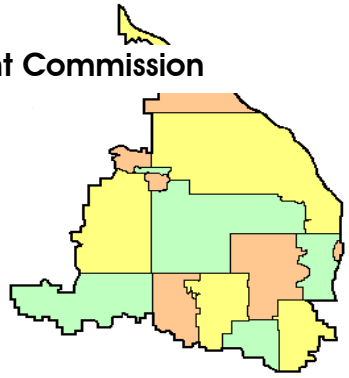
Shingle Creek Watershed Management Commission

West Mississippi Watershed Management Commission



3235 Fernbrook Lane N • Plymouth, MN 55447
Tel: 763.553.1144 • Fax: 763.553.9326
Email: judie@jass.biz • Website: www.shinglecreek.org

March 4, 2021

Commissioners
Members of the TAC
Shingle Creek and West Mississippi
Watershed Management Commissions
Hennepin County, Minnesota

The agendas and meeting packets for both the TAC and regular meetings are available to all interested parties on the Commission's web site at http://www.shinglecreek.org/tac-meetings.html **and** http://www.shinglecreek.org/minutes--meeting-packets.html

Dear Commissioners and Members:

Regular meetings of the Shingle Creek and West Mississippi Watershed Management Commissions will be held **Thursday, March 11, 2021, at 12:45 p.m.** This will be a virtual meeting.

The Joint SCWM Technical Advisory Committee will meet at 11:30 a.m., prior to the regular meeting.

Until further notice, all meetings will be held online to reduce the spread of COVID-19. **To join a meeting,** click https://us02web.zoom.us/j/834887565?pwd=N3MvZThacmNRVDFrOWM3cU1KRU5qQT09, which takes you directly to the meeting.

OR, go to www.zoom.us **and click Join A Meeting. Please use the regular meeting ID and passcode for both meetings.** The meeting ID is **834-887-565.** The passcode for this meeting is **water.**

If your computer is not equipped with audio capability, you need to dial into one of these numbers:

+1 929 205 6099 US (New York)	+1 312 626 6799 US (Chicago)	+1 669 900 6833 US (San Jose)
+1 346 248 7799 US (Houston)	+1 253 215 8782 US	+1 301 715 8592 US

Meetings remain open to the public via the instructions above**.**

Please email me at judie@jass.biz to confirm whether you or your Alternate will be attending the regular and TAC meetings. Thank you.

Regards,

Judie A. Anderson
Administrator

cc:	Alternate Commissioners	Member Cites	Troy Gilchrist	TAC Members
	Wenck/Stantec	BWSR	MPCA	Met Council

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Shingle Creek Watershed Management Commission

West Mississippi Watershed Management Commission

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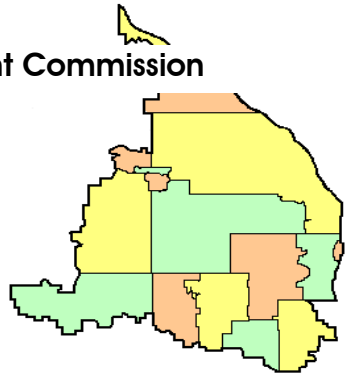

A meeting of the joint Technical Advisory Committee (TAC) of the Shingle Creek and West Mississippi Watershed Management Commissions is scheduled for **11:30 a.m., Thursday, March 11, 2020.** This will be a virtual meeting. **For this meeting we will use the regular meeting ID and passcode. The meeting ID is 834-887-565, the passcode is water. If your computer is not equipped with audio capability, dial into one of these numbers:**

+1 929 205 6099 US (New York) | +1 312 626 6799 US (Chicago) | +1 253 215 8782 US |
+1 669 900 6833 US (San Jose) | +1 346 248 7799 US (Houston) | +1 301 715 8592 US

A G E N D A

1. Call to Order.
   a. Roll Call.
   b. Approve Agenda.*
   c. Approve Minutes of Last Meeting.*
2. 2021 CIP.*
   a. Brooklyn Park Riverbank Stabilization Project.*
   b. Palmer Lake Estates Stream Restoration.*
   c. Other
3. NPDES General Permit Application – verbal discussion.
4. HUC 8 Model Status - presentation.
5. Wild Wings Western Wetland – presentation.*
6. Partitioned TMDL Wasteload Allocations* - also emailed to members on March 5, 2012.
7. Other Business.
8. Next TAC meeting is scheduled for _____..
9. Adjournment.

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Shingle Creek Watershed Management Commission
West Mississippi Watershed Management Commission

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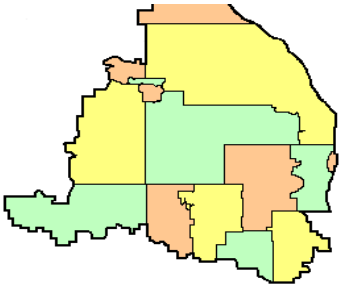


MINUTES
February 11, 2021

A virtual meeting of the Technical Advisory Committee (TAC) of the Shingle Creek and West Mississippi Watershed Management Commissions was called to order by Chairman Richard McCoy at 11:38 a.m., Thursday, February 11, 2021.

Present were: Andrew Hogg, Brooklyn Center; Mitch Robinson, Brooklyn Park; Todd Tuominen, Champlin; Mark Ray, Crystal; Derek Asche, Maple Grove; Megan Hedstrom, New Hope; Ben Scharenbroich and Amy Riegel, Plymouth; Richard McCoy and Marta Roser, Robbinsdale; Ed Matthiesen, Diane Spector, and Todd Shoemaker, Wenck/Stantec; and Judie Anderson and Amy Juntunen, JASS.

Not represented: Minneapolis and Osseo.

Also present: Melissa Collins, Brooklyn Park, and Burt Orred, Crystal.

I. Motion by Ray, second by Asche to **approve the agenda.*** *Motion carried unanimously.*

II. Motion by Ray, second by Hogg to **approve the minutes***of the December 1, 2020 meeting. *Motion carried unanimously.*

[Tuominen arrived 11:46 a.m.]

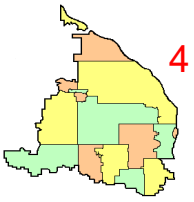
III. Twin/Ryan Lake Subwatershed Assessment.*

Shoemaker gave a slide presentation of this proposed project. The cities of Robbinsdale and Crystal are developing/revising pumping plans to outlet areas within their cities into the Twin/Ryan Lakes chain. The City of Robbinsdale is installing a permanent emergency overflow from Crystal Lake into Ryan Lake. The City of Crystal has in place a pumping operation plan for managing the Gaulke Pond chain that receives runoff from Crystal and New Hope. That system outlets into Lower Twin Lake. Crystal is looking to make improvements to that pond system to provide more storage, alleviate flooding, and potentially revise its pump operation plan.

With both cities proposing emergency flood relief pumping to the Twin/Ryan Lake system, it seems sensible to develop a coordinated pumping plan. Because there are multiple cities involved (New Hope, Crystal, and Robbinsdale upstream and Minneapolis downstream), they have requested that this be completed as a Subwatershed Plan.

The Subwatershed Assessment Account has about $8,800 carried over, with another $10,000 in the 2021 Shingle Creek budget for a total of $18,800. The slide presentation outlined a scope of work to complete this assessment in the amount of $18,000.

Motion by Ray, second by Riegel to recommend to the Shingle Creek Commission authorization for Staff to complete a subwatershed assessment for the Twin/Ryan Lake tributary area to develop a master Gaulke Pond and Crystal Lake Pump Operating Plan. *Motion carried unanimously.*



IV. Funding Ryan Creek Improvements.* The Commission and TAC have previously discussed Robbinsdale's plan to install a permanent emergency overflow pump system from Crystal Lake to Ryan Lake. As a part of the hydrologic and hydraulic analysis modeling of potential impacts to lake levels, it was recommended that the City remove excessive cattail growth around the outlet of Ryan Lake, and in the wetland and channel between Lower Twin and Ryan Creek. The purpose was to allow for a faster flow through the system to limit periods of high water on the lakes. The City recently took public bids on this project but rejected them because they exceeded the Engineer's Estimate by a considerable amount.

The proposal to develop the Gaulke Pond and Crystal Lake Pumping Plan includes the preparation of various pumping scenarios. It also includes assessing the role of the France Avenue weir. Modifications to the weir are not off the table.

The members discussed whether a project such as cattail removal and dredging and potential modifications to the weir might qualify as a Commission project with watershed significance and thus qualify for levy funding. This is a multi-jurisdictional drainage project intended to limit downstream flooding impacts.

Does this project fall under the existing Cost Share Policy? Eligible improvements include both structural and nonstructural activities. Routine maintenance or localized improvements are not eligible for cost share. Thus, a local street flooding issue is not a watershed priority, but a local flooding issue that creates significant erosion and sedimentation impacting a downstream resource may be a watershed priority.

Is this in the same class of improvements as a stream stabilization project where the Commission will 100% fund in- and on-bank improvements similar to a lake internal load project? The Cost-Share Policy sets out criteria, including "Other Watershed Benefiting Improvements as Recommended by the TAC."

Would the TAC be willing to consider and recommend to the Commission funding a project to remove cattails and dredge channels to increase flood conveyance?

It was a consensus of the members that this project would not be of watershed-wide benefit and, thus, should not be included on the CIP. Members agreed that the dredging and cattail removal seemed more like a maintenance project that the cities routinely undertake rather than a capital project. No recommendation will be made to the Commission at this time.

V. Solicit New 2021 and 2022 CIP Projects.*

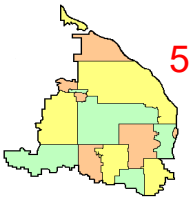
Staff is seeking potential revisions to the Commissions' 2021 and 2022 CIPs in anticipation of beginning the plan amendment process. (The Commission can move projects between years without requiring a plan amendment.)

Staff will consult with the city of Plymouth to determine if the proposed Palmer Creek Estates stream stabilization project falls into the new category of projects qualifying for 100% levy funding.

The upcoming SRP Channel Modifications at the Wetland 639W outlet should be added to the CIP as a stand-alone project.

The current CIPs for Shingle Creek and West Mississippi are shown in Tables 1 and 2 on the last pages of these minutes. They include projects that have been on the CIP for years and keep getting pushed back until such time as they are ready for implementation. Later this year the TAC and the Commissions will be embarking on the Fourth Generation Plan, including establishing a new CIP for 2023-2032.

New projects should be submitted by March 5 with the understanding that new projects proposed for levy certification in Fall 2021 should be presented in detail at the TAC's March 11 meeting, although a



full feasibility report is not required at that time. The TAC and Commission may request more detailed information about 2021 projects at the public meeting to consider a Minor Plan Amendment at the April 8, 2021 meeting. Attached to Staff's memo* is the Request to Add a Project to the CIP.* Cities with projects on the current 2021 or 2022 CIP can request they be moved or removed from the CIP at any time.

V. MS4 General Permit Reauthorization. The Minnesota Pollution Control Agency has reissued the MS4 General Permit. City staff within the SCWMC (and other area watersheds) are currently working to determine the changes to the rules and the implications they have to individual MS4 cities and the Commissions. A group of city staff members are working together to determine the best approach to meeting the rules in the most cost-effective way possible. This includes, but is not limited to, working with the West Metro Water Alliance (WMWA) on educational efforts that will focus specifically on Chlorides, Pet Waste and other topics of importance such as TMDLs, water quantity and excessive nutrient control. Ordinance templates are also being developed. The members will continue to discuss the MS4 General Permit in the next 12-18 months to ensure city staff have the resources they need in order to be in compliance with the permit going forward.

VI. Other Business.

A. Robbinsdale Project. McCoy shared the most recent site photo of the Water Treatment Plant construction site. Work has been curtailed recently due to the cold temperatures.

B. Next meeting – 11:30 a.m., Thursday, March 11, 2021, prior to the regular meeting. This will be a virtual meeting.

There being no further business, the meeting was adjourned at 12:28 p.m.

Respectfully submitted,

Judie A. Anderson
Recording Secretary
JAA:tim

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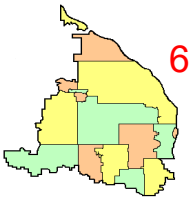
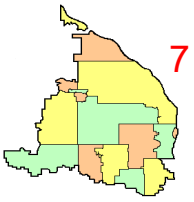


Current Shingle Creek CIP

CAPITAL IMPROVEMENT PROGRAM	2020	2021	2022	Comments
Cost Share Program	200,000	200,000	200,000	
Commission Contribution	100,000	100,000	100,000	
Local Contribution	100,000	100,000	100,000	
Partnership Cost-Share BMP Projects	100,000	100,000	100,000	
Commission Contribution	50,000	50,000	50,000	
Local Contribution	50,000	50,000	50,000	
Lake Internal Load Improvement Project	200,000		200,000	Meadow Lake Mgmt Plan
Commission Contribution	200,000		200,000	
Local Contribution	0		0	
Shingle Creek Restoration, Regent to Brooklyn Blvd	400,000			Connections II project
Commission Contribution	400,000			
Local Contribution	0			
Plymouth Enhanced Street Sweeper	350,000			Added by MPA
Commission Contribution	75,000			
Local Contribution	275,000			
Shingle Creek or Bass Creek Restoration Project	500,000			Bass Creek Project
Commission Contribution	500,000			
Local Contribution	0			
Maple Grove Pond P57		648,000		Moved to future
Commission Contribution		162,000		
Local Contribution		486,000		
Maple Grove Pond P33		574,000		Moved to future
Commission Contribution		143,500		
Local Contribution		430,500		
Shingle Creek Brookdale Park Habitat Enhancement		150,000		Nothing pending
Commission Contribution		150,000		
Local Contribution		0		
Minneapolis Webber Park Stream Restoration		500,000		Nothing pending
Commission Contribution		500,000		
Local Contribution		0		
Minneapolis Flood Area 5 Water Quality Projects		6,000,000		Nothing pending
Commission Contribution		250,000		
Local Contribution		5,750,000		
Maple Grove Pond P55		855,000		Moved to future
Commission Contribution		213,800		
Local Contribution		641,200		
Palmer Creek Estates Bass Creek Restoration		450,000		Added by MPA Review for 100%
Commission Contribution		112,500		
Local Contribution		337,500		
TOTAL PROJECT COST	**$1,750,000**	**$9,477,000**	**$500,000**	
TOTAL COMMISSION SHARE	**$1,325,000**	**$1,681,800**	**$350,000**	
TOTAL CITY SHARE	**$425,000**	**$7,795,200**	**$150,000**	



Current West Mississippi CIP

CAPITAL IMPROVEMENT PROGRAM	2020	2021	2022	Comments
Cost Share Program	100,000	100,000	100,000	
Commission Contribution	50,000	50,000	50,000	
Local Contribution	50,000	50,000	50,000	
River Park Stormwater Improvements	485,000			Added by MPA 9/19
Commission Contribution	121,250			
Local Contribution	363,750			
Mississippi Crossings Phase B Infiltration Vault	400,000			Moved per Todd
Commission Contribution	100,000			
Local Contribution	300,000			
Champlin Woods Trail Rain Gardens		180,000		Moved per Todd
Commission Contribution		45,000		
Local Contribution		135,000		
Wetland Restoration Project		250,000		Moved, nothing pending
Commission Contribution		62,500		
Local Contribution		187,500		
TOTAL PROJECT COST	985,000	530,000	100,000	
TOTAL COMMISSION SHARE	271,250	157,500	50,000	
TOTAL CITY SHARE	713,750	372,500	50,000	

WENCK now part of Stantec

To: Shingle Creek/West Mississippi WMO TAC

From: Ed Matthiesen, P.E.
Diane Spector

Date: March 5, 2021

Subject: Proposed 2021 CIP

Recommended TAC Action	Make recommendations to the Commissions on two amendments to the CIP.

