BROWN'S CREEK WATERSHED DISTRICT

455 HAYWARD AVE N
OAKDALE, MN
55128

651.330.8220 X26 [PHONE]
651.330.7747 [FAX]
WWW.BCWD.ORG

REGULAR MEETING OF THE BOARD OF MANAGERS
Wednesday, May 8, 2024 at 6:30 PM

NOTE MEETING LOCATION
Regular Board Meeting will be held at
Family Means
1875 Northwestern Ave, Stillwater, MN 55082

1) Call Regular Meeting to order

2) Approve Regular Meeting Agenda and Discussion Agenda **-Board Action**

3) Public Comments

4) Consent Agenda – **Board Action** (*all items listed under the consent agenda are considered to be routine by the Board of Managers and will be enacted by one motion. There will be no separate discussion on these items unless a Manager removes an item from the consent agenda for discussion or there is a request to remove the item from the consent agenda, in which event the board will consider whether to remove the item from the consent agenda and consider it separately.*)
   a) Approve Board Meeting Minutes of the April 10, 2024 Regular Meeting
   b) Accept Permit Fee Statement
   c) Authorize president to execute amended agreement with city of Stillwater for the Brown's Creek Restoration Project
   d) Approve public notice for Brown's Creek Restoration Project not to exceed $1,500 from account 947-0022
   e) Approve Washington Conservation District to WCD scope for shoreline assessments on Woodpile, Masterman, Long Lakes not to exceed $518 from account 300-4710-1 and transfer $518 from contingency reserve to account 300-4710-1
   f) Approve Lower St Croix One Watershed One Plan workplan amendment as presented
   g) Approve EOR groundwater monitoring scope for 2024 not to exceed $3,960 from account number 942-0004 and $10,724 from account number 942-001

5) Treasurer's Report
   a) Review Authorized Funds Spreadsheet
   b) Current Items Payable-**Board Action (Roll Call Vote)**
   c) 2023 Audit Presentation- Tyler See, Abdo

6) Permits
   a) BCWD Permit 24-06 Rutherford Elementary – Engineer Review – **Board Action**

7) Projects
   a) Monitoring Result Presentations
      (1) Macroinvertebrate monitoring in Brown's Creek – Mike Majeski, EOR

(2) Lakes and Stream monitoring – Aaron DeRusha, EOR
(3) Groundwater trends – Stu Grubb, EOR
(4) Performance Monitoring
(a) Iron Enhanced Sand Filter Project & Scope– Ryan Fleming, EOR – **Board Action**
(b) Brown's Creek Park Rock Crib – Camilla Correll, EOR
(5) Drone Flight Results

b) 62nd Street Trail Flood Risk Reduction Project– Public Hearing & Resolution 24-01 – **Board Action**

8) Discussion Agenda - No Action Required
a) Updates
(1) Administrator
(a) Management Plan Update – kick-off meeting June 6, 2024 at Family Means 2-6pm
(b) HELP grant application
(c) Coordination with Washington County CR 57 drainage survey
(d) Coordination with city of Stillwater Northland Ave/Brewers Pond drainage
(e) Coordination with MN Department of Natural Resources – rare species outreach plan
(2) Legal
(3) Engineer –
(a) Brown's Creek Restoration Project
(b) Permit Inspections
(4) Managers
b) May 2024 Regular Meeting BCWD Board Agenda:

9) Adjournment

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DRAFT Minutes of the regular meeting of the Brown's Creek Watershed District Board of Managers, Wednesday April 10, 2024

ROLL CALL

Managers Present:	**Others Present:**
Celia Wirth, Vice President	Karen Kill, BCWD administrator
Gerald Johnson, Treasurer	Ryan Fleming, EOR, BCWD engineer
Chuck LeRoux	Michael Welch, Smith Partners, BCWD counsel
Debra Sahulka, Secretary	Cameron Blake, BCWD
	Camilla Correll, EOR, BCWD engineer (attended virtually)
Managers Absent:	
Klay Eckles, President	

1) Call to Order

Vice President Celia Wirth called the regular meeting to order at 6:30 p.m.

2) Approve Agenda

Manager Johnson moved, seconded by Manager Sahulka, to approve the agenda as presented. Motion carried, 4/0

3) Public Comments

There were no public comments

4) Consent Agenda

Manager LeRoux moved, seconded by Manager Johnson, to approve the consent agenda:

a) Approve Board Meeting Minutes of the March 19, 2024 Regular Meeting
b) Accept Permit Fee Statement
c) Approve scope of work for newsletter, not to exceed $3,800 from account 910-0000

Motion carried 4/0.

5) Treasurer's Report

a) Review Authorized Funds Spreadsheet

Karen Kill explained that the board authorized $4,000 for fen management in March, but funds will need to be transferred into the account 953-000 from contingency reserve to fund this expense.

Manager Johnson moved, seconded by Manager Sahulka, to transfer $4,000 from the contingency reserve to account 953-0000 Fen Management Plan Implementation and to approve the authorized funds spreadsheet. Motion carried, 4/0.

b) Current Items Payable

Manager Johnson moved, seconded by Manager LeRoux, to approve payment of bills as presented in the amount of $105,912.89. Motion carried on a roll call vote, 4/0.

c) Board Treasurer Position Training

Manager Johnson notes that he is not reapplying for appointment to the board next fall. The managers agreed that Manager Johnson should train Manager Wirth on treasurer duties.

6) Projects

a) 62nd Street Trail – Stillwater Cost-Share Request

Ms. Kill reminded the managers that a flood-risk assessment performed by the BCWD engineer identified townhomes around the 62nd Street stormwater pond that no longer have adequate flood freeboard for the 100-year storm event. The City of Stillwater has developed plans and specifications for lowering the 62nd Street Trail adjacent to the pond to increase freeboard for the townhomes. The city requested BCWD cost-share for the work last year, but quotes came in higher than expected so the city delayed the work. The city has received a better price this year and has again requested BCWD support of around $15,000.

The managers discussed the precedent of the district assisting the city with funding for projects. Ms. Kill reminded the board that the district does not typically own the land in which the management plan needs to be implemented and so partnerships are essential. There is a precedent for the city to partner on district projects and efforts and vis versa, including contribution of funding.

Ms. Kill stated that to dedicate funding to the work, BCWD would need to have a public hearing at next month's meeting, then consider ordering the project. Michael Welch advised that the managers must find that the spending would be consistent with the Public Purposes Doctrine, which requires the board to find that the spending would accrue to the public benefit and be consistent with watershed purposes.

b) Flood-risk Assessments and Community Meetings for Woodpile, Masterman, and Long

Ms. Kill explained that the district has not yet completed systematic flood-risk and water quality assessments for Woodpile, Masterman and water quality for Long Lake.

Manager Wirth moved, seconded by Manager Johnson, to approve the scope of services of $25,956 by from 923-0002 by transferring $10,206 from account 923-0000 to account 923-0002. Motion carried, 4/0

7) Planning

a) Management Plan update scope

Ms. Kill reminded the managers that the plan-update process started with 60-day notice of initiation to plan-review agencies, and would continue under this scope with technical advisory committee meetings, three board workshops, citizen advisory committee workshops and a kickoff meeting. There will be engineering, legal, and administration time. The total for the engineering scope within the budgeted amount and reflects the total budget for 2024 and 2025. Camilla Correll explained that the board workshops will focus on issue and goal identification, development of measurable goals and actions, and prioritization of fund allocation. The managers noted the importance of identifying and address pollutants of emerging concern such as PFAS in groundwater. Ms. Correll noted the other critical issues are climate change adaptation strategies, flooding, and an operations and maintenance program.

