DRAPE INNER (NON-WOVEN) FABRIC OVER THE OUTER (WOVEN) FABRIC. EMBED 1 FOOT OF THE INNER FABRIC.
4. APPLY NATIVE SEED TO THE INSIDE, VERTICAL FACE OF THE INNER FABRIC ALONG THE FES LIFT FORM (FIGURE 2).
5. FILL WITH SALVAGED SOIL TO FINISH GRADE. COMPACT SOIL WITH BUCKET OF EXCAVATOR (FIGURE 3).
6. APPLY SEED TO THE TOP OF THE SOIL.
7. PULL BOTH THE INNER AND OUTER FABRICS OVER THE FILL. REMOVE WRINKLES FROM INNER AND OUTER FABRICS. PULL THE OUTER FABRIC TIGHT WITH THE EXCAVATOR BUCKET OR WITH A METHOD APPROVED BY THE ENGINEER. CONTRACTOR SHALL NOT RIP THREADS OF FABRIC.
8. PLACE STAKES ON 3 FOOT CENTERS APPROXIMATELY 18 INCHES OF THE OUTER FABRIC BEHIND THE STAKES. PLACE STAKES THROUGH HOLES IN OUTER FABRIC; DO NOT PUNCTURE THREADS (FIGURE 4).
9. EXCAVATE KEY TRENCH FOR OUTER FABRIC AND INSTALL STAKES 3 FEET ON CENTER. PLACE ADDITIONAL STAKES AND STAPLES IN ACCORDANCE WITH DETAIL 2, THIS SHEET.

FES LIFT SPECIFICATIONS

1. MATERIALS
   A. OUTER (WOVEN) FABRIC SHOULD BE 700 WEIGHT (700 GRAMS PER SQUARE METER) 100% COIR WITH A MINIMUM ROLL WIDTH OF 12 FEET. THICKNESS SHALL BE 0.30 INCHES (PER ASTM D6525), DRY TENSILE STRENGTH OF 100X70 LB/IN (PER ASTM D6818), LIGHT PENETRATION 50% (MAX, PER ASTM D6567). PRE-APPROVED PRODUCTS INCLUDE: BELTON INDUSTRIES GEOCOIR 700, NEDIA KOIRMAT 700, ROLANKA BIODMAT 70
   B. INNER (NON-WOVEN) FABRIC SHALL BE 100% COIR (NO SYNTHETIC MATERIALS ALLOWED) WITH A ROLL WIDTH OF 8 FEET (MINIMUM). MASS SHALL BE 10 OUNCES/SQUARE YARD (MIN., PER ASTM D6475), THICKNESS OF 0.25 IN. (PER ASTM D6525), TENSILE STRENGTH OF 18X10 LBS/IN. (PER ASTM D6818), PERMISSIBLE SHEAR STRESS OF 2.35 LBS/SQ. FT. PRE-APPROVED PRODUCTS INCLUDE: NEDIA C400B AND NORTH AMERICAN GREEN C125BN
   C. WOOD STAKES SHALL BE 18 INCHES LONG WITH A TOP (HEAD) DIMENSION OF AT LEAST 1.5 INCHES ON ONE AXIS AND 3 INCHES ON THE SECOND AXIS. STAKES SHALL BE MANUFACTURED BY RIPPING AN 18 IN. LONG STANDARD 2-INCH BY 4-INCH WOODEN STUD ALONG THE DIAGONAL FROM CORNER TO CORNER. STAKES SHALL NOT BE TREATED WITH PRESERVATIVE.
   D. WOOD STAPLES SHALL BE 12 INCHES IN LENGTH, UNTREATED, SOLID, AND FREE OF KNOTS OR DEFECTS. WOOD STAPLES SHALL BE NORTH AMERICAN GREEN 12 INCH ECO-STAKES OR APPROVED EQUAL.

CHANNEL BED MATERIAL SPECIFICATIONS

1. REFER TO THE FULL GRADATION TABLE FOR CHANNEL BED MATERIAL.
2. A STONE GRADATION EQUIVALENT TO WISDOT HEAVY RIPRAP SHALL BE USED FOR THE COARSE FRACTION (D30–D100) WITH THE EXCEPTION THAT THE MATERIAL SHALL BE ROUNDED (GLACIAL-DERIVED MATERIAL).
3. A FINER FRACTION OF 1–3" GRAVEL SHALL BE MIXED WITH A TYPICAL DRIVEWAY BASE COURSE (FINES-GRAVEL).
4. LARGE VOIDS IN THE MATRIX SHALL BE FILLED WITH SUFFICIENTLY SIZED SMALLER STONES TO AVOID WATER ROUTING THROUGH THE BED RATHER THAN THE SURFACE.
5. LARGE STONES SHALL BE PLACED IN ORDER TO AVOID PIPING OF FINES THROUGH VOIDS WHEN THEY ARE FILLED.
6. THE FINE FRACTION OF STONE MAY NEED TO BE WASHED INTO THE VOIDS TO ENSURE THE MAXIMUM DENSITY OF THE BED MATERIAL.

DESCRIPTION | DATE

raSmith
CREATIVITY BEYOND ENGINEERING
16745 W. Bluemound Road
Brookfield, WI 53005-5938
(262) 781-1000
rasmith.com
Brookfield, WI | Milwaukee, WI | Appleton, WI | Madison, WI
Cedarburg, WI | Naperville, IL | Irvine, CA

DAVIS DRIVEWAY CULVERT
VILLAGE OF SOMERS, WI

DETAILS
FABRIC ENCAPSULATED SOIL LIFT

DATE: 07/15/22
SCALE: N.T.S.
JOB NO. 2210213
PROJECT MANAGER: GARY E. RAASCH, P.E.
DESIGNED BY: RRS
CHECKED BY: GER
SHEET NUMBER
5

H:\2210213\Dwg\Plan Set\2210213DT01.dwg, DETAILS - 1, 7/15/2022 7:58:22 AM, rrs

2023-05-19