In preparation for the CIP process for 2021, one new project has been submitted for addition to the CIP in West Mississippi. In addition, one current project on the CIP deserves further discussion as to whether it should be considered for 25% funding or 100% funding.

Shingle Creek

The City of Plymouth previously submitted the Palmer Lake Estates Bass Creek Restoration project to the CIP, and it was added in 2017 for implementation in 2021/2022 for 25% cost share. The Commission has revised its policy for CIP projects to allow for 100% funding of projects that would consider to be "load allocation" or "internal load" projects such as in-lake treatments or stream restorations to repair erosion, improve water quality, and enhance habitat. In our mind it is not clear that the Palmer Lake Estates project falls under the 100% cost participation policy.

On the one hand, that reach of Bass Creek is just upstream of Bass Lake, it is clearly experiencing erosion and mass wasting, and is clearly exporting sediment and nutrient loading to the lake. On the other hand, that reach of Bass Creek is not an Impaired Water for either water quality or biotic integrity, and since it is intermittent, it would be difficult to create habitat that could sustain and enhance aquatic life, although it is clear some habitat improvement could be made.

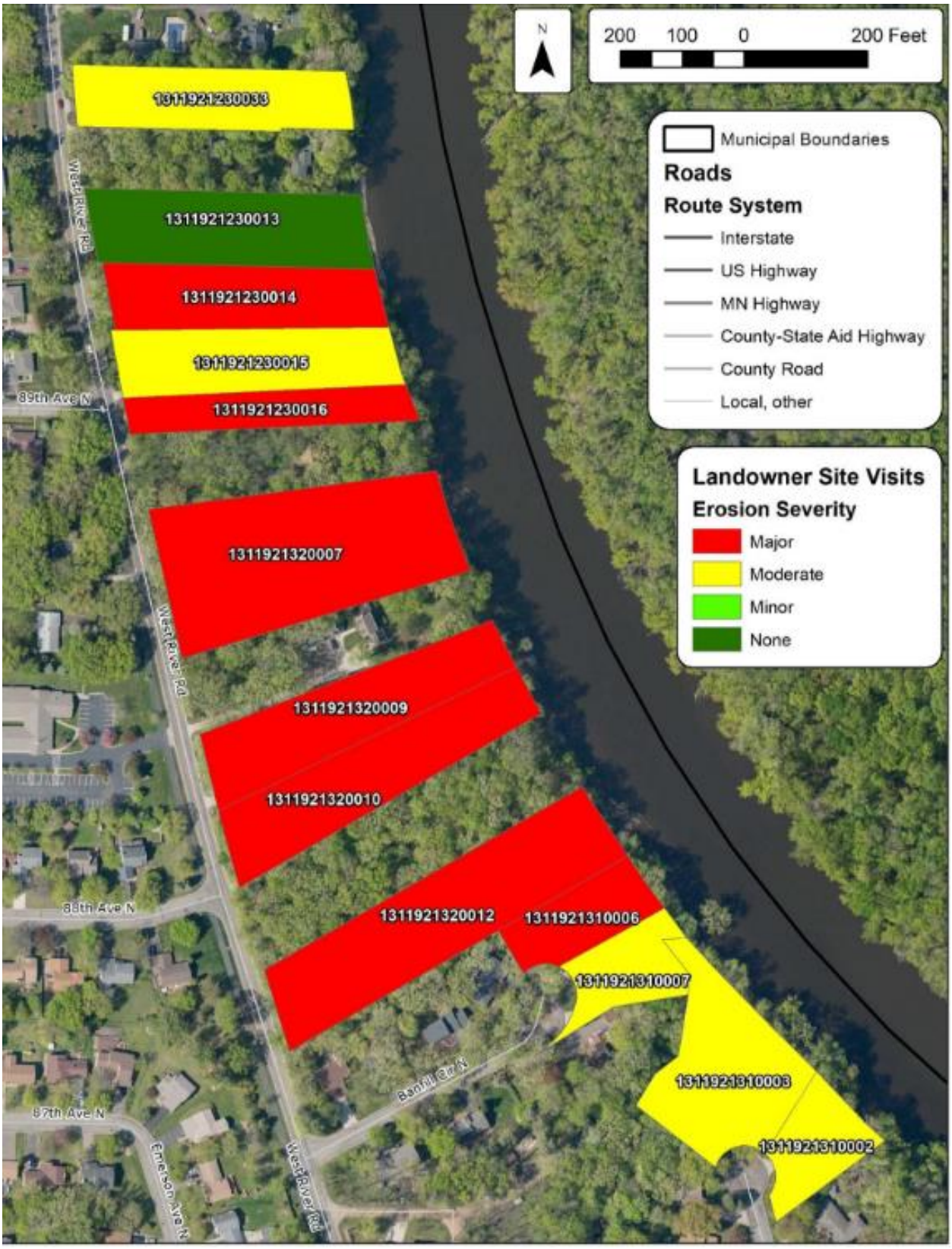
Revising the cost share to 100% would require a minor plan amendment. This is presented to the TAC for discussion and recommendation to the Shingle Creek Commission.

West Mississippi

The City of Brooklyn Park has been working with Hennepin County to complete an inventory of bank conditions along the Mississippi River. Several private properties are experiencing moderate to severe erosion and bank loss. The TAC had previously had some discussion with the City as to whether Cost Share funds could be used to help match grant funds. West Mississippi does not at this time have a Partnership Cost Share program such as Shingle Creek, so we talked at that time about how the city cost share could potential be used but did not resolve that question. The City did submit a Clean Water Fund grant application (see attached) to help fund about 715 linear feet of restoration along 7 properties, but fell just short of being funded. In the feedback from BWSR to the city, BWSR asked that the Commission provide more specifics and more clearly support the project.

The South Metro Mississippi Turbidity TMDL requires a 50% Load Allocation reduction to the Mississippi River. The LA is defined as "**field, ravine, bluff, and stream bank erosion**," so a case can reasonably be made that it would be consistent with other cost share projects to share in the cost of riverbank stabilization where we can estimate a specific annual load reduction. Stabilization on public property would be eligible under the levy or the city cost share program. West Mississippi would have to establish a Partnership Cost Share Program for privately owned properties. IN the guidelines for project eligibility we could specifically call out riverbank stabilization to reduce TSS LA to the Mississippi River as an eligible project. If this is something the TAC is willing to recommend to the COmmision, we can work with BWSR to come up with wording that would meet its need for specificity.

Adding a Partnership Cost Share to the West Mississippi CIP would require a minor plan amendment. This is presented to the TAC for discussion and recommendation to the West Mississippi Commission.


N
200 100 0 200 Feet
Municipal Boundaries
Roads
Route System
Interstate
US Highway
MN Highway
County-State Aid Highway
County Road
Local, other
Landowner Site Visits
Erosion Severity
Major
Moderate
Minor
None
13119212300033
1311921230013
1311921230014
13119212300015
1311921230016
1311921320007
1311921320009
1311921320010
1311921320012
1311921310006
1311921310007
13119213100003
13119213100002
West River Rd
89th Ave N
88th Ave N
87th Ave N
Emerson Ave N
Bend of River Rd

BWSR

Projects and Practices Application

Grant Name - Mississippi River Shoreline Stabilization Project
Grant ID - C21-7834
Organization - Brooklyn Park, City of

Allocation	**Projects and Practices 2021**	**Grant Contact**	**Mitch Robinson**
Total Grant Amount Requested	$663,000.00	**County(s)**	Hennepin
Grant Match Amount	$221,000	**12 Digit HUC(s)**	070102060702
Required Match %	25%	**Applicant Organization**	Brooklyn Park, City of
Calculated Match %	33%	**Application Submitted Date**	
Other Amount			
Project Abstract	This Mississippi River Shoreline Stabilization Project will enhance water quality, restore natural habitats, and sustain and protect property along the west banks of the Mississippi River, within the City of Brooklyn Park. A 5.8-mile shoreline assessment completed in Summer 2020 (Mississippi River Stabilization Project Site Assessment and Summary) comprehensively surveyed erosion issues along the City's river shoreline and identified numerous critical riverfronts severely eroding into the river, contributing significant sediment and nutrient loads. The report catalogued these properties and recommended a set of properties west of Banfill Island as the most critical and cost-effective for restoration. This grant request is to support Phase I of the plan for stabilization of approximately 715 linear feet of river shoreline focused on these properties west of Banfill Island. The project scope includes design development, administration, and construction of approximately 715 linear feet of shoreline on up to seven non-profit and privately-owned properties, targeting stabilization of both the toe		

	of the slope as well as mid-bank destabilization via groundwater seepages. Design strategies may include hard armoring such as riprap at/below the toe of the slope and/or drain tile to manage groundwater seepages, but will emphasize bioengineering practices that enhance aquatic and terrestrial habitats while maintaining long-term environmental sustainability of the practices. The total budget for this project is $884,000 with $663,000 requested from BWSR and $221,000 from local sources including the landowners ($101,000), the city ($40,000), Hennepin County ($40,000), and West Mississippi Watershed Management Commission ($40,000).
Proposed Measurable Outcomes	(1) For sediment, retention of 548 tons/yr, 13,688 tons over 25-yr lifespan at $68.01/ton (2) For TP, retention of 506 lb-TP/yr, 12,661 lbs over 25-yr lifespan at $70.28/lb (3) Aquatic & terrestrial habitat restoration along critical corridor

Narrative

Questions & Answers
Does your organization have any active CWF competitive grants? If so, specify FY and percentage spent. Also, explain your organization's capacity (including available FTEs or contracted resources) to effectively implement additional Clean Water Fund grant dollars.
The City has an active 2020 CWF grant for stormwater and habitat improvements in the City's River Park. The River Park project is currently over 50% executed. That grant is managed by the Recreation and Parks Dept. with an expected completion June 2021. **This project will be managed by Brooklyn Park's Engineering Division. Hennepin County Environment and Energy staff will also be providing technical and administrative assistance. Both Brooklyn Park and Hennepin County have 2 FTEs each dedicated to this project, with additional capacity available if necessary.** **Contracted services will also be utilized for both design and construction. An engineering firm will be used for design and an independent contractor specializing in riverbank restorations will be used for construction. More detail on the project team is provided later in this application.**
Water Resource: Identify the water resource the application is targeting for water quality protection or restoration.
Mississippi River: A 5.8 mile stretch of the west bank of the Mississippi River from 73rd Ave. N. to 109th Ave N. in Brooklyn Park was considered for this project. The scope was narrowed down to the most critical areas on the west side of Banfill Island, approximately 715 linear feet from just north of 89th Ave N to Mattson Brook Ln. Other critical areas on this stretch of river could be addressed with future grants if awarded.

Questions & Answers
Prioritization (Relationship to Plan): Question 1. (17 points): (A) Describe why the water resource was identified in the plan as a priority resource. For the proposed project, identify the specific water management plan reference by plan organization (if different from the applicant), plan title, section, and page number.
The Mississippi River is a vital resource for wildlife, recreation and a major drinking water supply for the Twin Cities. Protecting and improving the water quality of river has been a part of three different strategic plans by the City of Brooklyn Park, Hennepin County and the West Mississippi Watershed Management Commission. **This project advances several goals within the City's 2040 Comprehensive Plan, specifically, the two chapters listed below:** **Chapter 10 - Local Water Management Plan (Page 538 for goals)** **Goal #3 is to maintain or improve both surface water and groundwater quality** **Goal #4 is to protect and enhance fish and water related wildlife habitats** **Goal #5 is to protect and enhance opportunities for water recreation** **Chapter 12 - Mississippi River Corridor Critical Area (Page 647 for goals)** **Goals 1 through 7 and 9 are addressed with the proposed project. The most closely related goals are:** **Goal #5 includes working with property owners to introduce vegetation on riverbanks and steep slopes to control erosion** **Goal #7 includes the need to achieve enhanced shoreline restoration, tree preservation and replacement, water quality management, and erosion control in the corridor.** **This project also advances goals in partner organization's plans. For the West Mississippi Watershed Management Commission, implementing this project will help reach their 3rd Generation Plan goals related to water quality improvement (Goal B.3, Page 110) and to work proactively with watershed partners to foster implementation of TMDL projects (Goal F.2, Page 114). Similarly, this also meets Hennepin County's Natural Resources Strategic Plan goals to restore degraded waterbodies not meeting water quality standards (Goals 1.1.2 & 1.1.4, Pages 10-11) and to work cooperatively with county partners to address soil erosion (Goals 2.4.1 & 3.1.1, Pages 19-20) while leveraging dollars among multiple agencies (Goal 5.1.1 Page 24).**
Prioritization (Relationship to Plan): Question 1, continued: (B) In addition to the plan citation, provide a brief narrative description that explains whether this application fully or partially accomplishes the referenced activity.
This project is proposing stabilization of both the toe of the slope as well as mid-bank destabilization via groundwater seepages. Design strategies may include hard armoring such as riprap at/below the toe of the slope and/or drain tile to manage groundwater seepages, but will emphasize bioengineering practices that enhance aquatic and terrestrial habitats while maintaining long-term environmental sustainability of the practices.

Questions & Answers
This would accomplish the water quality goals called out in the above plans by reducing both the sediment load to the river by 548 tons/yr and the phosphorous load by 506 lbs/yr. With property owners contributing to the cost of the project, this will accomplish public outreach and education goals. These goals would be fully accomplished for the area of shoreline proposed to be stabilized with this project. Future projects along the river could accomplish these same goals for other areas of need and build from this project.
Prioritization (Relationship to Plan): Question 1, continued: (C) Provide weblinks to all referenced plans.
City 2040 Comprehensive Plan: https://www.brooklynpark.org/wp-content/uploads/2020/05/2040-Comprehensive-Plan_NoAppendices.pdf West Mississippi Watershed Management Commission 3rd Generation Plan: http://www.shinglecreek.org/uploads/5/7/7/6/57762663/scwm_third_generation_plan_april_2013.pdf Hennepin County's Natural Resources Strategic Plan: https://www.hennepin.us/-/media/hennepinus/residents/environment/natural-resource-management/natural-resources-strategic-plan.pdf
Prioritization (Relationship to Plan): Question 2. (3 points): (A) Describe how the resource of concern aligns with at least one of the statewide priorities referenced in the Nonpoint Priority Funding Plan (also referenced in the "Projects and Practices" section of the RFP). (B) Describe the public benefits resulting from this proposal from both a local and state perspective.
This stabilization, water quality and pollution prevention project will protect and restore property along the Mississippi River resulting in the reduction of sediments and pollutants entering the Mississippi River. The Mississippi River serves as the drinking water source for almost 20% of all Minnesotans. The St. Paul Regional Water Intake Building is located on the Mississippi River within a 1/2 mile down river, increasing the project's value due to its proximity to a drinking water source. The Mississippi River is impaired for nutrients not only at this stretch of the River but for all downstream stretches before and including Lake Pepin. People downstream live with the benefits and consequences of their upstream river neighbors. By removing sediment and pollutants along this stretch of the River we also aid downstream communities by reducing the pollutant loads in the River for all stretches downstream. Reduced nutrient loads help decrease the risk of eutrophication, algal blooms and low oxygen levels in the Mississippi River and Gulf of Mexico. The stretch of the Mississippi River is within the Mississippi River Corridor Critical Area (MRCCA). The MRCCA program promotes protecting and preserving the natural, biological, ecological, cultural, and historic values of the Mississippi River to benefit the health and welfare of the citizens of the state, region, and nation.