Manager LeRoux moved, seconded by Manager Sahulka, to approve the scope of services in the amount of $152,142 from account number 927-0000. Motion carried 4/0.

8) New Business

a) Annual Report

Manager Johnson moved, seconded by Manager LeRoux, to authorize the administrator to distribute the 2023 annual report as required by statute. Motion carried 4/0.

b) Macroinvertebrate Monitoring in Brown's Creek

Ms. Kill explained the macroinvertebrate monitoring provides the district with information about the quality of water resources in the watershed. Ms. Kill clarified the monitoring will be conducted annually at three locations in the fall 2024 based on guidance from the Minnesota Pollution Control Agency. Manager Johnson requested Mike Majeski present the 2023 monitoring results at a future board meeting.

Manager Johnson moved, seconded by Manager Sahulka, to approve not to exceed $3,776 from account number 947-0018 to conduct the 2024 Macroinvertebrate Assessment, including a subcontract to RMB Labs for macroinvertebrate specimen identification and reporting for $1,537. Motion carried 4/0.

9) Discussion Agenda

a) Updates

(1) Administrator

Ms. Kill explained that the Brown's Creek Restoration project will likely start in mid-May. Educational signs will be posted along the project site with a QR code

to a project update page on the district's website, and a mailing is planned for nearby residents. The management plan update kickoff meeting is planned to run from 2 to 4 p.m. with the technical advisory members, followed by an open house from 4 to 6 p.m. for the public. The date has not yet been selected. Ms. Kill said she will bring a scope for rule revision meeting facilitation to the next board meeting. The last round of flood-assessment letters are soon to be sent out and the drone flight of Brown's Creek occurred.

(2) Legal

Mr. Welch said that the state landscapers group does not support the chloride limited liability legislation approach being advanced by coalition assembled by Minnesota Watersheds because it would not exempt property owners and managers from negligence, which is not feasible from a legal standpoint. Mr. Welch said he would provide an update about the plumbing code stormwater conflict at the next board meeting.

(3) Engineer

Brown's Creek Watershed District capital improvement projects will be featured in EOR's company tour this year.

(4) Managers

Manager Wirth updated the board that the Citizens Advisory Committee will be co-hosting the annual community event with Sustainable Stillwater again and the event will again have a raptor show. The district's annual newsletter is available for CAC and board review.

12) Adjournment

Manager Sahulka moved, seconded by Manager Johnson, to adjourn the meeting at 8:18 p.m. Motion carried 4/0.

Respectfully Submitted by
Karen Kill, BCWD Administrator and Debra Sahulka, Secretary

APPLICANT/PERMIT NO.	RULES							TYPE				FEES OWED	
	2	3	4	5	6	7	Decomp action	GOV	SF RES	RES DEV	COM	EXEMPT	AMT DUE
Bergmann Development/Sanctuary Permit No. 05-12	X	X	X			X				X			$ -
Stillwater Medical Center Parking Permit 13-26	X	X				X					X		$3,039.10
Brown's Creek Cove Permit 15-07	X	X	X			X				X			$8,238.52
Heifort Hills Permit 16-03	X	X	X	X		X				X			$1,327.34
Farms of Grant/White Oaks Savannah Permit 17-01	X	X	X			X				X			$18,688.85
The Lakes of Stillwater Permit 17-04	X	X	X			X					X		$3,368.08
West Ridge Permit 17-17	X	X	X			X	X			X			$701.51
Heifort Hills Estates Permit 18-02	X	X	X			X	X			X			$41,206.46
Boutwell Farms Permit 18-04A	X	X	X			X	X			X			$0.79
Hazel Place/Hertiage Ridge Permit 18-05 (Was 17-09)	X	X	X			X	X			X			($2,445.17)
Nottingham Village Permit 18-06	X	X	X			X				X			$650.03
Ridgecrest Permit 18-11	X	X				X	X				X		$16.68
St Croix Valley Recreation Center Expansion Permit 18-14		X				X	X	X				$6,970.28	
Central Commons Permit 19-05	X	X	X			X	X				X		($5,000.00)
Neal Ave Road Reconstruction Permit 20-05	X	X						X				$19,088.31	
CSAH 15-36 Interchange Permit 20-08		X			X	X		X				$19,495.85	

APPLICANT/PERMIT NO.	RULES							TYPE				FEES OWED	
	2	3	4	5	6	7	Decomp action	GOV	SF RES	RES DEV	COM	EXEMPT	AMT DUE
White Pine Ridge Permit 20-12		X					X			X			($631.32)
Westridge Block 1 Lot 1 Permit 21-09 - NOPV, no permit received		X					x		x				$2,851.61
Maryland Gateway Addition Permit 21-13	x	x				x				x			($854.61)
Schwartz Residence Permit 21-15	x	x							x				($319.38)
Millbrook Park- City of Stillwater Permit 21-21	x	x	x					x				$6,970.18	
Fahey Permit 21-34		x							x				($743.78)
Norell Ave N Improvements Permit 21-45	x	x				x		x				$10,458.63	
Gonyea (8 lots)- White Pine Ridge Permit 22-02		x								x			($570.51)
Wetridge (12 lots) - Sharkey/GreenHalo Permit 22-03 (Transferred 21-30 and 21-31)		x								x			($442.71)
13290 Boutwell Road N - Sharkey/GreenHalo Permit 22-05		x								x			($590.51)
7125 Lone Oak Trail (WOS L106)-weichman Permit 22-11		x							x				$7,313.25
13199 Dellwood Rd Permit 22-15		x							x				$217.83
Read Residence Permit 22-17	x	x							x				$1,246.52
Stillwater Oaks Permit 22-18	x	x								x			$4,293.00
Miller Flood Protection Permit 22-19						x				x		$0.00	
Popeyes OPH Permit 22-20		x									x		($266.26)

APPLICANT/PERMIT NO.	RULES							TYPE				FEES OWED	
	2	3	4	5	6	7	Decomp action	GOV	SF RES	RES DEV	COM	EXEMPT	AMT DUE
Fanberg Residence - Manning Estates L4B3 Permi 22-22		x							x				($729.36)
7138 Lone Oak Trl N (WOS L109) Permit 22-24		x							x				($52.82)
7164 Lone Oak Trl (WOS L113) Permit 22-25		x							x				($102.45)
Wash Co. CSAH 5 Phase II Permit 22-30		x						x				$820.28	
Wash Co. CSAH 57 culverts Permit 22-31		x						x				$0.00	
Cty Rd 61 Re-alignment Permit 23-01	x	x						x				$8,073.47	
WOS L114 - Cates (7211 Lone Oak Trail Tweden) Permit 23-02		x	x			x			x				$8,275.20
Boutwell Farm Lot 1 (2545 Boutwell Farm Rd) Permit 23-03		x							x				$3,500.18
Westridge B1L4 (986 Creekside) Permit 23-04		x							x				($656.02)
Rocket Carwash Permit 23-05	x	x									x		$4,824.00
7239 Lone Oak Trail (WOS L118) Permit 23-07		x							x				$488.96
72nd St Road and Trail Improvements Permit 23-08								x				$3,254.41	
Kirn Residence (McLafferty 8000 Neal Ave) Permit 23-09		x							x				($693.29)
Curio Dance Studio Permit 23-10	x	x									x		$5,267.50
7273 Lone Oak Trail- WOS Lot 122 - Freiroy Residence Permit 23-11		x							x				$805.49
CSAH 9 -Keystone Ave - Culvert Replacement						x		x				$1,525.04	

APPLICANT/PERMIT NO.	RULES							TYPE				FEES OWED	
	2	3	4	5	6	7	Decomp action	GOV	SF RES	RES DEV	COM	EXEMPT	AMT DUE
Permit 23-12													
The Lakes - Phase III/Sandhill Shores Permit 23-13		x								x			($327.92)
Wiskow Berm Permit 23-14		x							x				($849.11)
7085 Lone Oak Trail- WOS L102- Mensah Res/Cates Permit 23-15		x							x				$1,045.74
13294 Boutwell Rd. N Permit 23-16		x							x				($816.54)
Sundance Townhomes Permit 23-17										x			$6,688.75
7285 Lone Oak Trl- WOS L124 Permit 23-18									x				($8.30)
Liberty Classical Academy Expansion Permit 23-19											x		$8,612.75
Lodges of Settler's Glen Pond Excavation Permit 23-20								x				$351.38	
Take 5 Oil Change Permit 24-01											x		$6,069.50
Schuster Residence- 122nd St N Permit 24-02									x				$650.00
WOS L120- 7255 Lone Oak- Hilgert Permit 24-03													$1,715.00
Washington County CSAH 5 - 36 to Croixwood Permit 24-04		x						x				$ 1,071.25	
Swager Residence Permit 24-05		x							x				$ (846.25)
Rutherford Elementary Permit 24-06													$ 5,709.75
Elliot Crossing Permit 24-07													$ 1,365.25
	90	326	34	15	27	160		71	153	13	119		
TOTAL NON-EXEMPT DUE BCWD:													**$148,177.64**

APPLICANT/PERMIT NO.	RULES							TYPE				FEES OWED	
	2	3	4	5	6	7	Decompaction	GOV	SF RES	RES DEV	COM	EXEMPT	AMT DUE
Total due back to applicants if closed:													($212,620.11)

Amendment to Agreement Dedicating a Land-Use License
for the Brown's Creek Restoration Project
Between the City of Stillwater and
Brown's Creek Watershed District

This amends the March 19, 2024, agreement (Agreement) between the City of Stillwater, a Minnesota municipal corporation (Stillwater), and Brown's Creek Watershed District, a special purposes governmental entity of the State of Minnesota with purposes and powers set forth at Minnesota Statutes chapters 103B and 103D (BCWD), to revise the property-access area to be used by BCWD's contractor for construction and maintenance of a creek-improvement project.

Recitals

A. Stillwater and BCWD entered into the Agreement to provide BCWD with rights to access the Brown's Creek Nature Preserve, 10.8 acres of certain real property owned in fee by Stillwater at the southwest corner of McKusick Road North and Neal Avenue North in the City of Stillwater, Washington County property identification number 19-030-20-41-0001 (the Stillwater Property) to construct "the Project," a creek-restoration construction and improvement defined and specified in the Agreement;

B. As contemplated by the Agreement, BCWD has awarded a construction contract for the Project to a responsible and qualified bidder, and the selected contract has identified an alternative route to access the Stillwater Property than is specified in the Agreement, and Stillwater concurs that the route specified by the contractor and shown in Exhibit BB, attached hereto and incorporated into this amendment as a term hereof, and the associated alteration of the "Project Area," as defined in the Agreement, are feasible and acceptable; and

C. Stillwater and BCWD are authorized by Minnesota Statutes section 471.59 to enter into this amendment to designate a new access route for purposes of the Project.

Amendment

NOW, THEREFORE, in consideration of the foregoing recitals, which are incorporated into and made a part of this amendment, and to facilitate the Project for the benefit of the public, the parties agree as follows:

1. Replacement of Access-Route Exhibit. Exhibit B to the Agreement is deleted in its entirety and replaced with Exhibit BB to this amendment.

All terms of the Agreement not expressly altered or amended by this amendment remain in full force and effect.

[remainder of page intentionally left blank]

IN WITNESS WHEREOF, the undersigned have executed this amendment with the intent to be legally bound by its terms as of the date this amendment is fully executed by both parties.

City of Stillwater

_____
By Ted Kozlowski
Its Mayor

Attest

_____
By Beth Wolf
Its City Clerk

Date:_____

Brown's Creek Watershed District

_____
By Klayton Eckles
Its President

Approved as to form and execution

_____
BCWD counsel

Date:_____

EXHIBIT BB

Site Plan – Project Area

MCKUSICK RD N

NEAL AVE N

SITE ACCESS - 2

SOIL STORAGE AREA
APPROX. HEIGHT 5 FT
ESTIMATED VOLUME
= 2,928 CY

STAGING AREA - 2

CITY OF
STILLWATER

FLOW

PROJECT AREA

BROWN'S CREEK
THALWEG

STAGING AREA - 1

SITE ACCESS - 1

SCALE IN FEET

0 50 100 200

N

NOT FOR CONSTRUCTION

DATE	NO.	DESCRIPTION
	1	
	2	
	3	
	4	
	5	
	6	

EOR water ecology community
EMMONS & OLIVIER RESOURCES, INC.
1919 UNIV. AVE. W. #300 ST. PAUL, MN
TEL 651.770.8448 FAX 651.770.1552

DESIGNED BY: EOR
DRAWN BY: DEM
CHECKED BY: MJM

EOR JOB #0041-0418

BROWN'S CREEK WATERSHED DISTRICT

CLIENT PROJECT #XXX-XXXX

BROWN'S CREEK PARK
STREAM RESTORATION
WASHINGTON COUNTY, STILLWATER, MN

BROWN'S CREEK WATERSHED DISTRICT OAKDALE, MN 55128

EXHIBIT BB:
PROJECT AREA

SHEET 01 OF 01

Plot Date: 04/19/2024
Drawing name: X:\Clients_WD\041_BCWD\0418_Brown's_Ck_Pk_Restrol\09_GIMS\dwg\0041_0418-EasementExhibitCity_041824.dwg
Xrefs: 0041_0418-PBASE
0041_0418-PBASE
0041_0418-LBASE
Images: ..\Images\BCWD_logo
C:\Users\DMcessing\AppData\Local\Temp\mxt20_17722

BROWN'S CREEK WATERSHED DISTRICT
455 HAYWARD AVE N
OAKDALE, MN
55128
651.330.8220
WWW.BCWD.ORG

MEMORANDUM

TO: BCWD Board of Managers
FROM: Cameron Blake
RE: Brown's Creek Restoration Project Postcard Mailing
DATE: May 3, 2024

Background:

The Brown's Creek Restoration Project is beginning this spring. Due to the public nature of the project it would be beneficial to provide information in multiple ways to residents who live in the nearby neighborhoods. Educational signage has already been designed and posted along the project site. This same graphic could be mailed as a postcard to nearby neighborhoods.

Issue:

Stillwater Printing gave the following cost quote for postcard printing and mailing:

Item	Details
Postcard printing	$688
Bulk mailing for approx. 1500	$540
residents	
Total	$1228

Requested Action:

Approve public notice for Brown's Creek Restoration Project not to exceed $1500 from account 947-0022.