Questions & Answers
Targeting: Question 3. (15 points): Describe the methods used to identify, inventory, and target the root cause (most critical pollution source(s) or threat(s)). Describe any related additional targeting efforts that will be completed prior to installing the projects or practices identified in this proposal.
For years, property owners along the Mississippi River have asked for the City's support to partner on a more comprehensive and coordinated approach to addressing significant erosion issues along the river, including shoreline and tree loss due to high water and river eddy and ice damage; each resulting in sediments and other pollutants directly entering the river from adjacent riverfronts. In June of 2020, the City and County engaged over 55 property owners along the riverbank. The City received nearly 50 Letters of Intent granting permission for a site assessment and providing a good faith commitment to cost share work completed on their property. **Following the June public meeting, site visits were conducted on these properties spanning the 5.8-mile riverfront in Brooklyn Park. The site visits were conducted by Hennepin County Environment and Energy staff to survey and assess existing erosion features, to estimate the extent to which erosion has increased sediment and nutrient loading to the river, and to understand the sources for this erosion. The MRSP Site Assessment and Summary (https://www.brooklynpark.org/wp-content/uploads/2020/08/MRSP_Eng_Report_DRAFT.pdf) document resulting from this field work classified and prioritized each property based on erosion severity and identified the properties west of Banfill Island as those exhibiting the most severe erosion which could most cost-effectively be addressed through a single restoration project. Erosion was most severe in this area due to a combination of flow-induced forces and destabilization in the banks from groundwater seepages. Without restoration, these banks would continue to erode at nearly a half-foot per year rate, further endangering buildings and properties, degrading habitat, and increasing sediment and nutrient load to the river.**
Targeting: Question 4. (10 points): How does this proposal fit with complementary work that you and your partners are implementing to achieve the goal(s) for the priority water resource(s) of concern? Describe the comprehensive management approach to this water resource(s) with examples such as: other financial assistance or incentive programs, easements, regulatory enforcement, or community engagement activities that are directly or indirectly related to this proposal.
From the beginning, this effort has been community led, with riverfront neighbors banding together to engage the City concerning the degradation to their riverbanks and its impact on the river. These conversations with the community and neighborhood groups have been ongoing for many years. More recently, the City and Hennepin County worked together to expand this effort to more comprehensively consider erosional issues across properties throughout the City's riverfront. This effort culminated in the MSRP Site Assessment and Summary report which identified the Banfill Island properties as the group most critically in need of assistance. Other neighborhood groups and individual properties in need of restoration assistance will be considered for implementation in the future when additional dollars are available, potentially as future phases of this effort. **This effort aligns well with other City, County, and Watershed Management Commission goals and priorities; including those identified within the City's Comprehensive Plan and Stormwater Management Plan. Among other initiatives, the City has recently contributed over $2,200,000 toward restoration of River Park that includes an integrated stormwater pond and an enhanced natural space with rain gardens. The integrated**

Questions & Answers
stormwater pond and rain gardens will now provide water quality to an otherwise untreated 250 acre subwatershed; whereby removing over 50 pounds of total phosphorus (TP) and 31,260 pounds of sediment from water discharging to the Mississippi River. The West Mississippi Watershed Management Commission has goals in their 3rd Gen. Plan to work proactively with watershed partners to foster implementation of TMDL projects such as this. They, like the City, recognize the importance of the Mississippi River Corridor Critical Area and view practices in the area as a priority.
Measurable Outcomes and Project Impact: Question 5. (10 points): (A) What is the primary pollutant(s) this application specifically addresses? (B) Has a pollutant reduction goal been set (via TMDL or other study) in relation to the pollutant(s) or the water resource that is the subject of this application? If so, please state that goal (as both an annual pollution reduction AND overall percentage reduction, not as an in-stream or in-lake concentration number). (C) If no pollutant reduction goal has been set, describe the water quality trends or risks associated with the water resource or other management goals that have been established. (D) For protection projects, indicate measurable outputs such as acres of protected land, number of potential contaminant sources removed or managed, etc.
Riverbank restorations proposed in this application will directly address water quality impairments in the Mississippi River as any erosion from these banks discharge directly to the river. Once completed, this project is estimated to annually keep 548 tons of sediment and 506 lbs of total phosphorus (TP) from eroding into the river. Over the anticipated 25-year lifetime of the practices, that amounts to 13,688 tons of sediment and 12,661 lbs-TP at a cost-effectiveness (including maintenance) of $65.01/ton of sediment and $70.28/lb-TP. In addition, anticipated secondary benefits include restored and enhanced near-channel habitats and improved access to the river for homeowners and the public (via the Izaak Walton League). The sediment and nutrients currently eroding into the river are exacerbating downstream water quality issues, including sedimentation which inhibits fish spawning and healthy benthic habits and eutrophication from increased nutrient loads. This reach of the Mississippi River (AUID 07010206-805) is impaired for nutrients but does not yet have an approved TMDL. Further downstream, both the South Metro Mississippi River and Lake Pepin TMDLs proposed 20% reductions from non-point sources in the Mississippi River basin from both sediment and phosphorus sources. This project is also consistent with the goals set forth in the Sediment Reduction Strategy, which calls for a 25% reduction in sediment loading by 2020 and a 50% reduction by 2030. That report also directly calls out river and stream bank erosion as a significant contributor to sediment and nutrient impairments downstream. This project can cost-effectively help in addressing all of these goals. Although water quality has generally been improving along this reach of the Mississippi River over the last 40 years, its imperative that work continues to ensure a sustained positive trend line locally and to help mitigate for poorer water quality in the river further downstream.
Measurable Outcomes and Project Impact: Question 6. (10 points): (A) What portion of the water quality goal will be achieved through this application? Where applicable, identify the annual reduction in pollutant(s) that will be achieved or avoided for the water resource if this project is completed. (B) Describe the effects this application will have on the root cause of the issue it will address (most critical pollution source(s) or threat(s)).
As previously noted, this project will stabilize and restore severely eroded riverbanks along the Mississippi River and annually reduce erosion to

Questions & Answers
the river by 548 tons of sediment and 506 lbs of total phosphorus (TP). Over the 25-year lifetime of the practices, that amounts to 13,688 tons of sediment and 12,661 lbs-TP at a cost-effectiveness (including maintenance) of $65.01/ton of sediment and $70.28/lb-TP. Although a specific load allocation goal has not been set for nutrient management in this reach of the Mississippi River (AUID 07010206-805), this project will help to achieve the percent load reduction goals as stated in the answer to Question 5. Riverbank erosion sources in this area are presumed to be from a combination of (1) toe erosion caused by high sheer stress from high flow velocities, (2) wave action from recreational boats during high flows, and (3) bank seepage which destabilizes the bank. This project will not be able to address the combined impacts of a wetter climate and land use decisions which have led to higher and more frequent intense flood events, but bank stabilization strategies will consider this "new normal" to ensure the restoration practices remain viable through the practice lifetime. Similarly, this project cannot address the choices river recreators make when operating vehicles on the river, but will protect the banks from the impacts of wave action. Separately, the City, the MN Department of Natural Resources, and the Hennepin County Sheriff have been working diligently to better ensure boaters are aware of no wake warnings during times of high flows. Stabilization strategies will seek to manage and more safely convey bank seepages so that they do not continue to destabilize and erode the riverbanks.
Measurable Outcomes and Project Impact: Question 7. (5 points): If the project will have secondary benefits, specifically describe, (quantify if possible), those benefits. Examples: hydrologic benefits, climate resiliency, enhancement of aquatic and terrestrial wildlife species, groundwater protection, enhancement of pollinator populations, or protection of rare and/or native species.
This project's primary benefit is to reduce bank erosion and thereby reduce sediment and nutrient loading to the river. Bank stabilization, though, has other benefits in addition to this. Notably, an opportunity to restore aquatic and terrestrial habitats along a critical area of the river. The strategies used for installation will consider preferred habitat environments for bird, fish, frog, snake, and turtle species, along with other invertebrate and medium to large vertebrate species. Where possible, softer bioengineered strategies such as root wads and live stakes will be used in lieu of hard armoring (e.g. riprap) to better support positive habitat and wildlife outcomes. These strategies are discussed further in the MRSP Site Assessment and Summary report: https://www.brooklynpark.org/wp-content/uploads/2020/08/MRSP_Eng_Report_DRAFT.pdf Native plantings will also be included further upland along the banks. These plantings will incorporate pollinator-friendly native grasses, forbs, trees, and shrubs within an area deemed critical (Priority 1) for pollinator habitat re-establishment in the State of Minnesota's Lawn's to Legumes program. These projects will be contiguous across over a half-dozen properties, allowing for establishment of a large buffer of native vegetation currently either unvegetated or over-grown with invasive species (predominantly buckthorn). Native vegetation species and planting plans will be consistent with recommendations in BWSR's Native Vegetation Establishment and Enhancement Guidelines, as well as other scientific best practices. Lastly, there will also be public benefit through the restoration and improvement of the Izaak Walton League property. Currently, the riverfront is inaccessible to most visitors. Restoration of the riverfront will reconnect this area to the property and give visitors access to the riverfront.

Questions & Answers
Cost Effectiveness and Feasibility: Question 8. (15 points): (A) Describe why the proposed project(s) in this application are considered to be the most cost effective and feasible means to attain water quality improvement or protection benefits to achieve or maintain water quality goals. Has any analysis been conducted to help substantiate this determination? Discuss why alternative practices were not selected. Factors to consider include, but are not limited to: BMP effectiveness, timing, site feasibility, practicality, and public acceptance. (B) If your application is proposing to use incentives above and beyond payments for practice costs, please describe rates, duration of payments and the rationale for the incentives' cost effectiveness. Note: For in-lake projects such as alum treatments or carp management, please refer to the feasibility study or series of studies that accompanies the grant application to assess alternatives and relative cost effectiveness. Please attach feasibility study to your application in eLINK.
Following public engagement activities, Hennepin County staff solicited interest for site visits to view riverfronts and assess the extent to which banks have destabilized and eroded. Nearly 50 properties were surveyed, and the results of site visits were summarized in the MRSP Site Assessment and Summary report. This report detailed the findings of the survey, the extent to which erosional features were found, the erosion severity, likely sources of erosion, the water quality impact of the erosion, and the strategies and cost to address erosion and stabilize the banks on each property. This analysis found the properties west of Banfill Island had the most severe damage and were most critically in need of repair. In addition, these were also deemed to be the most cost-effective to replace, largely due to the high erosion rate (therefore loading to the river) and the ability to restore them as a group and achieve some economy-of-scale savings. The report recommended restoration activities that utilized hard armoring only when absolutely necessary, and advocated for bioengineered practices wherever feasible. **The estimated cost-effectiveness of these practices were $65.01/ton of sediment and $70.28/lb-TP, which are well below the typical cost-effectiveness for other urban BMPs. These cost-effectiveness estimates considered the full life cycle of the practice, including design, implementation, and maintenance (estimated at 15% construction costs) as well as the benefit realized over the 25-year lifetime of the practices. Costs were developed considering other, locally implemented practices with similar engineering and site access challenges. Timing is opportune for implementation as public and City Council engagement were recently completed and each group has shown a strong willingness to participate in the project. Grant awarding in early 2021 would also allow for design in spring and implementation in early fall when water levels are low.**
Project Readiness: Question 9. (8 points): What steps have been taken or are expected to ensure that project implementation can begin soon after the grant award? Describe general environmental review and permitting needs required by the project (list if needed). Also, describe any discussions with landowners, status of agreements/contracts, contingency plans, and other elements essential to project implementation.
In 2020, the City, in partnership with Hennepin County, West Mississippi Watershed Management Commission (WMWMC) and Brooklyn Park river front homeowners conducted a shoreline assessment to determine the severity of the erosion damage along the 5.8 mile stretch on the west bank of the Mississippi River (73rd Ave. N. to 109th Ave N.) in Brooklyn Park, MN. The MRSP Site Assessment and Summary is being used to help define the priority properties and focus for this project. City of Brooklyn Park staff and Council members, along with Hennepin County staff, met with over 55 Brooklyn Park river side property owners to discuss the process, scope and homeowner's partnership and commitment to the riverbank stabilization project. There was overwhelming support for the City and County to advance this project, with nearly 50 Letters

Questions & Answers
of Intent providing support for a site visit and a good faith commitment to financially support the project through cost sharing. Property owners highly encouraged the City to submit the grant application. City Council approved the City's contribution to this project, and, if awarded, approved financing the neighborhood contribution and assessing back to the homeowners over a 10-year period. Partnering agencies will meet with all permitting agencies for pre-permit discussion to garner feedback on proposed design strategies and, later, for permit review. Expected permits include West Mississippi Watershed Management Commission rules/permits related to stormwater management, erosion and sediment control, floodplain alteration, and wetland alteration; MRCCA regulations; MNDNR Public Water permits, and any necessary permissions from the Army Corps of Engineers and National Park Service. If awarded, the City of Brooklyn Park would work with a contracted engineering firm in the spring of 2021 to produce design documents. Contstruction would occur in the fall of 2021 when water levels are low.
Project Readiness: Question 10. (2 points): What activities, if any proposed, will accompany your project(s) that will communicate the need, benefits, and long-term impacts to your local community? This should go above and beyond the standard newsletters, signs and press releases.
While the scope for this grant is limited to the most critical properties along the River, the collaboration and outreach taken to work with a majority of the 128 non-public properties along the 5.8 mile stretch of shoreline within the City, has resulted in increased awareness and understanding of how important the impact of activities and issues on private lands have on surface water runoff and erosion and to the overall health of the River system. Ultimately, this also impacts the recreational value of the river and the quality of its use as drinking water for a large segment of the state population. This project has also increased the awareness of the shoreline erosion issues with City, Hennepin County, and the West Mississippi Watershed Management Commission (WMWMC) policymakers, whereby increasing the potential for on-going commitment to support future funding and action to continue to partner with homeowners to advance the full plan in the future. The City and property owners will work together to share the progress of this project, if awarded, through its newsletters (Izaak Walton League), City social media, City newsletters, website and signage along the river. Hennepin County and WMWMC will also promote activities on their respective social media platforms and newsletters.
Stream Restoration Projects Only (all other projects, please indicate "Not applicable"): Stream restorations benefit from the expertise of diverse professional experience in fields like: geomorphology, hydrology, plant and animal ecology, construction site management, and engineering. What technical skills will be applied to this project and who is providing them?
The following staff will be on the project team overseeing execution of project tasks: City of Brooklyn Park

Questions & Answers
Mitch Robinson (Water Resources Engineer): Mitch will serve as the grant administrator, fiscal agent and lead project management activities with Kris Guentzel. Mitch brings a background in civil engineering, with both project inspection and management. He was a part of a previous streambank stabilization project along Shingle Creek. **Jody Yungers (Parks and Recreation Director): Jody will serve as Project Lead, providing overall direction and assistance for staff regarding budget, grant execution, and coordination with city leadership and Council.** **Hennepin County** **Kris Guentzel (Senior Water Resources Specialist) - with a background in hydrology and civil engineering, Kris has been a project manager for engineering and planning projects spanning from the local to state level both with the county and in previous roles with other organizations. Kris will also be the main point of contact with landowners.** **Kristine Maurer (Senior Conservation & Natural Resource Ecologist): Kristine will be the main technical voice ensuring that restoration techniques remain true to the habitat systems they're being implemented in. She will be provided design recommendations and requirements and will be reviewing design documents.** **Contracted Engineering Firm: The City of Brooklyn Park will be soliciting for an engineering firm to assist them with development of design documents and with identification and selection of a contractor for practice installation. The Engineering Firm will serve as the Technical Assistance Provider and technical signatory for any drafted designs.** **Lastly, the project team will always utilize the best available materials for implementing environmentally beneficial and sustainability riverbank restoration practices, including those referenced in Recommendations to Improve Future Restorations from the recent Legacy Fund Evaluation Report.**
Stream Restoration Projects Only (all other projects, please indicate "Not applicable"):Describe how your organization will provide financial assurance that operations and maintenance funds are available if needed.
Project partners will be drafting an Operations and Maintenance agreement with each landowner which will clearly define the tasks expected from landowners to ensure these practices reach their 25-year lifespan. The Operations and Maintenance agreement will include expectations for the landowner to maintain and where necessary replace practice components The agreement will also include language that will allow access, inspection, and if necessary, maintenance by local government staff. Any maintenance costs incurred by the city will assessed back to the landowner. The project team will pursue deed restrictions along the riverfront to ensure owners maintain the practice and don't deliberately remove or modify the practice for 25 years.