WASHINGTON CONSERVATION DISTRICT
455 HAYWARD AVE N
OAKDALE, MN 55128
651-330-8220 [PHONE]
651-330-7747 [FAX]
WWW.MNWCD.ORG

MEMORANDUM

TO: BCWD Board of Managers

FROM: Rebecca Oldenburg-Downing, Senior Water Resource Specialist

DATE: April 18th, 2024

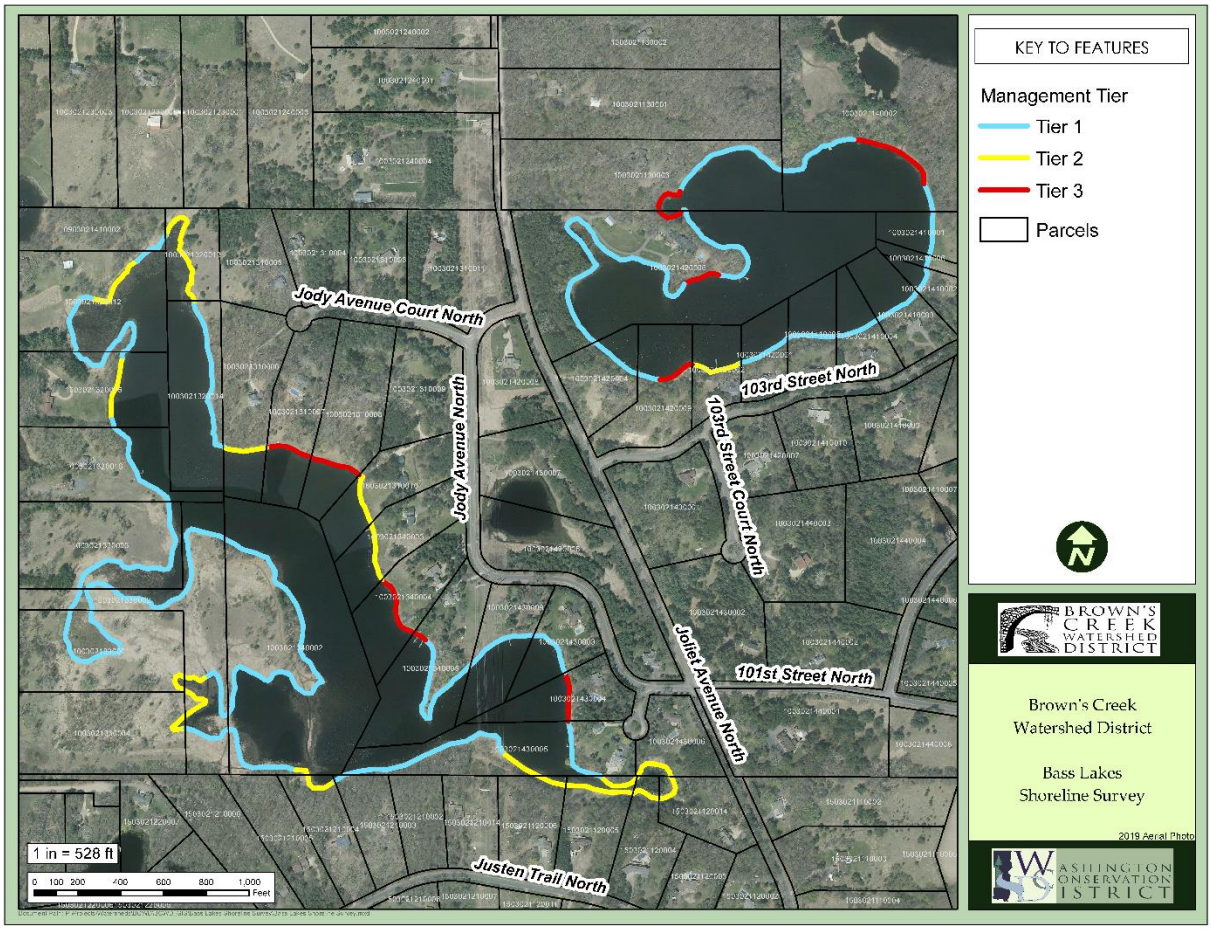
RE: **Shoreline Assessment Proposal 2024**

In order to better understand the current state condition of lakes' shorelines a shoreline assessment is performed. This serves to as a tool to be able to engage landowners about shoreline education, as well as identifying areas for protection and restoration. A healthy shoreline can help prevent nutrient loading to the lake, create valuable habitat for wildlife, and serve as a deterrent for invasive species. The data generated from shoreline assessments may also be used for: targeting future critical habitat designations within lakes, creating lake management plans and watershed management/comprehensive plans, planning Aquatic Plant Management, evaluating trends in lakeshore habitat over time, and understanding trends in lake ecology (e.g., fish, wildlife, invasive species).

To perform a shoreline assessment survey, the Washington Conservation District (WCD) references the Wisconsin Department of Natural Resources Shoreland Habitat Monitoring Field Protocol, see table below. After the shoreline assessment is perform in the field and the shoreline has been scored, a map is produced to visually summarize the data, see map below. The WCD has performed eight shoreline assessment surveys on the behalf of BCWD in the past three years. The WCD would perform three shoreline assessment surveys in 2024 on Long Lake, Masterman Lake, and Wood Pile Lake.

Table 11 - Shoreline Habitat Assessment Rating Scheme

Rating	Color Designation on Map	Description	Rating Criteria		
			Tree Canopy	Manicured Lawn	Impervious Area
Tier 1 - Natural	Green	Parcel with Lower Potential for Nutrient Export	80 - 100%	0 - 20%	0 - 5%
Tier 2 - Moderate	Yellow	Parcel with Medium Potential for Nutrient Export - Shoreline BMP Recommended	40 - 80%	20 - 40%	5 - 20%
Tier 3 - Developed	Red	Parcel with Higher Potential for Nutrient Export - Shoreline BMP Highly Recommended	0 - 40%	40 - 100%	20 - 100%



The total cost for the shoreline assessment monitoring for 2024 is **$518**. The funding for this work would come from the BCWD contingency reserve.

Shoreline Assessment Monitoring	Type	Labor	Travel Time/Mileage	Lab	Total	Notes
Long Lake	SAM	$296	$0	$0	$296	Shoreline assessment + map
Masterman	SAM	$111	$0	$0	$111	Shoreline assessment + map
Woodpile	SAM	$111	$0	$0	$111	Shoreline assessment + map
Total Monitoring Cost		**$518**	**$0**	**$0**	**$518**	

LOWER ST. CROIX WATERSHED
PARTNERSHIP

To: Members of the Lower St. Croix Watershed Partnership

From: Lower St. Croix Policy Committee

RE: LSC FY23 WBIF Work Plan Revision and Budget Amendment for Agronomy Outreach Specialist

At the Monday, April 22, 2024 meeting of the Lower St. Croix Watershed Partnership, Policy Committee members unanimously approved a recommendation to revise the FY23 Watershed Based Implementation Funds (WBIF) Work Plan and adjust the budget as outlined in this memo. The goal of this revision is to host the Lower St. Croix Agronomy Outreach Specialist as a local staff position instead of as an embedded position with University of Minnesota Extension.

At this time, the LSC FY23 WBIF Work Plan Revision and Budget Amendment is being sent to local governing boards for review. The local governing boards must act on Policy Committee recommendations within 60 days after the day in which the Policy Committee formally adopted such recommendation. The decisions of the various governing boards of the Parties will be deemed approved for purposes of this Agreement when 2/3rds of the governing bodies have adopted formal action on the respective recommendation. The Chisago SWCD would then submit a work plan revision request to the Board of Water and Soil Resources for consideration and approval.

Requested Action: Review and approve the proposed LSC FY23 WBIF Work Plan Revision and Budget Amendment.

Background: LSC Agronomy Outreach Specialist position has been vacant since October 2023. Over the winter, LSC partners worked with University of Minnesota Extension to conduct two consecutive applicant searches to fill the vacant position. After reviewing applications received from University of Minnesota, the LSC WP A1 Subcommittee determined that none of the applicants met the minimum requirements of the job announcement. As such, the LSC WP A1 Subcommittee recommended changes outlined in the following pages.

Proposed LSC FY23 WBIF grant work plan revision.

Activity 5: Agronomy Outreach Specialist

eLINK Activity Category: *Project Development*
Grant: ~~*$225,000*~~ *$125,000*
Co-Lead Agency: *Washington Conservation District, Jay Riggs* ~~*(partnership with UMN Extension)*~~*, Chisago Soil and Water Conservation District, Craig Mell*
~~***Co-lead Agency:*** *Chisago SWCD, Craig Mell*~~
Priority areas: *Agronomy outreach specialist will focus on priority areas described in Structural Ag BMP Implementation and Non-Structural Ag/Urban Implementation*

CWMP Reference: *Page 61*

Activity Description: *Agronomy outreach specialist. (A) Shared Services: Work with an agricultural conservationist* ~~*(one individual)*~~ *for basin wide assistance with agronomy, outreach, and technical assistance to agricultural producers including conservation planning and nutrient management plans. Approximately 80% of this position's time will be directly working with agricultural producers in the LSC Watershed to identify economical farming practices with water quality benefits to make them a routine part of farm operations. See Attachment A – Agronomy Outreach Specialist Details & Milestones for more information.*

This would allow for ~~*1 full time*~~ *the agronomy outreach specialist to work basin-wide. Staff will work basin-wide and may have more than one office space. LSC partners will ensure duties assigned to this staff member will be in alignment with WBIF funding intent and requirements.*

Costs billed to this item ~~*for the embedded Extension Agent*~~ *will include the following: Staff salary, supervisory time* ~~*(by University of MN)*~~*, benefits, travel expenses, training expenses, and office supplies. As with all grant activities, LSC partners will ensure program expenses are eligible before billing to the grant/match. All costs will primarily benefit water quality in a priority resource as identified in the LSC CWMP. In addition to direct landowner outreach and technical assistance, as described above, staff time will also include program and work plan coordination: annual partner coordination meetings, updates to partners, interfacing with the shared services educator, coordinated planning efforts, regular basin-scale coordination meetings with LSC partners and other agencies as appropriate.*

Subcommittee: *A subcommittee composed of LSC partners will meet on an as-needed basis in order to review projects and assist with project planning. Subcommittees may be grouped by implementation category.*

Proposed LSC FY23 WBIF grant work plan budget revision.

Adjust the FY23 budget, with the $100,000 approved to move from the A5 category, shifting $30,000 to the A2 category, $35,000 to A4, $25,000 to A7, and $10,000 to the A10. (See attached spreadsheet, column F is the proposed grant work plan.

FY23 WBIF GRANT WORK PLAN BUDGET (04/15/2024)

A	B	C	D	E	F	G	H	I
	WBIF BALANCE (01/01/2024)	WBIF SUPPLEMENTAL GRANT FUNDS (03/27/2024)	WBIF BALANCE WITH SUPPLEMENTAL GRANT FUNDS (04/04/2024)	WBIF GRANT WORK PLAN BUDGET REVISION SC RECOMMENDATION (03/27/2024)	PROPOSED WBIF BALANCE WITH WITH WORK PLAN BUDGET REVISION (04/22/2024)	AMOUNT WBIF's ENCUMBERED (Sub-Agreements)	CURRENT WBIF BALANCE REMAINING	PROPOSED WBIF BALANCE REMAINING
A1 Structural Ag BMP Implementation	$ 140,000.00	$ 120,000.00	$ 260,000.00	$ -	$ 260,000.00	$ 62,410.00	$ 197,590.00	$ 197,590.00
A2 Structural Urban BMP Implementation	$ 118,054.00	$ -	$ 118,054.00	$ 30,000.00	$ 148,054.00	$ 45,000.00	$ 73,054.00	$ 103,054.00
A3 Non-Structural Ag/Urban BMP Implementa	$ 122,025.00	$ -	$ 122,025.00	$ -	$ 122,025.00	$ 122,025.00	$ -	$ -
A4 Wetland Restoration Implementation	$ 220,000.00	$ -	$ 220,000.00	$ 35,000.00	$ 255,000.00	$ 220,000.00	$ -	$ 35,000.00
A5 Agronomy Outreach Specialist	$ 225,000.00	$ -	$ 225,000.00	$ (100,000.00)	$ 125,000.00	$ 225,000.00	$ -	$ (100,000.00)
A6 Shared Services Educator	$ 270,500.00	$ -	$ 270,500.00	$ -	$ 270,500.00	$ 227,840.00	$ 42,660.00	$ 42,660.00
A7 Technical/Engineering	$ 40,000.00	$ 47,615.00	$ 87,615.00	$ 25,000.00	$ 112,615.00	$ 62,000.00	$ 25,615.00	$ 50,615.00
A8 Internal Analyses	$ 18,000.00	$ -	$ 18,000.00	$ -	$ 18,000.00	$ -	$ 18,000.00	$ 18,000.00
A9 Targeting Analyses	$ 45,000.00	$ -	$ 45,000.00	$ -	$ 45,000.00	$ 12,000.00	$ 33,000.00	$ 33,000.00
A10 Administration/Coordination	$ 80,000.00	$ -	$ 80,000.00	$ 10,000.00	$ 90,000.00	$ 67,312.50	$ 12,687.50	$ 22,687.50
PROJECT BALANCE:	$ 1,278,579.00	$ 167,615.00	$ 1,446,194.00	$ -	$ 1,446,194.00	$ 1,043,587.50	$ 402,606.50	$ 1,043,587.50

2024 GROUNDWATER MONITORING AND MANAGEMENT

Date |	02/06/2024
ITo / Contact info |	BCWD Board of Managers and Karen Kill, District Administrator
From / Contact info |	Stu Grubb, PG
Regarding |	2024 Groundwater Monitoring and Management Services

Background

The BCWD has been monitoring groundwater levels in a network of 16 residential wells and 7 golf course wells since 2012. By sponsoring this data collection effort, the BCWD has started to accumulate a significant database of changing groundwater elevations over time in different aquifers and in different parts of the district. This data has been helpful in documenting and understanding the very low baseflow observed in Brown's Creek in 2013 and the extraordinarily high water levels recently observed in the Kimbro Basin. The data has also been useful in calibrating regional groundwater models, such as the model recently produced by consultants for 3M. The key value to this data has been the consistency in data collection and the duration. The data will continue to be useful in the future, but only if BCWD continues to implement its groundwater monitoring program.

Groundwater is a regional resource that requires management on a regional level. Activities outside the watershed can have a significant impact to groundwater resources within the watershed district. State, county, and regional government agencies all have active groundwater management programs that affect the watershed district. In order to effectively manage groundwater within BCWD, watershed district staff and engineers must be engaged in water management activities outside the watershed district. We recommend that a budget be approved for EOR staff to attend meetings and engage with other groundwater management organizations on behalf of BCWD.

Scope of Services

This scope of services includes both the work related to monitoring groundwater elevations as well as the activities related to management of the District's groundwater resources.

Groundwater Monitoring

It is recommended that the BCWD continue to implement the groundwater monitoring program in 2024. EOR and Washington Conservation District staff will continue to work together on the monitoring and reporting of water levels from the current network.

Expanding the Well Network

The BCWD Board of Managers approved the expansion of the well network to include other areas in the district where groundwater data will likely be important in the future. The work was not completed in 2023 but will be completed in 2024. The previously approved budget will be used to complete the work.

As a reminder, the purpose for this expansion of the well network is to collect groundwater level information in those portions of the watershed that are likely more sensitive to flooding due to groundwater. The BCWD has a long history of dealing with flooding issues in closed basins. Often these basins have a relatively small watershed, and much of the flooding is due to rising groundwater elevations. Addressing these types of flooding issues requires an understanding of past groundwater levels and trends.