Questions & Answers
The Constitutional Amendment requires that Amendment funding must not substitute traditional state funding. Briefly describe how this project will provide water quality benefits to the State of Minnesota without substituting existing funding.
Riverbank restoration projects are one of the more costly water quality improvement projects per linear foot. In this area of the Mississippi River, this is especially true as banks show evidence of instability throughout the bank height, often as high as 40 feet. The MRSP Site Assessment and Summary report estimated the cost to restore banks on properties viewed during July 2020 at over $3,920,000, not including maintenance costs. This estimate is a fraction of the expected cost as only 38% of privately-owned Mississippi Riverfront properties in Brooklyn Park were surveyed. Although a portion of this cost could be added to the City's Capital Improvement Project (CIP) fund, the city cannot shoulder the full cost. Even when pooling other resources from local government units including Hennepin County and the West Mississippi Watershed Management Commission, as well as riverfront landowners, the cost is too high for solely local implementation dollars. Thus, the local partnership felt it most practical to pool significant funding from multiple local sources and to leverage those dollars for state assistance through the Clean Water Fund.

Application Budget

Activity Name	Activity Description	Category	State Grant $ Requested	Activity Lifespan (yrs)
Mississippi River Shoreline Stabilzation	Stabilization of approximately 715 linear feet of river bank that will prevent 548 tons/year of TSS and 506 lbs/year of TP from entering the Mississippi River	STREAMBANK OR SHORELINE PROTECTION	$663,000.00	25

Proposed Activity Indicators

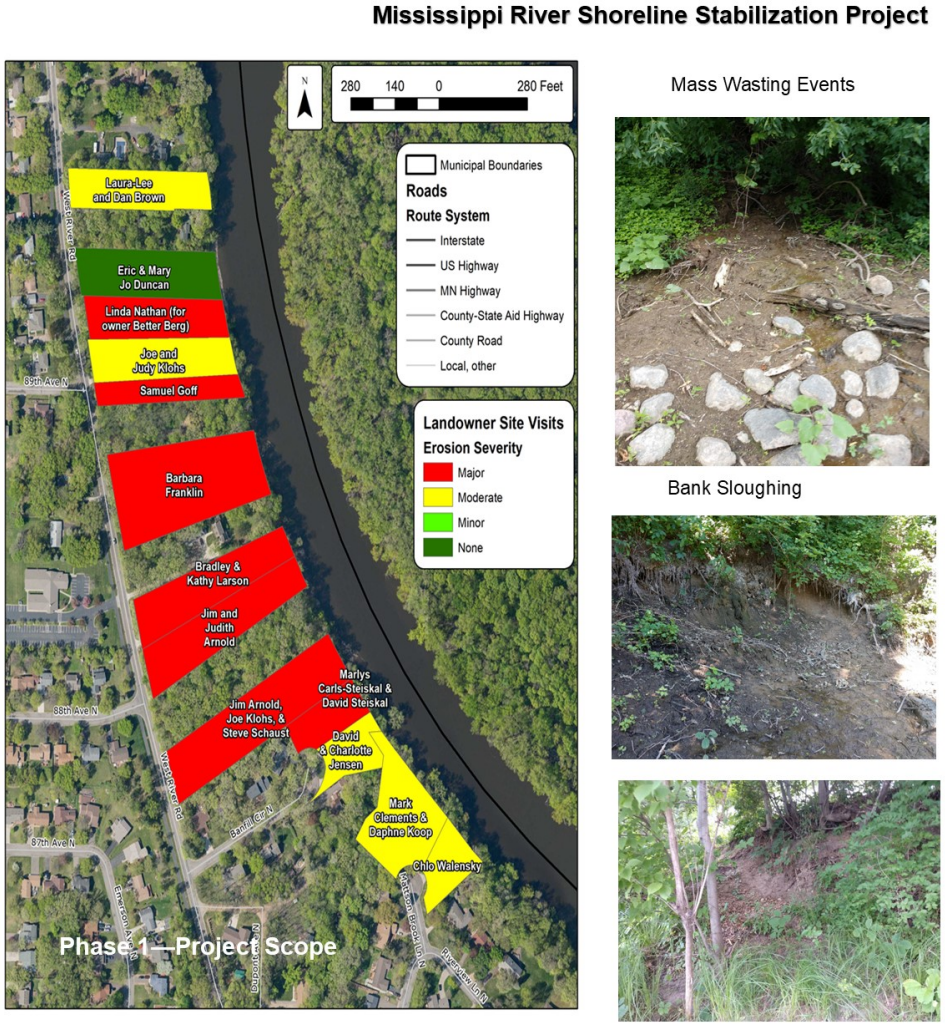
Activity Name	Indicator Name	Value & Units	Waterbody	Calculation Tool	Comments
Mississippi River Shoreline Stabilzation	PHOSPHORUS (EST. REDUCTION)	506 LBS/YR	Mississippi	Other	WI NRCS Field Office Technical Guide: Streambank Erosion Direct

Activity Name	Indicator Name	Value & Units	Waterbody	Calculation Tool	Comments
					Volume Method
Mississippi River Shoreline Stabilzation	SEDIMENT (TSS)	548 TONS/YR	Mississippi River	Other	WI NRCS Field Office Technical Guide: Streambank Erosion Direct Volume Method

Activity Details

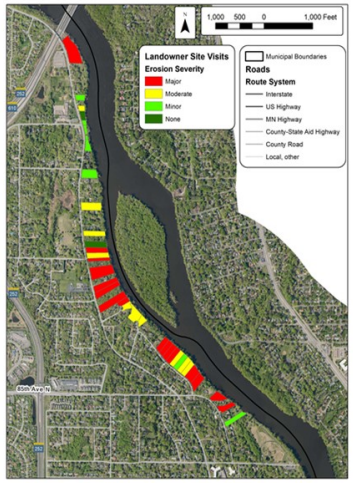
Activity Name	Question	Answer
Mississippi River Shoreline Stabilzation	Dollar amount requested for Ag BMP Loan Program:	Not Entered
Mississippi River Shoreline Stabilzation	Dollar amount requested for CWP Loans:	Not Entered

Application Image



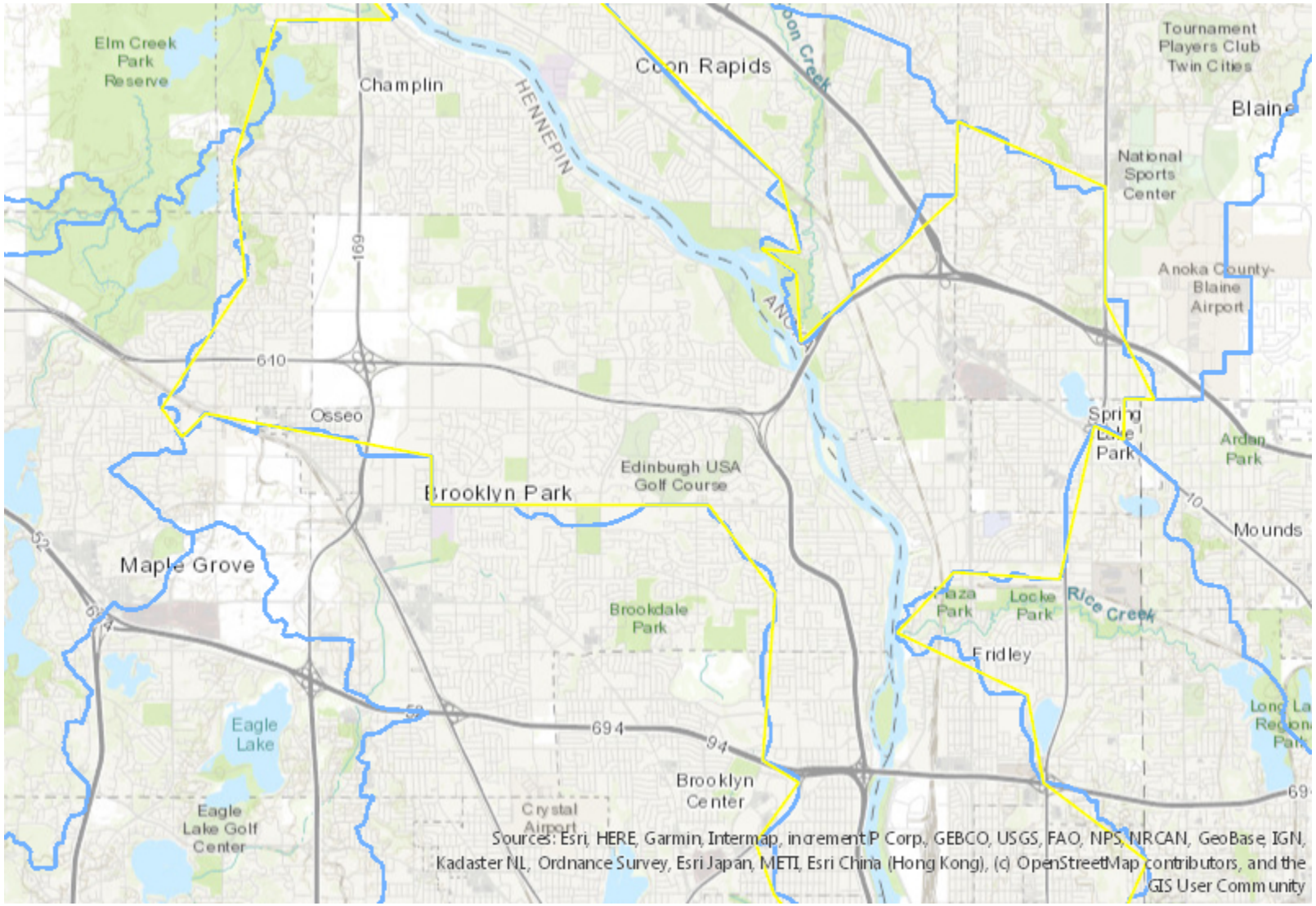
Mass Wasting Events

Bank Sloughing



Scarps / Overhanging Vegetation

Map Image


Elm Creek Park Reserve
Champlin
HENNEPIN
Coon Rapids
Tournament Players Club Twin Cities
Blaine
National Sports Center
Anoka County-Blaine Airport
169
610
Osseo
Brooklyn Park
Edinburgh USA Golf Course
Spring Lake Park
Ardan Park
10
Mounds
Maple Grove
52
Brookdale Park
Locke Park
Rice Creek
Fridley
694
94
Eagle Lake
Brooklyn Center
Crystal Airport
Eagle Lake Golf Center
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Shingle Creek Watershed Management Commission

West Mississippi Watershed Management Commission

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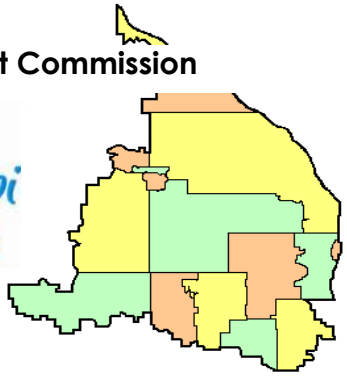
Tel: 763.553.1144 • Fax: 763.553.9326
Email: judie@jass.biz • Website: www.shinglecreek.org



Shingle Creek and West Mississippi Watershed Management Commissions
Request to Add a Project to the Capital Improvement Program

The Shingle Creek and West Mississippi Watershed Management Commissions share the cost of high watershed-priority capital improvements and demonstration projects through the Commissions' Capital Improvements Program (CIP). High-priority watershed capital improvements are those activities that go above and beyond general city management activities to provide a significant improvement to the water resources in the watershed. Thus, a local street flooding issue is not of watershed priority, but a local flooding issue that creates significant erosion and sedimentation impacting a downstream resource may be a watershed priority.

The Commissions' Cost Sharing Policy provides for up to 25 percent of the cost of qualifying projects to be shared by all property in the watershed, with the balance of project cost funded by the local governments participating in or benefiting from the improvement. *The Commissions' maximum share is $250,000.* The Commissions have developed a set of criteria by which proposed projects would be scored, with those projects scoring a minimum number of points on the proposal form screening questions advancing to a prioritization stage by the Technical Advisory Committee (TAC). Prioritization will be based on cost effectiveness, amount of improvement achieved, and regional significance.

Because the Commissions intend to utilize Hennepin County's ad valorem tax levy to finance the watershed share of most of these projects, preference will be given to "bricks and mortar" –type construction projects. However, some management-type projects such as rough fish control may be considered for cost sharing through the Commission budget.

Shingle Creek and West Mississippi Watershed Management Commissions
Capital Improvement Program Proposal

Date:	2/28/2017
City:	Plymouth
Contact Name:	Ben Scharenbroich
Telephone:	763-509-5527
Email:	bscharenbroich@plymouthmn.gov
Project Name:	Palmer Creek Estates Stream Restoration
Proposed CIP Year:	2021
Total Estimated Project Cost:	$ 450,000.00
Total Estimated Commission Share: (Maximum smaller of 25% or $250,000)	$ 112,500.00

In no more than two pages, please address the following questions:

1. Please describe:
   a. The proposed project and its estimated cost for construction, engineering, easement or land acquisition, and any other costs;
      - Erosion along a stream/drainage way within the Palmer Creek Estates subdivision may be causing drainage to leave the existing easement and is contributing nutrients to downstream Bass Lake, a state listed impaired water. Construction cost is estimated to be $450,000.00.
   b. Its purpose;
      - This proposed stream restoration would repair erosion, ensure drainage is within designated easements, and would reduce nutrient loading to Bass Lake. Water quality improvements is a goal of the Surface Water Management Plan and is required as part of the Bass Lake TMDL.
   c. The water resource(s) that would be affected by the project;
      - Bass Lake & Bass Creek
   d. The anticipated improvement that would result from the proposed project, for example, estimated pounds of phosphorus removed annually; linear feet of streambank stabilized with native vegetation; square feet of vegetated buffer added; and
      - This project is proposed to restore approximately 1250 linear feet of streambank.
      - Pollutant removals are unknown at this time however, we are estimating this project would reduce nutrient loading to Bass Lake by around 28 lbs annually based on calculated data from the recent stream restoration of Elm Creek behind Wayzata High School.
   e. The nature of the improvement.
      - Stream restoration to correct erosion and sedimentation along the drainage way. The stream restoration will look similar to the recent Elm Creek and Plymouth Creek stream restoration projects once completed.