The critical monitoring areas were identified using the District's landlocked basin evaluation. Some areas are covered by the current well network, but others could benefit from additional groundwater data nearby. Four to five additional residential wells will be targeted for monitoring. Acceptable wells are located near the areas of interest, have an existing well log, are completed in an aquifer of interest, and have a willing well owner.

EOR has identified 19 candidate wells for expanding the network. WCD mailed letters to the well owners asking if they would consider being part of the monitoring network. EOR will follow up on the letters and work with the willing well owners to get the necessary information and agreements in place so we can begin collecting data on the four to five additional wells.

Groundwater Management

It is recommended that BCWD approve a budget for EOR staff to attend meetings and participate in regional groundwater management activities on behalf of the watershed district. Most of these activities have not yet been scheduled and are often quickly organized to address new groundwater issues that arise throughout the year. Examples of past BCWD groundwater management activities include:

- Participation in meetings for the North and East Metro Groundwater Management Area sponsored by DNR.
- Contributions to development of the Metro Model groundwater model developed by the Metropolitan Council. This includes gathering information about infiltration and aquifer recharge rates in the watershed. The model is also being used to research the effects of climate change on groundwater resources.
- Engagement with Washington County programs such as the Water Consortium and the Individual Septic Treatment System regulatory program.
- Contributions to development of the 3M groundwater model used to simulate PFAS contamination and cleanup options. Although the contaminated areas are outside the watershed district, the domain of the groundwater model included all of Washington County and BCWD.
- Working with DNR to expand their observation well network in BCWD.

The following table summarizes the cost for EOR to perform these tasks in 2024.

Tasks	Hours	Cost
Monitoring the existing well network, including coordination with landowners and the WCD and producing a final report	20	$3,960
Expanding the well network to include 4-5 additional wells, including coordination with landowners and the WCD	36	$5,576
Groundwater management	26	$5,148
TOTALS	**86**	**$14,684**

Requested Action

1. Approve this scope of services in the amount of $14,684 as follows:
    - $3,960 from account number 942-0004.
    - $10,724 from account number 942-0011.

Brown's Creek Watershed District
2024 Approved Budget- Final Certified Levy
5-8-2024

		Revised 2023 Carry Forward for Approval	2024 Grants	2024 Levy	2024 Total Budget (For approval)	Allocated	Available
100-2910	Designated Funds - Management Plan Projects	*$ 992,580*			$ 992,580		$ 1,003,777
					$ -		$ -
Revenue					$ -		$ -
100-3700	Interest Income				$ -		$ -
100-3601	Metropolitan Council Outlet Monitoring Grant		$ 5,000		$ 5,000		$ 5,000
100-3630	Washington County Cost-share Applewood Reuse	*$ 66,800*			$ 66,800		$ 66,800
100-3631	MPCA Small Watershed Grant 2023-2026	*$ 320,706*			$ 320,706		$ 320,706
100-3100	Tax Levy			$ 1,180,803	$ 1,180,803		$ 1,180,803
TOTAL, ESTIMATED Sources of Funding		***$ 1,380,086***	***$ 5,000***	***$ 1,180,803***	**$ 2,565,889**		**$ 2,577,086**

ACCT. #	General Expenses	Revised 2023 Carry Forward for Approval	2024 Grants	2024 Levy	2024 Total Budget (For approval)	Allocated	Available
200-4000	Manager Per Diem and Expense			$ 10,000	$ 10,000	$ 10,000	$ -
200-4001	Manager Communications/Tablets	*$ 4,350*			$ 4,350	$ 4,350	$ -
200-4220	Secretarial Services	*$ 4,000*		$ (4,000)	$ -		$ -
200-4250	Dues & Subscriptions (MAWD 6500 and LMCIT 2500)			$ 9,000	$ 9,000	$ 9,000	$ -
200-4270	Bonding & Insurance			$ 6,000	$ 6,000	$ 6,000	$ -
200-4280	Postage & Delivery			$ 1,000	$ 1,000		$ 1,000
200-4290	Printing & Notices			$ 1,000	$ 1,000		$ 1,000
200-4330	Accounting			$ 4,560	$ 4,560	$ 4,560	$ -
200-4331	Audit			$ 10,300	$ 10,300	$ 10,300	$ -
200-4949	Misc., Other Expense			$ 2,000	$ 2,000	$ 1,000	$ 1,000
200-4320	Wash. Conservation District--Admin			$ 58,670	$ 58,670	$ 58,670	$ -
200-4265	Admin Conference Registrations			$ 2,000	$ 2,000		$ 2,000
200-4410	Legal Fees - General			$ 25,800	$ 25,800	$ 25,800	$ -
200-4500	Staff Engineer			$ 28,445	$ 28,445	$ 28,445	$ (1)
	Diversity, Equity and Inclusion Training			$ 5,000	$ 5,000		$ 5,000
	Contingency Reserve	*$ 46,342*		$ -	$ 46,342		$ 46,342
TOTAL GENERAL FUND EXPENSES:		***$ 54,692***	***$ -***	***$ 159,775***	***$ 214,466***	***$ 158,125***	**$ 56,341**