Attach a conceptual or preliminary site plan, and if available a drainage plan, and estimated benefiting area. (See maps and plans below)

2. Please describe how the proposed project addresses as many of the following as apply:
    a. Improved water quality.
        a. This project will help to improve the water quality entering into Bass Lake. As mentioned above, we are estimating pollutant removals around 28 pounds annually if the stream restoration is completed.
    b. Prevention of flooding.
        a. Flooding is not a known issue in this project area.
    c. Prevention or correction of erosion.
        a. The stream in this area is severely degraded as shown in the attached photos. This project would help to keep the stream within the existing drainage and utility easements and correct erosion issues that are currently threating public infrastructure and private structures
    d. Groundwater recharge.
        a. Opportunities for groundwater recharge will be investigated during the project design phase. According to our soil maps, the soils in this area are types A and B/D
    e. Protection and/or enhancement of fish and wildlife habitat.
        a. The installation of root wads, rock veins and native vegetative buffers should help to improve terrestrial and aquatic habitat.
    f. Improvement or creation of water recreation facilities.
        a. N/A
3. Does the project address one or more TMDL requirements, and if so, which and by how much?
    a. This project will help to meet the TMDL requirements for nutrient reduction on Bass Lake. As stated previously, the estimated improvement will be around 28 pounds annually.
4. How does the proposed project implement a strategy identified in one or more TMDL Implementation Plans, Subwatershed Assessments, other special or feasibility study?
    a. This area was included in the Bass Lake Watershed Water Quality Improvement Study (WSB & Associates Inc, 2013). The proposed project in this study was the installation of a water quality pond within a wetland area.
5. Do all the cities responsible for sharing the 75 percent balance of the cost of the project agree to go forward with the project? (It is not necessary to have a final agreement on the precise cost sharing yet.)
    a. Yes
6. Is the project in your CIP and the CIP of other cost-sharing cities?
    a. Yes, CIP project number WR-21-0002

Figure 1: Project Location

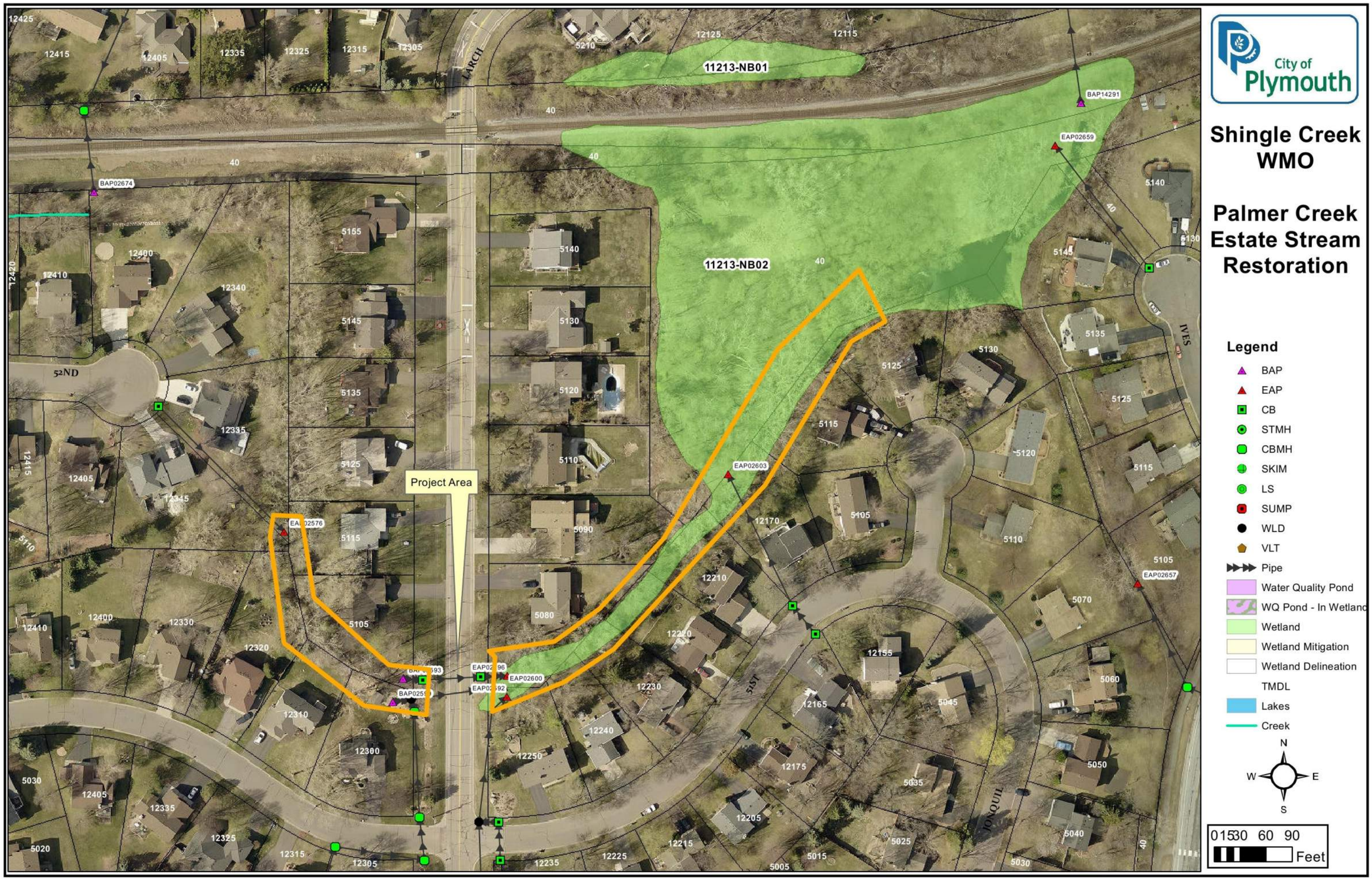
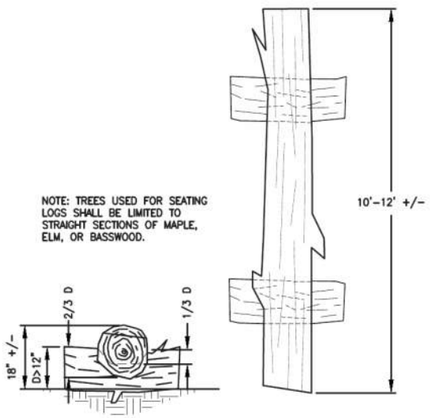
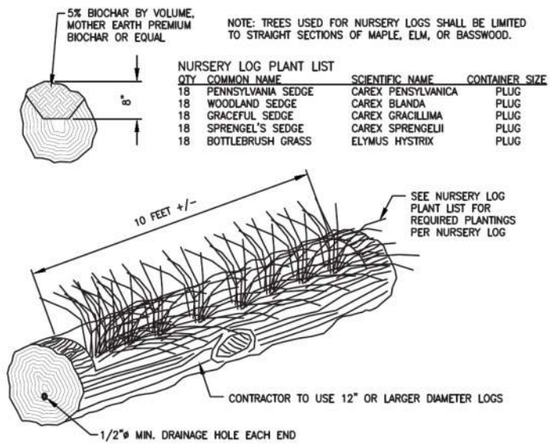


Figure 2: Project location in relation to Bass Lake

Plot Date & Time: 17 June 2016 3:31 PM



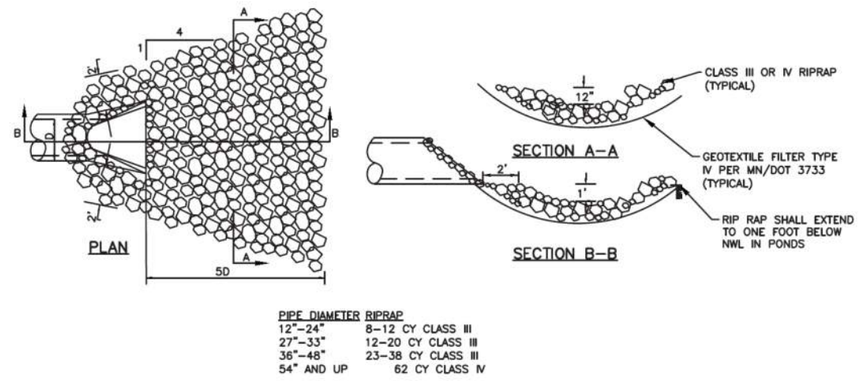
SEATING LOGS
NOT TO SCALE
1
D-102



NURSERY LOG PLANT LIST

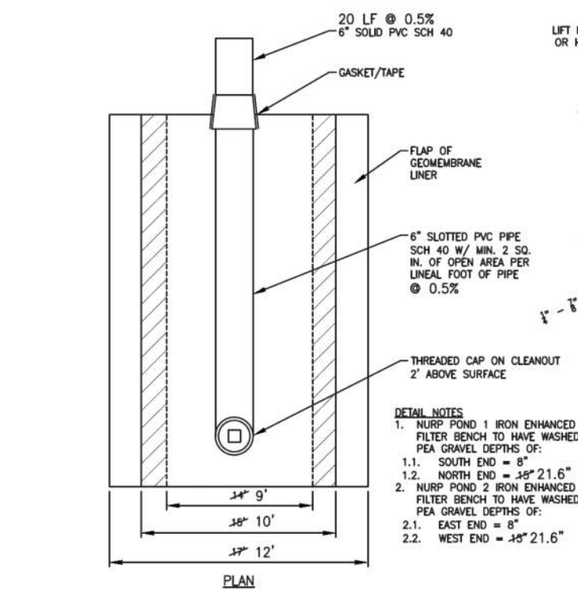
QTY	COMMON NAME	SCIENTIFIC NAME	CONTAINER SIZE
18	PENNSYLVANIA SEDGE	CAREX PENSYLVANICA	PLUG
18	WOODLAND SEDGE	CAREX BLANDA	PLUG
18	GRACEFUL SEDGE	CAREX GRACILLIMA	PLUG
18	SPRENGEL'S SEDGE	CAREX SPRENGELII	PLUG
18	BOTTLEBRUSH GRASS	ELYMUS HYSTRIX	PLUG

NURSERY LOG DETAIL
NOT TO SCALE
2
D-102



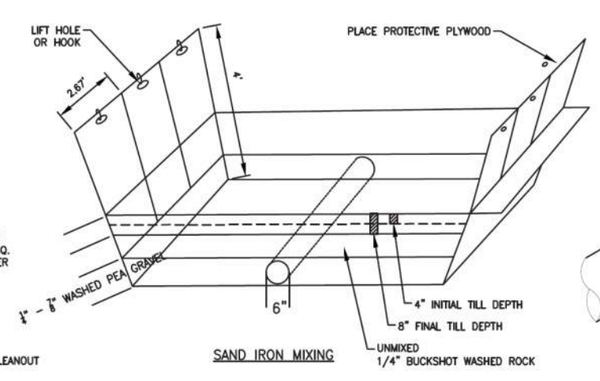
PIPE DIAMETER	RIPRAP
12"-24"	8-12 CY CLASS III
27"-33"	12-20 CY CLASS III
36"-48"	23-38 CY CLASS III
54" AND UP	62 CY CLASS IV

RIPRAP AT FLARED END SECTIONS DETAIL
NOT TO SCALE
3
D-102



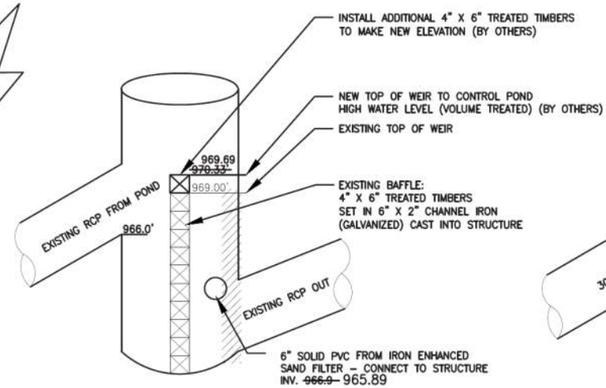
IRON ENHANCED SAND FILTER
NOT TO SCALE
4
D-102

DETAIL NOTES
1. NURP POND 1 IRON ENHANCED FILTER BENCH TO HAVE WASHED PEA GRAVEL DEPTHS OF:
   1.1. SOUTH END = 8"
   1.2. NORTH END = ~~18"~~ 21.6"
2. NURP POND 2 IRON ENHANCED FILTER BENCH TO HAVE WASHED PEA GRAVEL DEPTHS OF:
   2.1. EAST END = 8"
   2.2. WEST END = ~~15"~~ 21.6"

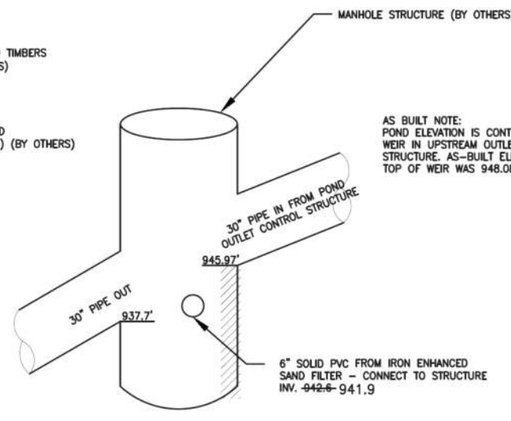


SAND IRON MIXING

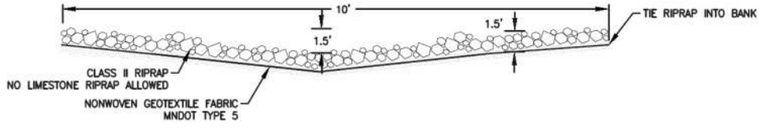
SUGGESTED CONSTRUCTION SEQUENCE
1. DEWATER.
2. GRADE 20' BENCH. 10' WIDE X VARYING DEPTH
3. EXCAVATE ~~15' WIDE X 1.5' DEEP~~ BENCH.
4. COMPACT IN-PLACE SUBSOIL.
5. ROLL OUT GEOTEXTILE FABRIC/60 MIL HDPE GEOMEMBRANE LINER.
6. INSTALL 6' DIAMETER SLOTTED/PERFORATED PVC PIPE AND CLEANOUTS.
7. PLACE ¼" - 7/8" WASHED PEA GRAVEL TO A ~~DEPTH OF 6'~~ VARYING DEPTH WITH A MIN. 2' COVER OVER PIPE AND LEVEL WITH SURFACE.
8. PUT TEMPORARY PROTECTIVE PLYWOOD IN PLACE (OR OTHER METHOD
9. APPROVED BY ENGINEER TO PREVENT PUNCTURE OF EPDM).
10. PLACE ¼" 'BUCKSHOT' WASHED ROCK TO A DEPTH OF 4'.
11. PLACE FINE FILTER AGGREGATE TO A DEPTH OF 8" (TOP OF BENCH).
12. PLACE 3.7 LBS/SF (PER 8" THICK SECTION) IRON FILINGS [ETI-CC-1004(-8+50) CONNELLY GPM, INC. OR APPROVED EQUAL] ON TOP OF FINE FILTER AGGREGATE.
14. TILL IN IRON FILINGS TO 4' DEPTH USING SMALL GARDEN STYLE TILLER.
15. HAND MIX SIDES NEAR 2.67' X 4' PROTECTIVE PLYWOOD.
16. SET TILLER DEPTH TO 8" AND MIX AGAIN WITH SAME PROCESS.
17. REMOVE PROTECTIVE PLYWOOD AND RAKE SURFACE FLAT.
18. STAKE LINER DOWN EVERY TWO FEET.