ACCT. #	MANAGEMENT PLAN EXPENSES	Revised 2023 Carry Forward for Approval	2024 Grants	2024 Levy	2024 Total Budget (For approval)	Allocated	Available
300-4320	Wash. Conservation District--Administrator			$ 176,005	$ 176,005	$ 176,005	$ -
300-4410	Legal Fees - Mgmt Plan			$ 60,000	$ 60,000		$ 60,000
300-4501	Staff Engineer			$ 90,474	$ 90,474	$ 90,474	$ 0
300-4702	Permitting, Legal Review			$ 15,000	$ 15,000		$ 15,000
300-4703	Permitting, Engineering Review			$ 55,000	$ 55,000		$ 55,000
300-4704	Permitting, Inspection Database			$ 1,000	$ 1,000		$ 1,000
300-4710-1	Baseline Monitoring		$ 5,000	$ 136,420	$ 141,420	$ 141,420	$ -
300-4640	Equip. Maint. and Upgrades	*$ 15,000*		$ 10,000	$ 25,000	$ 7,400	$ 17,600
300-4810	Shared Educator Position			$ 20,500	$ 20,500	$ 20,500	$ -
300-4950	Management Plan Implementation -future projects			$ -	$ -		$ -
903-0001	Trout Habitat Preservation Project: Monitoring,			$ 6,500	$ 6,500	$ 6,490	$ 10
909-0000	Rules Review/Evaluation	*$ 27,000*		$ 3,000	$ 30,000		$ 30,000
909-0001	Groundwater Dep Nat Resource Inventory update	*$ 10,000*		$ (10,000)	$ -		$ -
909-0002	Permitting Program Internal Procedure updates	*$ 25,000*			$ 25,000		$ 25,000
910-0000	Education & Outreach			$ 15,000	$ 15,000	$ 13,648	$ 1,352
911-0000	Volunteer Stream Monitoring			$ 4,045	$ 4,045	$ 4,045	$ -
912-0000	Grant Preparation	*$ -*			$ -		$ -
914-0000	Homeowner BMP Program			$ 50,000	$ 50,000		$ 50,000
922-0000	Plan Reviews - LGU/LWMP				$ -		$ -
923-0000	H & H Model Maintenance	*$ 3,800*		$ 130,824	$ 134,624		$ 134,624
923-0002	Flood Risk Assessment	*$ 89,316*		$ (63,360)	$ 25,956	$ 25,956	$ -
927-0000	Management Plan Update	*$ 127,000*		$ 90,000	$ 217,000	$ 170,642	$ 46,358
929-0000	Long Lake Plan Implementation-shoreline management			$ -	$ -		$ -
929-0010	Long Lake -Implementation - regional treatment	*$ 75,000*		$ (75,000)	$ -		$ -
929-0011	Long Lake - 62nd Street Pond Retrofit Feasibility	*$ 15,000*			$ 15,000		$ 15,000
929-0012	Long Lake - Marketplace Reuse Feasibility	*$ 164,900*		$ 60,220	$ 225,120		$ 225,120
931-0001	Benz Lake Management Plan Implementation	*$ 15,500*		$ (15,500)	$ -		$ -
935-0000	Land Conservation Program	*$ 100,000*		$ 50,000	$ 150,000		$ 150,000
935-0002	110th Street Property Implementation	*$ 45,000*		$ 25,000	$ 70,000		$ 70,000
935-0003	Develop Land Conservation Priorities	*$ 20,000*			$ 20,000		$ 20,000
940-0000	BMP Program – LGU/Community Demonstration Projects	*$ 10,000*			$ 10,000		$ 10,000
942-0004	Measuring Trends in GW Elevations & Flow	*$ 3,960*			$ 3,960	$ 3,960	$ -
942-0007	Groundwater - Browns Creek piezometers	*$ 8,960*			$ 8,960		$ 8,960
942-0011	Groundwater - Coordination with users	*$ 40*		$ 24,000	$ 24,040	$ 24,036	$ 4
942-0012	Groundwater - Install Monitoring Wells	*$ 58,000*		$ (58,000)	$ -		$ -
942-0013	Groundwater - Pump Test	*$ 15,000*		$ (15,000)	$ -		$ -
947-0017	Brown's Creek Implementation - Ecoli site visits/cost-share	*$ 10,000*			$ 10,000		$ 10,000
947-0018	Brown's Creek - Biological Survey (Macroinvert & Fish)	*$ 4,000*			$ 4,000	$ 3,776	$ 224
947-0022	Brown's Creek - Buffer and Stream Restoration	*$ 330,000*		$ 133,000	$ 463,000	$ 357,744	$ 105,257
947-0023	Brown's Creek - Golf Course Reuse - Oak Glen				$ -		$ -
947-0026	Brown's Creek - Brown's Creek Cove Reach			$ 20,000	$ 20,000		$ 20,000
948-0000	CIP Maintenance	*$ 35,418*		$ 135,000	$ 170,418	$ 12,300	$ 158,118
950-0001	South School Curly Leaf Treatment	*$ 1,000*		$ (1,000)	$ -		$ -
951-0001	Woodpile Lake Management Plan Implementation	*$ 10,000*		$ (10,000)	$ -		$ -
953-0000	Fen Management Plan Implementation	*$ 4,000*			$ 4,000	$ 4,000	$ -
957-0000	Weather Station			$ 3,700	$ 3,700	$ 3,642	$ 58
959-0001	Resource Assessment - upstream 110th/Drone flight			$ 4,700	$ 4,700	$ 4,700	$ -
959-0002	Resource Assessment - Diversion Tribs - Head cut Repairs	*$ 60,000*		$ (60,000)	$ -		$ -
959-0003	Resource Assessment - Brown's Creek Gorge Bluff				$ -		$ -
960-0000	St Croix Phosphorus Reduction	*$ 10,000*			$ 10,000		$ 10,000
961-0000	Mendel Wetland Restoration Feasiblity	*$ 20,000*		$ 15,000	$ 35,000		$ 35,000
962-0000	District-Wide Pond Management Planning/Implementation			$ 4,500	$ 4,500	$ 4,500	$ -
963-0000	District-Wide Vegetation Surveys	*$ 10,000*		$ (10,000)	$ -		$ -
964-0000	District-Wide Chloride Source Assessment	*$ 2,500*			$ 2,500		$ 2,500
TOTAL MANAGEMENT PLAN PROJECT EXPENSES:		***$ 1,325,394***	***$ 5,000***	***$ 1,021,028***	***$ 2,351,422***		**$ 1,276,184**
TOTAL, OPERATING EXP. & MGMT. PLAN PROJECTS:		***$ 1,380,086***	***$ 5,000***	***$ 1,180,803***	***$ 2,565,888***		***$ 1,332,526***

BROWN'S CREEK WATERSHED DISTRICT
5/8/2024
CURRENT ITEMS PAYABLE-PAGE 1 of 2

	YES	NO	ABSTAIN	ABSENT
ECKLES	_____	_____	_____	_____
JOHNSON	_____	_____	_____	_____
LEROUX	_____	_____	_____	_____
WIRTH	_____	_____	_____	_____
SAHULKA	_____	_____	_____	_____

VENDOR		**ACCOUNT #**		ITEMS	TOTAL	**CK NO**
Emmons & Olivier Resources, Inc.	Invoices April 2024					
	Inv. 41-0000-221 Retainer	300-4500	$	7,078.50		
	Inv. 41-0000-221 Retainer	200-4500	$	2,359.50		
	Inv. 41-0001-224 General Permitting	300-4703	$	8,828.25		
	Inv. 41-0307-85 Permits 2017					
	Permitting #17-01 Grant Holdings Subd	300-4703	$	36.18		
	Inv. 41-0402-26 Permits 2022					
	Permitting #22-02 Gonyea at White Pine Ridge	300-4703	$	108.54		
	Permitting #22-03 Sharkey/Westridge	300-4703	$	71.02		
	Permitting #22-08 Sharkey Boutwell Farms	300-4703	$	125.04		
	Permitting #22-11 WOS Lot 106	300-4703	$	36.18		
	Permitting #22-24 WOS Lot 109	300-4703	$	36.18		
	Permitting #22-25 WOS Lot 113	300-4703	$	36.18		
	Inv. 41-0420-16 Permits 2023					
	Permitting #23-02 WOS Lot 114	300-4703	$	65.43		
	Permitting #23-03 Boutwell Farm Lot 1	300-4703	$	37.52		
	Permitting #23-04 Westridge B1L4	300-4703	$	37.52		
	Permitting #23-07 WOS Lot 118	300-4703	$	36.18		
	Permitting #23-11 WOS Lot 122	300-4703	$	36.18		
	Permitting #23-13 Sandhill Shores	300-4703	$	37.52		
	Permitting #23-14 Wiskow Berm	300-4703	$	19.43		
	Permitting #23-15 WOS Lot 102	300-4703	$	36.18		
	Permitting #23-16 Brock Residence	300-4703	$	16.75		
	Permitting #23-17 Sundance Stillwater	300-4703	$	49.50		
	Permitting #23-18 WOS Lot 124	300-4703	$	33.50		
	Permitting #23-19 Liberty Classical Academy Expansion	300-4703	$	3,976.50		
	Inv. 41-0438-04 Permits 2024					
	Permitting #24-06 Rutherford Elementary	300-4703	$	2,437.50		
	Permitting #24-07 Elliot Crossing	300-4703	$	7,256.25		
	Inv. 41-0205-79 CIP Operation and Maintenance	948-4500	$	966.50		
	Inv. 41-0391-22 Milbrook HOA Restoration	948-4500	$	297.00		
	Inv. 41-0418-17 Brown's Ck Pk Restoration	947-0022	$	2,968.31		
	Inv. 41-0440-2 2024 THPP	903-0001	$	865.03		
	Inv. 41-0443-2 Rare Aquatic Plant Outreach	910-0000	$	282.75		
	Inv. 41-0445-2 BCWD Baseline Survey	927-0000	$	1,837.50		
	Inv. 41-0431-3 BCWD 2023 Bio Survey	947-0018	$	2,774.50		
	Inv. 41-0432-7 Enhanced Stakeholder Engagement	927-0000	$	979.50		
	Inv. 41-0434-3 Mendel Wetland Landowner Engagement	961-0000	$	2,681.50		
	Inv. 41-0437-3 2024 OGGC Reuse Maintenance and Monitoring	948-0000	$	835.34		