MODIFICATIONS TO NURP POND #2 OUTLET STRUCTURE
NOT TO SCALE
5
D-102



MODIFICATIONS TO NURP POND #1 MANHOLE
NOT TO SCALE
6
D-102



CLASS II RIPRAP SPILLWAY DETAIL
NOT TO SCALE
7
D-102

RECORD PLANS

CONTRACTOR: MINNESOTA NATIVE LANDSCAPES

DATE: 05/26/16

RECORD DRAWINGS ARE BASED ON INFORMATION OBTAINED THROUGH ON SITE OBSERVATION OF CONSTRUCTION AND FIELD SURVEY DATA COLLECTED BY RMP

REV	REVISION DESCRIPTION	DWN	APP	REV DATE
2	AS BUILT			6/15/16
1	ISSUED FOR BID			3/17/15
0	ISSUED FOR REVIEW			11/13/14

SEAL

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

ED MATTHIESEN

DATE 3/17/15 REG. NO. 16800

PRIME CONSULTANT

WENCK ASSOCIATES

Responsive partner. Exceptional outcomes.

PROJECT TITLE

ELM CREEK STREAM RESTORATION AND WATER QUALITY IMPROVEMENTS CITY PROJECT NO. 14006

CITY OF PLYMOUTH

3400 PLYMOUTH BOULEVARD PLYMOUTH, MN 55447

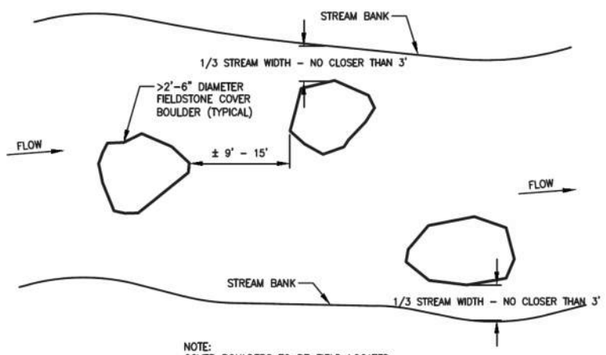
SHEET TITLE

DETAILS

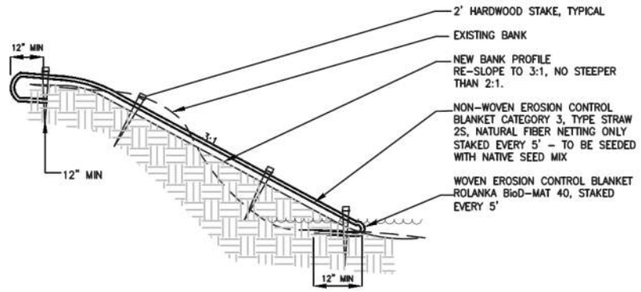
DWN BY	CHK'D	APP'D	DWG DATE	NOV 2014
LNJ	EAM	EAM	SCALE	AS SHOWN

PROJECT NO.	SHEET NO.	REV NO.
1756-07	D-102	2

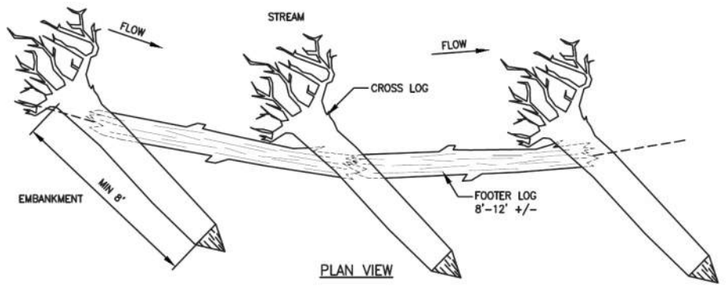
M:\1756\07 Elm Creek Design\CAD\CIVIL\RECORD PLANS\D-101 DETAILS_AS BUILTS.dwg



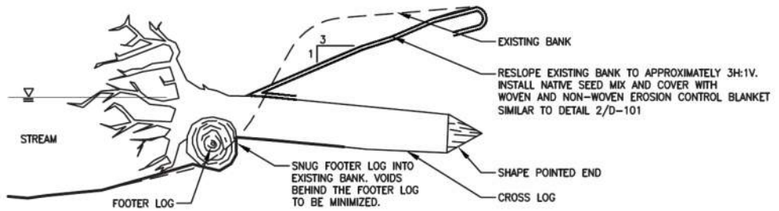
COVER BOULDERS — 1 / D–101
NOT TO SCALE



BANK RESLOPING — 2 / D–101
NOT TO SCALE



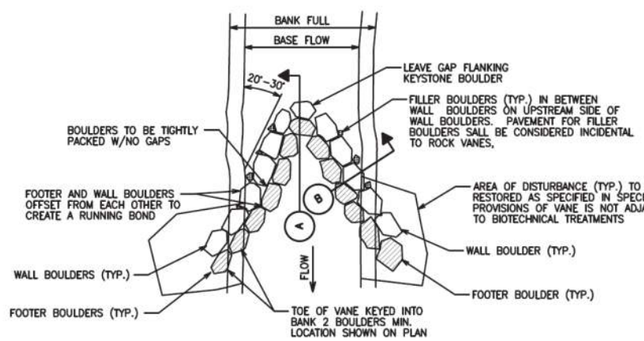
PLAN VIEW



SECTION VIEW

NOTE:
1. A MINIMUM OF TWO CROSS LOGS PER FOOTER LOG IS REQUIRED TO ANCHOR FOOTER LOG.
2. MINIMUM LOG DIAMETER is 12" +/–

LOG TOE WITH ROOT WADS — 3 / D–101
NOT TO SCALE

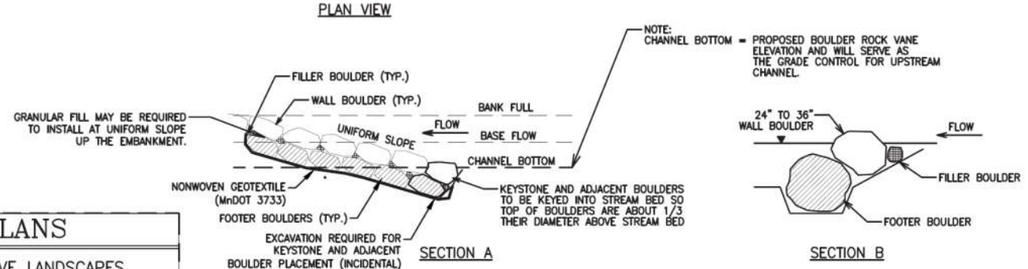


PLAN VIEW

LEGEND

- SUBMERGED OR FOOTER 18" TO 24" FIELDSTONE BOULDER MEETING MnDOT 3601.2A. AT LEAST 20% OF THE BOULDERS SHALL HAVE A DIAMETER OF 24" OR LARGER.
- PROTRUDING OR WALL 24" TO 30" BOULDERS MEETING MnDOT 3601.2A. AT LEAST 20% OF THE BOULDERS SHALL HAVE A DIAMETER OF 30" OR LARGER.
- ø FILLER BOULDER 6" TO 12" DIA.;

NOTE:
1. FIELD STONE BOULDERS SHALL HAVE NO CUT, BLAST OR SHEAR MARKS.
2. ENOUGH WALL BOULDERS TO BE FLAT TOPPED AND SET TO CREATE A DRY CROSSING/WALKWAY ACROSS THE CREEK.
3. FINAL PLACEMENT OF ROCK VANE AND BOULDERS TO BE FIELD VERIFIED BY ENGINEER.
4. ALL VANES EXTEND UPSTREAM INTO FLOW OF CREEK.
5. CLASS V RIPRAP ACCEPTABLE ROCK ALTERNATIVE



SECTION A

SECTION B

CROSS VANE DETAIL — 4 / D–101
NOT TO SCALE

RECORD PLANS

CONTRACTOR: MINNESOTA NATIVE LANDSCAPES

DATE: 05/26/16

RECORD DRAWINGS ARE BASED ON INFORMATION OBTAINED THROUGH ON SITE OBSERVATION OF CONSTRUCTION AND FIELD SURVEY DATA COLLECTED BY RMP

REV	REVISION DESCRIPTION	DWN	APP	REV DATE
2	AS BUILT			6/15/16
1	ISSUED FOR BID			3/17/15
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SEAL

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

ED MATTHIESEN

DATE 3/17/15 REG. NO. 16800

PRIME CONSULTANT

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Responsive partner. Exceptional outcomes.

PROJECT TITLE
ELM CREEK STREAM RESTORATION AND WATER QUALITY IMPROVEMENTS
CITY PROJECT NO. 14006

CITY OF PLYMOUTH

3400 PLYMOUTH BOULEVARD
PLYMOUTH, MN 55447

SHEET TITLE
DETAILS

DWN BY	CHK'D	APP'D	DWG DATE
LNJ	EAM	EAM	NOV 2014

SCALE AS SHOWN

PROJECT NO.	SHEET NO.	REV NO.
1756–07	D–101	2

Plot Date & Time: 22 June 2016 3:31 PM

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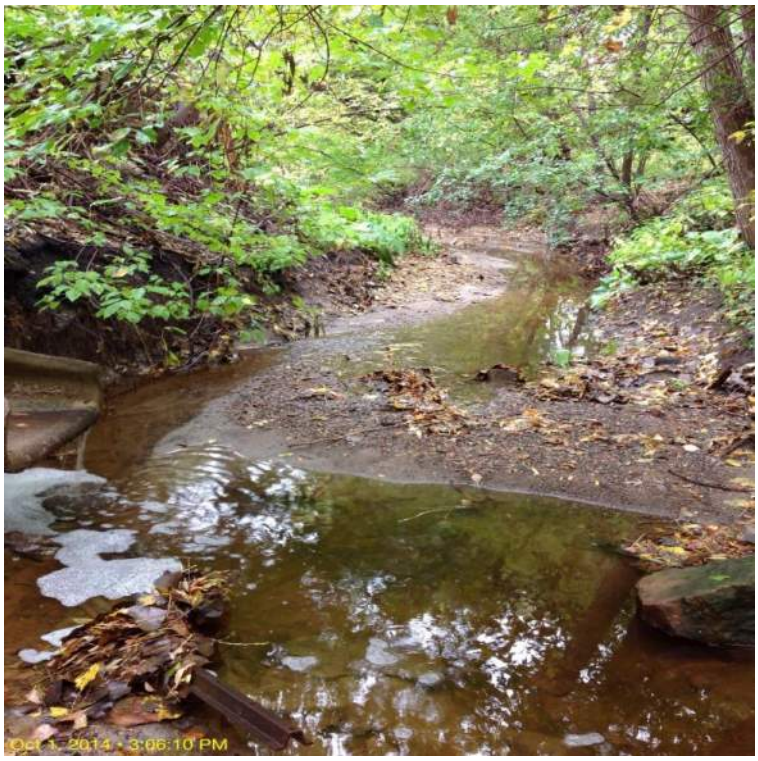
Figure 5: Inspection Photos within the project area

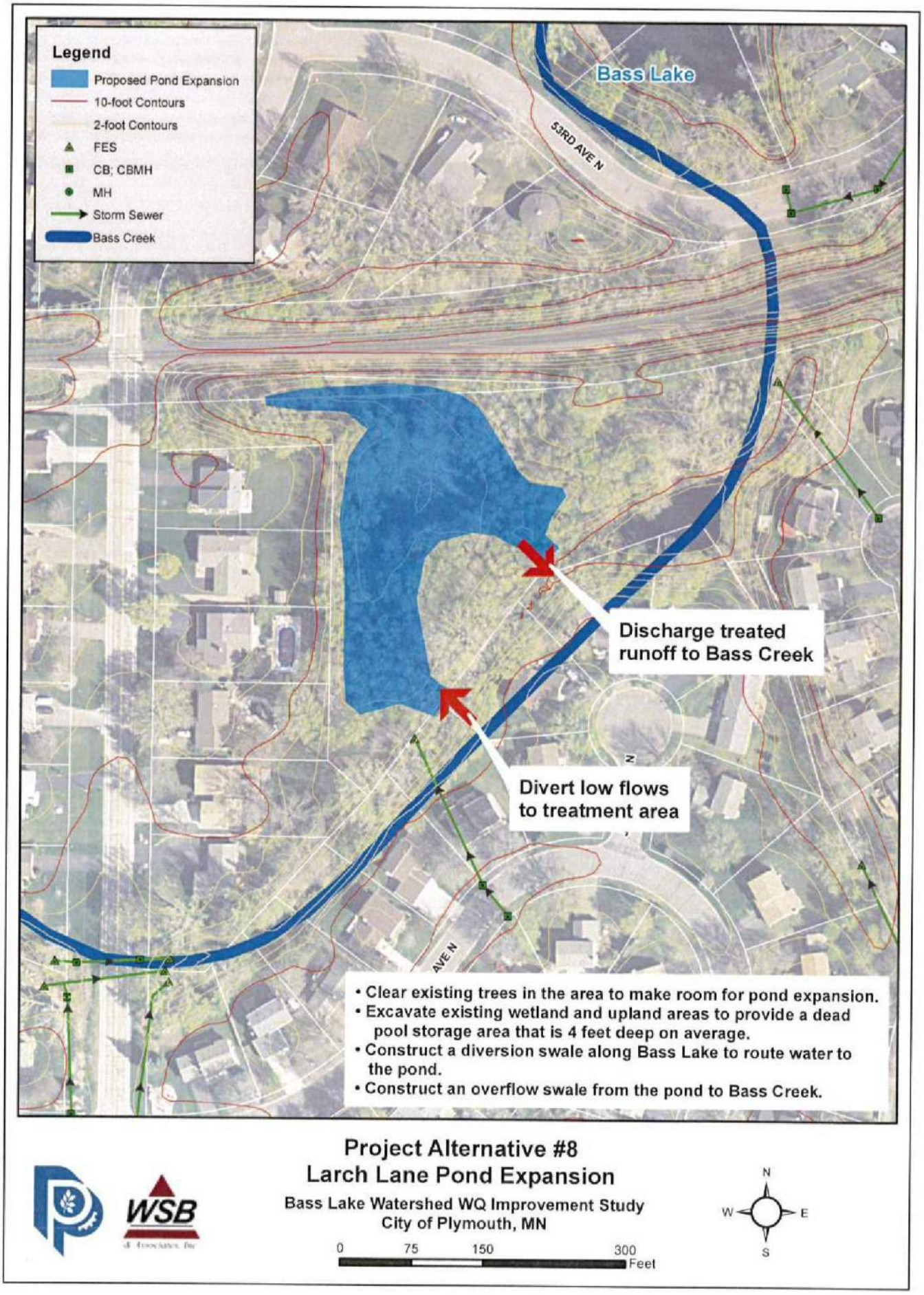



09-16-2016


09-16-2016


09-16-2016

Figure 6: Excerpt from Bass Lake Watershed Water Quality Improvement Study



Bass Lake Watershed Improvement Photos

Improvement No. 8
Larch Lane Pond Expansion

Existing Site Conditions:

- This site is located along the east side of Pineview Lane between 55th Avenue and 54th Avenue.
- It currently consists of a shallow wetland between the railroad tracks and Bass Creek.
- A large portion of the Bass Lake Watershed flows through Bass Creek near this location. Most of this area is treated through a series of stormwater treatment ponds and wetland areas.
- A 95 acre untreated area discharges to this location.
- This location is about 600 feet upstream of Bass Lake.
- A small in-line pond is located to the east of this site along Bass Creek. This currently provides limited treatment for water flowing through Bass Creek.
- This portion of Bass Creek between Larch Lane and Bass Lake is experiencing significant erosion in many places.

Description of Proposed Improvements:

- Clear existing trees in the area to make room for pond expansion.
- Excavate existing wetland and upland areas to provide a dead pool storage area that is 4 feet deep on average.
- Construct a diversion swale along Bass Lake to route water to the pond.
- Construct an overflow swale from the pond to Bass Creek.

Other Design Considerations:

- Estimate of TP removal assumes no treatment under the existing condition.
- Tree impacts will be necessary to maximize the pond expansion area. However, there does not appear to be many high value trees such as oak or maple trees in the area.
- There is a low probability that wetland mitigation can be avoided in this location.
- Fiber optic utilities are located along the railroad grade on the north side of the wetland.

Ownership: City of Plymouth	**Drainage Area Served:** 95 ac. (untreated) / 2,200 ac. (treated)
Approx. Wetland Impacts: 0.5	**Existing TP Load:** 1,578 lbs annually
Probability of Wetland Mitigation: High	**Approx. Proposed TP Removal:** 70 lbs TP annually
Estimated Capital Cost: $332,000 (additional $65,000 for wetland mitigation)	**Annual Cost per Pound of TP Removed:** $330 (includes wetland mitigation)

Bass Lake Watershed Improvement Photos

Improvement No. 8
Larch Lane Pond Expansion

Bass Lake Watershed Improvement Photos

OPINION OF PROBABLE COST
BASS LAKE WATER QUALITY IMPROVEMENT STUDY
PLYMOUTH, MN
WSB NO. 01709-190

Larch Lane Pond Expansion

ITEM DESCRIPTION	UNIT OF MEASUREMENT	APPROXIMATE QUANTITY	UNIT PRICE	COST
MOBILIZATION (5%)	LUMP SUM	1	$11,000	$11,000
DEWATERING	LUMP SUM	1	$3,000	$3,000
COMMON EXCAVATION	CU YD	10,000	$20	$200,000
RESTORATION (SEEDING/SODDING)	SQ YD	1,800	$4	$7,200
TEMPORARY EROSION CONTROL	LUMP SUM	1	$2,000	$2,000
CLEARING AND GRUBBING	ACRE	0.4	$10,000	$4,000
CLASS III GRANITE RIPRAP	CU YD	30	$60	$1,800

SUBTOTAL - CONSTRUCTION	**$229,000**
CONTINGENCY (20%)	$46,000
INDIRECT (25%)	$57,000
TOTAL	**$332,000**
COST FOR PURCHASE OF BANKED WETLAND CREDITS (2:1 REPLACEMENT @ $1.50/SF)	**$65,000**
ANNUALIZED 30 YEAR LIFECYCLE COST*	**$23,200**

*TOTAL CONSTRUCTION + COST FOR WETLAND REPLACEMENT + 3% ANNUAL MAINTENANCE COST / 30 YEARS

PONDNET 2.1 FLOW AND PHOSPHORUS ROUTING IN POND NETWORKS
W. Walker March 1989 Press ALT-G for Graphs
TITLE--> Larch Lane Pond Existing Conditions

INPUT VARIABLES....	UNITS		
case labels		Pond A	Pond C
watershed area	acres	2200	135
runoff coefficient	-	0.3	0.3
pond surface area	acres	50.00	0.15
pond mean depth	feet	3.00	3.00
upstream pond p load	lbs/yr	0	1423.179
upstream pond outflow	ac-ft/yr	0	2200.000
OUTPUT VARIABLES.....			
outflow p load	lbs/yr	1423.179	1628.361
outflow volume	ac-ft/yr	2200	2335
outflow p conc	ppb	238.005741	256.5749868
pond removal	%	60.33447798	0.912036575
total removal	%	60.3323765	57.2375022
ASSUMED EXPORT FACTORS.....			
period length	yrs	0.5	0.5
period precipitation	inches	20	20
runoff total p	**ppb**	600	600
runoff ortho p/total p	-	0.3	0.3
relative decay rate	-	1	1
unit runoff	in/yr	12	12
unit export	lbs/ac-y	1.6308864	1.6308864
POND WATER BUDGETS.....			
runoff	ac-ft/yr	2200	135
upstream pond	ac-ft/yr	0	2200
total inflow	ac-ft/yr	2200	2335
outflow	ac-ft/yr	2200	2335
POND PHOSPHORUS BUDGETS.....			
runoff	lbs/yr	3587.95008	220.169664
upstream pond	lbs/yr	0	1423.179129
total inflow	lbs/yr	3587.95008	1643.348793
net sedimentation	lbs/yr	2164.770951	**14.98794204**
outflow	lbs/yr	1423.179129	1628.360851
HYDRAULIC PARAMETERS.....			
pond volume	acre-ft	150	0.45
vlawmo pond volume	acre-ft	137.5	8.4375
relative volume	inches	2.727272727	0.133333333
residence time	years	0.068181818	0.000192719
residence time	days	24.88636364	0.070342612
overflow rate	ft/yr	44	15566.66667
inflow phos conc	ppb	600.0317881	258.9365831
outflow phos conc	ppb	238.005741	256.5749868
p reaction rate	-	3.834769028	0.009289032
1-rp	-	0.39665522	0.990879634

PONDNET 2.1 FLOW AND PHOSPHORUS ROUTING IN POND NETWORKS
W. Walker March 1989 Press ALT-G for Graphs
TITLE--> Larch Lane Pond Proposed Conditions

INPUT VARIABLES....	UNITS	Pond A	Pond B	Pond C
case labels				
watershed area	acres	2200	95	40
runoff coefficient	-	0.3	0.3	0.3
pond surface area	acres	50.00	0.8	0.15
pond mean depth	feet	3.00	3.00	3.00
upstream pond p load	lbs/yr	0	1423.179	1508.013
upstream pond outflow	ac-ft/yr	0	2200.000	2295.00
OUTPUT VARIABLES.....				
outflow p load	lbs/yr	1423.179	1508.013	1559.501
outflow volume	ac-ft/yr	2200	2295	2335
outflow p conc	ppb	238.005741	241.7536245	245.7250647
pond removal	%	60.33447798	4.442023194	0.873805809
total removal	%	60.3323765	59.70772925	59.04582256
ASSUMED EXPORT FACTORS.....				
period length	yrs	0.5	0.5	0.5
period precipitation	inches	20	20	20
runoff total p	**ppb**	600	600	600
runoff ortho p/total p	-	0.3	0.3	0.3
relative decay rate	-	1	1	1
unit runoff	in/yr	12	12	12
unit export	lbs/ac-y	1.6308864	1.6308864	1.6308864
POND WATER BUDGETS.....				
runoff	ac-ft/yr	2200	95	40
upstream pond	ac-ft/yr	0	2200	2295
total inflow	ac-ft/yr	2200	2295	2335
outflow	ac-ft/yr	2200	2295	2335
POND PHOSPHORUS BUDGETS.....				
runoff	lbs/yr	3587.95008	154.934208	65.235456
upstream pond	lbs/yr	0	1423.179129	1508.013177
total inflow	lbs/yr	3587.95008	1578.113337	1573.248633
net sedimentation	lbs/yr	2164.770951	**70.10016046**	13.74713794
outflow	lbs/yr	1423.179129	1508.013177	1559.501495
HYDRAULIC PARAMETERS.....				
pond volume	acre-ft	150	2.4	0.45
vlawmo pond volume	acre-ft	137.5	5.9375	2.5
relative volume	inches	2.727272727	1.010526316	0.45
residence time	years	0.068181818	0.001045752	0.000192719
residence time	days	24.88636364	0.381699346	0.070342612
overflow rate	ft/yr	44	2868.75	15566.66667
inflow phos conc	ppb	600.0317881	252.9915687	247.891152
outflow phos conc	ppb	238.005741	241.7536245	245.7250647
p reaction rate	-	3.834769028	0.048645977	0.008892791
1-rp	-	0.39665522	0.955579768	0.991261942

From: Amy Riegel <ariegel@plymouthmn.gov>
Sent: Friday, March 5, 2021 9:21 AM
To: Judie Anderson <Judie@jass.biz>; Diane Spector (dspector@wenck.com) <dspector@wenck.com>; Ed A. Matthiesen <ematthiesen@wenck.com>; Amy Juntunen <Amy@jass.biz>
Cc: Ben Scharenbroich <bscharenbroich@plymouthmn.gov>
Subject: Wild Wings Western Wetland Improvement Project

Hi Judie, Amy, Diane, and Ed,

Excavation on our Wild Wings Western Wetland Project near Bass Lake wrapped up this week, and I wanted to share some drone photos/videos with you.
https://www.dropbox.com/sh/0stxzm7vyy603rt/AADh0_nBzVzDg2JqH9Gl7ptoa?dl=0

Wild Wings Western Wetland Improvement Project

Project Overview

The City is implementing a project to improve water quality and drainage within the Wild Wings neighborhood. The project is located in the wetland north of Schmidt Lake Road, between Yorktown Lane North and Valley Forge Lane North.

This project will improve drainage through the wetland by cleaning out and reestablishing a channel though the wetland. Additional work will occur at storm sewer inlet and outlet pipes to the wetland to ensure flow rates are maintained as to minimize impacts downstream. The primary goal for this project is to reduce backyard flooding and to improve water quality in Bass Lake, which is downstream from the project area.

Sunram Construction Inc. was our contractor on this project.

Thanks,

Amy Riegel | Senior Engineering Technician
City of Plymouth
3400 Plymouth Boulevard
Plymouth, MN 55447
Phone: 763-509-5531
www.plymouthmn.gov
ariegel@plymouthmn.gov

Z:\Shingle Creek\Communications\2021\Wild Wings Wetland.docx

Memorandum

1800 Pioneer Creek Center, Maple Plain, MN 55359
Phone: 763-479-4200 Fax: 763-479-4242

Wenck Engineers • Scientists Business Professionals

To: Shingle Creek WMO Technical Advisory Committee

From: Ed Matthiesen, P.E.
Diane Spector

Date: December 17, 2013

Subject: Partitioned TMDL Wasteload Allocations

As you are aware, the new NPDES permit reapplication requires each MS4 to report their individual wasteload allocations even if approved TMDLs were written using categorical wasteload allocations. The purpose of this memo is to provide you with estimated individual wasteload allocations for the approved TMDLs in the Shingle Creek watershed by MS4. The following are the dates of TMDL and Implementation Plan approvals:

Table 1. TMDL and Implementation Plan approval dates.

TMDL	EPA Approval	Implementation Plan Approval
Shingle Creek Chloride	February 12, 2007	March 5, 2007
Twin and Ryan Lakes	November 9, 2007	November 13, 2007
Crystal Lake	March 25, 2009	July 7, 2009
Pomerleau, Bass, and Schmidt Lakes	September 25, 2009	December 3, 2009
Meadow Lake	March 23, 2010	June 14, 2010
Cedar Island, Pike, and Eagle Lakes	April 14, 2010	May 18, 2010
Lake Magda	September 30, 2010	October 1, 2010
Shingle and Bass Creeks Biotic Integrity and Dissolved Oxygen	November 4, 2011	January 30, 2012
Bass Creek Chloride	Not yet started	Not yet started

Chloride TMDL

The chloride TMDL is difficult to partition between MS4s because it is not a single numerical load but is expressed as a load duration curve that is dependent on flow (Figure 1). The Chloride TMDL wasteload thus remains a categorical allocation requiring an overall 71% reduction in chloride load to Shingle Creek.

The "flow duration percent interval" on the x-axis of Figure 1 is the fraction of time flow is at or above a given flow rate. For example, the 10% interval is about 30 cfs, meaning that 10% of the flow observations at the outlet station were at 30 cfs or higher. The 90% interval is about 4.4 cfs, again meaning that 90% of the observations were at 4.4 cfs or higher. The load duration curve is simply the chloride chronic exposure standard of 230 mg/L times the streamflow volume at a given flow.

The TMDL is expressed as the percent load reduction – 71% – that would be necessary to ensure that the concentration would never at any time be more than 230 mg/L. Figure 2 shows the load

duration curve in red, and the symbols are monitored concentrations converted to load by multiplying by the flow rate at the time the sample was taken. The load reduction is set by the highest required reduction based on the monitoring data. As seen on Figure 2, the required reduction is driven by the loads observed during peak spring runoff events that are high or very high on the flow duration curve. The black line represents the load 71% greater than the TMDL load duration curve. For the other flows where load is not that far above the load duration curve, that 71% reduction will result in concentrations lower than the 230 mg/L chronic standard.

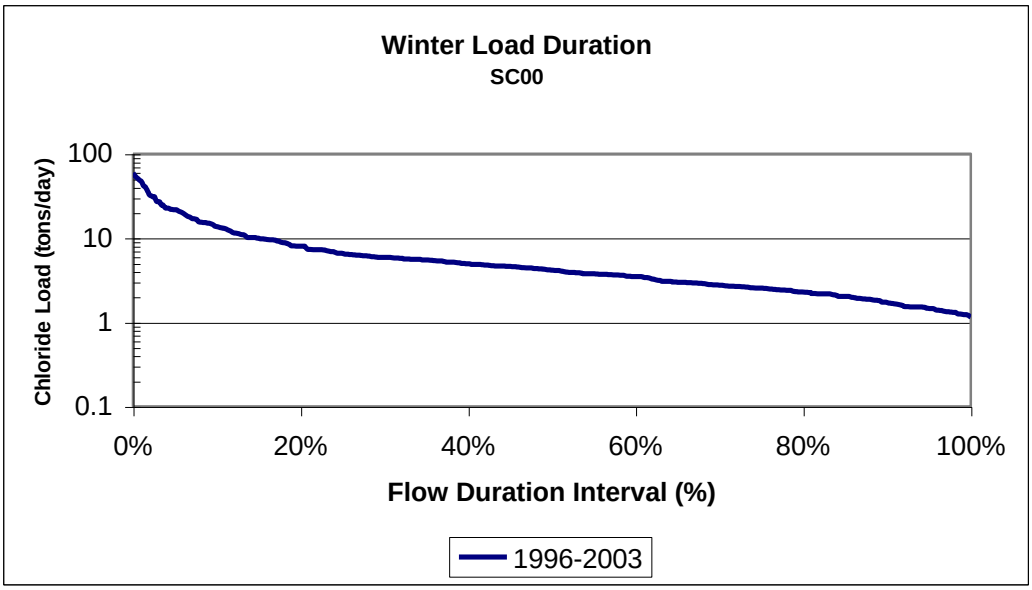


Figure 1. Shingle Creek Chloride TMDL load duration curve.

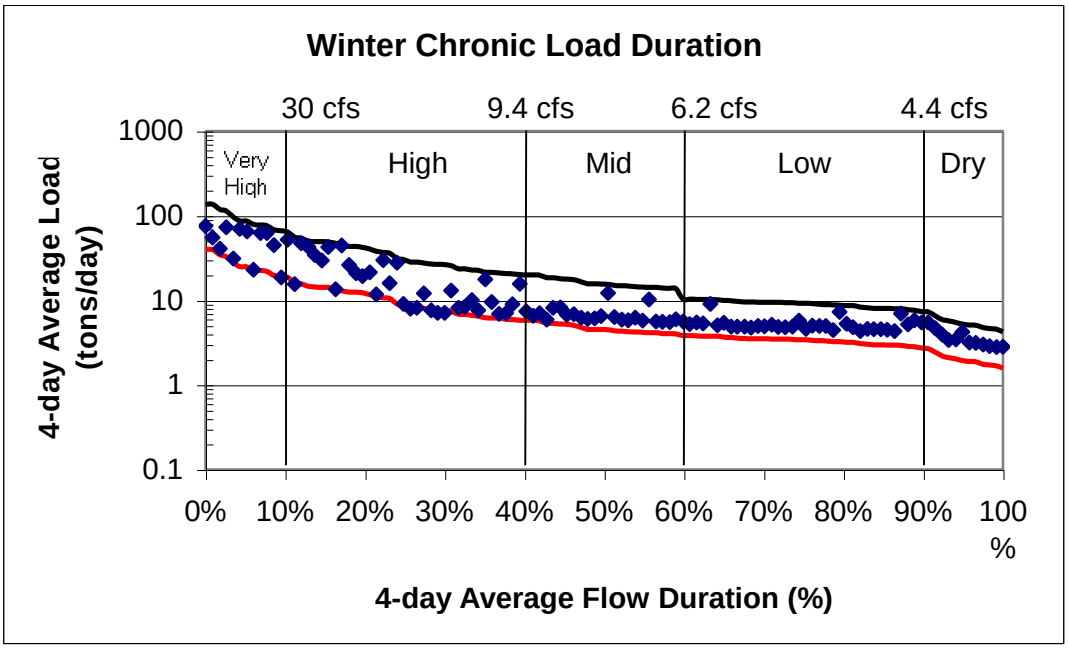


Figure 2. Shingle Creek Chloride TMDL load duration curve applied to the 2003-2003 monitoring season.
The red line represents the TMDL. The black line represents the loads across flow durations where the allocated load reductions would result in all of the measured loads meeting the standard.

Lake Nutrient TMDLs

Tables 2, 3, 4, and 5 show the Total Phosphorus (TP) wasteload allocation partitioning for each of the TMDL lakes. The wasteloads were partitioned based on contributing area as follows:

Lakeshed area is from the SWMM/P8 model lakesheds used in the TMDLs. Each lakeshed was intersected with the city shapefile to generate lakeshed area by city. Upstream lake areas were not double counted. For example, the Bass Lake lakeshed includes the Schmidt and Pomerleau Lakes lakesheds. For partitioning wasteload, the Schmidt and Pomerleau Lakes lakeshed areas were subtracted from the Bass Lake lakeshed area. The lakesheds for those two lakes are totally within Plymouth, so Plymouth was assigned 100% of the WLA for those lakes. The Bass Lake lakeshed minus those two upstream lakesheds was then partitioned between Plymouth, MnDOT, and Hennepin County based on area. The same method was used for the other lake chains.

To estimate the Hennepin County MS4 area, we created a buffer polygon 80 feet wide centered on each county road in the watershed. The county road buffer shapefile was intersected by lakeshed and then by city so it was broken up into smaller polygons. Thus, one county road polygon may be CR 10 in the Upper Twin lakeshed in Crystal and another polygon CR 10 in the Upper Twin lakeshed in New Hope, and so forth.

To estimate the MnDOT MS4 area, we used parcel data and aerial photographs to digitize the estimated MnDOT ROW. As with the county road buffer shapefile, the MnDOT shapefile was intersected with lakeshed and also with city so it was broken up into smaller polygons.

The shapefile data was then imported into Excel and a series of pivot tables were created to compute areas. County and MnDOT areas were summarized by lakeshed and by city. Lakeshed areas were summarized by city. The city MS4 areas were then computed as the total area within the lakeshed by city minus the county and MnDOT area within the lakeshed by city. These areas were then converted into percentages, which were used as shown in Tables 2, 3, 4, and 5.

As a note, the wasteload allocations in the TMDLs are usually shown in kilograms per year or per day. The following tables show the Total Phosphorus (TP) wasteload allocations in pounds per year.

Table 2 . Twin and Ryan Lakes Nutrient TMDL TP wasteload allocation partition.

	Upper Twin				Middle Twin			
MS4	**%**	**Current Load (lbs/yr)**	**TMDL (lbs/yr)**	**Reduction (lbs/yr)**	**%**	**Current Load (lbs/yr)**	**TMDL (lbs/yr)**	**Reduction (lbs/yr)**
Brooklyn Center	9	105	38	67	26	98	81	17
Brooklyn Park	23	268	97	171				
Crystal	48	559	203	356	54	203	167	36
Minneapolis								
New Hope	16	186	68	118				
Robbinsdale					13	49	40	9
MnDOT					1	4	3	1
Hennepin Cty	4	47	17	30	6	23	19	4
Total	100	1,164	422	742	100	376	310	66

	Lower Twin				Ryan			
MS4	**%**	**Current Load (lbs/yr)**	**TMDL (lbs/yr)**	**Reduction (lbs/yr)**	**%**	**Current Load (lbs/yr)**	**TMDL (lbs/yr)**	**Reduction (lbs/yr)**
Brooklyn Center					41	198	153	45
Brooklyn Park								
Crystal	32	211	182	29				
Minneapolis					21	102	79	23
New Hope	34	224	193	31				
Robbinsdale	24	158	136	22	31	150	116	34
MnDOT	4	26	23	3	6	29	22	7
Hennepin Cty	6	39	34	5	1	5	4	1
Total	100%	658	568	90	100	484	374	110

Table 3. Cedar Island, Pike, and Eagle Lakes Nutrient TMDL TP wasteload allocation partition.

	Cedar Island Lake				Pike Lake				Eagle Lake			
MS4	%	Current Load (lbs/yr)	TMDL (lbs/yr)	Reduction (lbs/yr)	%	Current Load (lbs/yr)	TMDL (lbs/yr)	Reduction (lbs/yr)	%	Current Load (lbs/yr)	TMDL (lbs/yr)	Reduction (lbs/yr)
Maple Grove	80	195	86	109	59	263	166	97	95	1,078	618	460
Plymouth					35	156	98	58				
MnDOT	19	46	20	26	3	13	8	5	4	45	26	19
Hennepin Cty	1	2	1	1	3	13	8	5	1	11	7	4
Total	20	244	107	137	100	446	281	165	100	1,135	651	484

Table 4. Schmidt, Pomerleau, and Bass Lakes Nutrient TMDL TP wasteload allocation partition.

	Schmidt Lake				Pomerleau Lake				Bass Lake			
MS4	%	Current Load (lbs/yr)	TMDL (lbs/yr)	Reduction (lbs/yr)	%	Current Load (lbs/yr)	TMDL (lbs/yr)	Reduction (lbs/yr)	%	Current Load (lbs/yr)	TMDL (lbs/yr)	Reduction (lbs/yr)
Plymouth	100	103	92	11	100	173	52	121	96	1,336	866	470
MnDOT									3	42	27	15
Hennepin Cty									1	14	9	5
Total	100	103	92	11	100	173	52	121	100	1,392	902	490

Table 5. Crystal, Meadow, and Magda Lakes Nutrient TMDL TP wasteload allocation partition.

	Crystal				Meadow				Magda			
MS4	%	Current Load (lbs/yr)	TMDL (lbs/yr)	Reduction (lbs/yr)	%	Current Load (lbs/yr)	TMDL (lbs/yr)	Reduction (lbs/yr)	%	Current Load (lbs/yr)	TMDL (lbs/yr)	Reduction (lbs/yr)
Brooklyn Park									84	70	20	50
Minneapolis	27	133	47	86								
New Hope					100	116	20	96				
Robbinsdale	68	334	118	216								
MnDOT									16	13	4	9
Hennepin Cty	5	25	9	16								
Total	100	491	174	317	100	116	20	96	100	83	24	59

Dissolved Oxygen and Biotic Integrity TMDL

Dissolved Oxygen. The Dissolved Oxygen TMDL establishes load targets for Biological Oxygen Demand (BOD) and Sediment Oxygen Demand (SOD). It is useful to have some background regarding these pollutants. Total BOD is comprised of two components: nitrogenous biochemical oxygen demand (NBOD) and carbonaceous biochemical oxygen demand (CBOD). The Wasteload Allocation in the TMDL is only for NBOD; CBOD and SOD are in the Load Allocation. More on that and what you should include in your permit reapplication later.

CBOD is the reduction of organic carbon to carbon dioxide through the metabolic action of microorganisms. NBOD is the term for the oxygen required for nitrification, which is the biologic oxidation of ammonia to nitrate. NBOD is usually calculated by subtracting CBOD from total BOD. BOD is contributed from both natural sources not requiring a permit (e.g., in flows from wetlands) and from point (permitted) sources (e.g., wastewater treatment effluent, stormwater). Thus, CBOD and NBOD in Shingle Creek can be both Load (for loading from Palmer Lake and the I-94 Wetland) and Wasteload (for loading from stormwater).

SOD is the aerobic decay of organic materials that settle to the bottom of the stream. In natural, free-flowing streams, SOD is usually negligible because frequent scouring during storm events prevents long-term accumulation of organic materials. However, Shingle Creek has been ditched, straightened and over-widened, and runs through two major flow-through wetlands (I-94 Wetland and Palmer Lake). Stream modifications have lowered average velocity resulting in accumulation of organic matter and fine sediment particles. These reaches contain very soft, organic-rich and sometimes peaty sediments that are subject to very little bottom scouring. The over-wide stream channel means during lower flows there can be only inches of water moving very slowly across the wide streambed, with lots and lots of sediment contact time and area.

The DO TMDL used a model called QUAL2K to simulate the dynamics of stream chemistry, biology, and physics. Users input data about the stream and its chemistry and physical properties, and the model simulates all the different processes of settling, decay, transformation, etc. that occur in the stream environment. Model parameters are adjusted until the model is calibrated, or matches monitoring data. As part of this calibration process, users can add “prescribed” loads of parameters where not enough information about loading is available, or there are complexities the model can’t adequately handle. An example is a stream like Shingle Creek where there are frequently stagnant pools of water where a lot of BOD and SOD is taking place, more than the model would assume. The Shingle Creek models for the Upper Creek and the Lower Creek required adding prescribed SOD and NBOD loads. They did not require adding CBOD load from stormwater, called a diffuse load, to calibrate to monitoring data. So the TMDL shows a current wasteload of NBOD but not CBOD.

Part of the TMDL modeling includes running sensitivity analyses. Various parameters are altered to see what seems to be the ones most effecting predicted DO concentrations. SOD was very important, as was the CBOD and NBOD contributed from Palmer Lake and the I-94 Wetland. The models were not very sensitive to NBOD from stormwater. Reducing the prescribed NBOD did not appreciably improve DO in the stream. Therefore, the TMDL did not require a reduction in NBOD wasteload from stormwater.

Several scenarios were run to see what combination of load reductions would be most effective at increasing DO. Modifying the stream channel to be narrower, with a low flow channel and some

increased channel roughness combined with reducing CBOD and NBOD discharged from the headwaters wetlands was the most effective combination. All of those loads – SOD, and CBOD and NBOD from wetlands – are considered load allocation because they are naturally occurring and are not covered under a permit.

So, what do you put in your permit reapplication? The TMDL includes a wasteload allocation for the prescribed NBOD in stormwater. Table 6 shows that wasteload allocation partitioned to the MS4s proportionate to watershed area. Because there is no load reduction required, there are no required implementation activities. However, the TMDL encourages implementation of general BMPs across the watershed to reduce inputs of organic matter in stormwater runoff. If you are an MS4 through which Shingle Creek and Bass Creek do not flow, you are done.

If you are an MS4 through which Shingle Creek and Bass Creek flow, you do not have an assigned load allocation reduction, but rather there are implementation actions: narrow the stream channel to reduce exposure to sediments, and treat or otherwise increase dissolved oxygen in the flow being discharged from headwaters wetlands to reduce CBOD and NBOD.

Table 6. Shingle Creek Dissolved Oxygen wasteload allocation partition.

		Upper Watershed			Lower Watershed		
	Area	NBOD (kg/day)			NBOD (kg/day)		
MS4	(%)	Current	TMDL	Reduction	Current	TMDL	Reduction
Brooklyn Center	12%	4.3	4.3	0.0	1.4	1.4	0.0
Brooklyn Park	24%	8.5	8.5	0.0	2.8	2.8	0.0
Crystal	8%	3.0	3.0	0.0	1.0	1.0	0.0
Maple Grove	17%	5.9	5.9	0.0	1.9	1.9	0.0
Minneapolis	7%	2.4	2.4	0.0	0.8	0.8	0.0
New Hope	7%	2.5	2.5	0.0	0.8	0.8	0.0
Osseo	1%	0.3	0.3	0.0	0.1	0.1	0.0
Plymouth	14%	5.1	5.1	0.0	1.7	1.7	0.0
Robbinsdale	5%	1.7	1.7	0.0	0.6	0.6	0.0
MnDOT	3%	1.1	1.1	0.0	0.4	0.4	0.0
Henn Cty	3%	1.1	1.1	0.0	0.4	0.4	0.0
Total	100%	35.8	35.8	0.0	11.8	11.8	0.0

Biotic Integrity TMDL. The Stressor ID identified five primary stressors affecting biotic integrity in Shingle Creek and Bass Creek. Two of those stressors – low dissolved oxygen and excess chloride – would be addressed by achieving TMDL wasteload and load reductions. Three of the stressors – habitat alteration, altered hydrology, and loss of connectedness – are not associated with a specific pollutant for which a TMDL can be developed. However, goals for these stressors identified in the TMDL were:

<u>Habitat Alteration:</u>

- Restore the stream channel to achieve more substrate diversity, a more natural pool-riffle structure, and a low-flow channel.
- Restore native vegetation on the streambanks and riparian zone to stabilize streambanks, filter runoff, provide overhanging vegetation, and provide a buffer at least 20 feet wide on both sides of the stream.
- Thin the tree cover on the streambanks allow the growth of stabilizing understory vegetation, reduce streambank erosion from deadfall, and to reduce excessive shading.

- Remove or minimize barriers to fish and other aquatic and terrestrial organisms, both in the stream and those that inhibit access to and from floodplain, riparian wetlands, and lakes.
- Create or enhance refugia through the addition of woody debris, root wads, deeper pools, backwaters and side pools.

Altered Hydrology:

- Increase infiltration and abstraction in the watershed to reduce peak flows and volumes.
- Evaluate the use of extended detention basins to reduce peak flows.
- Evaluate surficial groundwater flows to determine where infiltration would be most effective for increasing base flows.

Loss of Connectedness:

- Remove or minimize barriers to fish and other aquatic and terrestrial organisms, both in the stream and those that inhibit access to and from floodplain, riparian wetlands, and lakes.
- Create or enhance refugia through the addition of woody debris, root wads, deeper pools, backwaters and side pools.
- Restore native vegetation on the streambanks and riparian zone to create habitat and to create migration corridors.

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