EOR Cont.	Inv. 41-0441-1 BCWD Drone Flight 2024	959-0001	$	4,700.00		
	Inv. 41-0442-1 2024 Weather Station	957-0000	$	508.40		
	Inv. 41-0444-1 BCWD Data Practices Act	300-4703	$	1,341.75		
	Inv. 41-0446-1 Masterman Long Woodpile Lake Plans	923-0002	$	818.00		
	Inv. 41-0447-1 BCWD 2024 WMP Update	927-0000	$	910.00		
	Inv. 41-0448-1 DPA Permit 18-02	300-4703	$	2,270.00		
	Inv. 41-0450-1 Coordinating WQ Improvements with Member	962-0000	$	396.00	$	58,223.61
Xcel Energy	Inv. 874557159- Iron Enhanced Sand Filter pump operation	948-4500	$	41.65	$	41.65
Washington Conservation District	Inv. 6471 March 2024- Water Monitoring					
	Baseline Water Monitoring- labor	300-4710	$	10,441.25		
	Baseline Water Monitoring- equipment	300-4640	$	1,658.55		
	Inv. 6503 1st Quarter 2024 Educator - EMWREP	300-4810	$	5,120.33	$	17,220.13
Smith Partners	April 2024 Invoices					
	Inv. 44857 Retainer - Meetings, Preparation	200-4410	$	2,184.81		
	Inv. 44858 General Legal Services	300-4410	$	251.10		
	Inv. 44859 Planning	300-4410	$	558.81		
	Inv. 44860 Budget/Levy/Audit	300-4410	$	195.30		
	Inv. 44862 Policy Issues	300-4410	$	586.08		
	Inv. 44861 Permits	300-4703	$	3,127.14		
	Inv. 44863 Lake McKusick Iron-Sand Infiltration	300-4410	$	83.70		
	Inv. 44864 Capital Project Development	300-4410	$	1,285.38		
	Inv. 44865 Brown's Creek Restoration	300-4410	$	662.70	$	8,935.02
Dave McCord	Inv. 4357 March 2024 Accounting Services	200-4330	$	380.00	$	380.00
Karen Iverson	2024 Spring Newsletter	910-0000	$	600.00	$	600.00
Abdo	Inv. 487324 2023 Audit	200-4331	$	8,000.00	$	8,000.00
Heritage Embroidery	Inv. 59941 2024 Apparel Order	910-0000	$	487.00	$	487.00
Total Amount Disbursed					**$**	**93,887.41**

BROWN'S CREEK WATERSHED DISTRICT
5/8/2024
MONTHLY ITEMS DEPOSITED - Page 1 of 1

VENDOR	INVOICE/DESCRIPTION	ACCOUNT #	CK NO	DEPOSIT DATE		TOTAL
Indian Hills Golf Club	#24-07 Permit Deposit	300-4703	16482	5/1/2024	$	5,900.00
Metropolitan Council	2024-2025 WOMP Grant Initial Payment	100-3601	2053834	5/1/2024	$	4,500.00
4M Fund	Dividend	100-3700	Direct Deposit	4/30/2024	$	4,786.98
TOTAL AMOUNT DEPOSITED:					**$**	**15,186.98**

5/8/24				
	4M Fund			
Total Bank Balance			$ -	1,045,033.04
Less Accounts Payable			$ -	93,887.41
Plus Unrecored Deposits since			$ -	10,400.00
Total Balance			$ -	961,545.63

Project Name |	BCWD Permit 24-06 2024 Rutherford Elementary Site Improvements	**Date** |	05/03/2024
To / Contact info |	BCWD Board of Managers		
Cc / Contact info |	TJ Rose; Larson Engineering, Mitch Honsa; Larson Engineering, Tony Willger; Stillwater School District		
Cc / Contact info |	Karen Kill, Administrator / BCWD		
From / Contact info |	Paul Nation, PE; John Sarafolean / EOR		
Regarding |	Permit Application No. 24-06 Engineer's Report		

The following review of the above-mentioned project located within the legal jurisdiction of the Brown's Creek Watershed District (BCWD) was conducted to determine compliance with the BCWD rules for purposes of the engineer's recommendation to the Board of Managers for its determination of the permit application.

Applicant: Stillwater School District
Permit Submittal Date: *04/02/2024*
Completeness Determination: 04/12/2024
Board Action Required By: 06/11/2024
Review based on BCWD Rules effective April 1, 2020
Recommendation: Consider variance request and otherwise Approve with Conditions

GENERAL COMMENTS

The applicant proposes site improvements to the existing Rutherford Elementary school in Stillwater. The project site includes the 16.1-acre Rutherford Elementary parcel and the adjacent 2.7-acre Washington County parcel to the north shown in Figure 1. The Washington county parcel is included because of the land-disturbing activities to connect the Rutherford Elementary and Washington county trail systems. The total site area is 18.8 acres.

Existing conditions: The project site is located southeast of the intersection of 75th Street North and Rutherford Road. The existing Rutherford Elementary parcel consists of turf grass, three baseball fields, bituminous basketball courts, two playgrounds, parking lots, and the elementary school building.

The applicant proposes:

- removal of a 5,455-sf impervious gravel ball field on the east side of the property and replacement with a new 10,430 square feet (sf) pervious playground and 4,736 sf impervious gaga ball pit;
- construction of a new pervious playground and 5,344 sf bituminous gaga ball pit, with 1,524 sf of reconstructed gravel ball field to concrete walk to access the playground,
- reconstruction of the pervious playground on the west side of the property with a new 5,840 sf pervious playground and new 457 sf concrete walk to access the playground,
- overlay of a 4,232 sf gravel trail with a new 9,716 sf bituminous trail system around the east side of the property,

- construction of storm sewer improvements and a 5,200 sf infiltration basin to treat stormwater.

The project site impervious will increase from 7.4 acres to 7.6 acres, an increase of 3 percent. The proposed improvements will create 0.23 acres of new impervious. There is 265,366 sf of existing impervious on the site, proposed new and reconstructed impervious totals 14,254 sf which is less than 50 percent of existing impervious surface, therefore the BCWD stormwater criteria apply only to reconstructed and net additional impervious surface, and all disturbed areas on the project site.

None of the stormwater generated from the new and reconstructed impervious surface will be treated by the new infiltration basin to be installed; instead, the applicant has submitted a variance supported by proposed treatment-in-lieu of runoff from existing impervious area. The stormwater runoff generated by the trail will flow overland through a large turf grass field before being picked up by the existing storm sewer on site and routed to Rutherford Pond. The new infiltration basin is being installed north of the school's main parking lot and will capture the stormwater runoff generated by the upgradient bituminous parking lot that is not proposed to be disturbed. The parking lot flows to the curb and gutter encompassing the north side of the parking lot.

The Rutherford Elementary site contributes surface stormwater to the South-Central Tributary which is classified as a groundwater dependent natural resource, by way of Rutherford Pond and a wetland to the north before flowing north through a culvert pipe under 75th St. N. Therefore, the project must also meet the requirements of BCWD Rule 2.5.3 Basin in contributing area to groundwater-dependent natural resource.

Recommendation: The BCWD engineer recommends that the board consider the applicant's variance request in light of the analysis provided below and otherwise approve the application with the conditions outlined in the report.

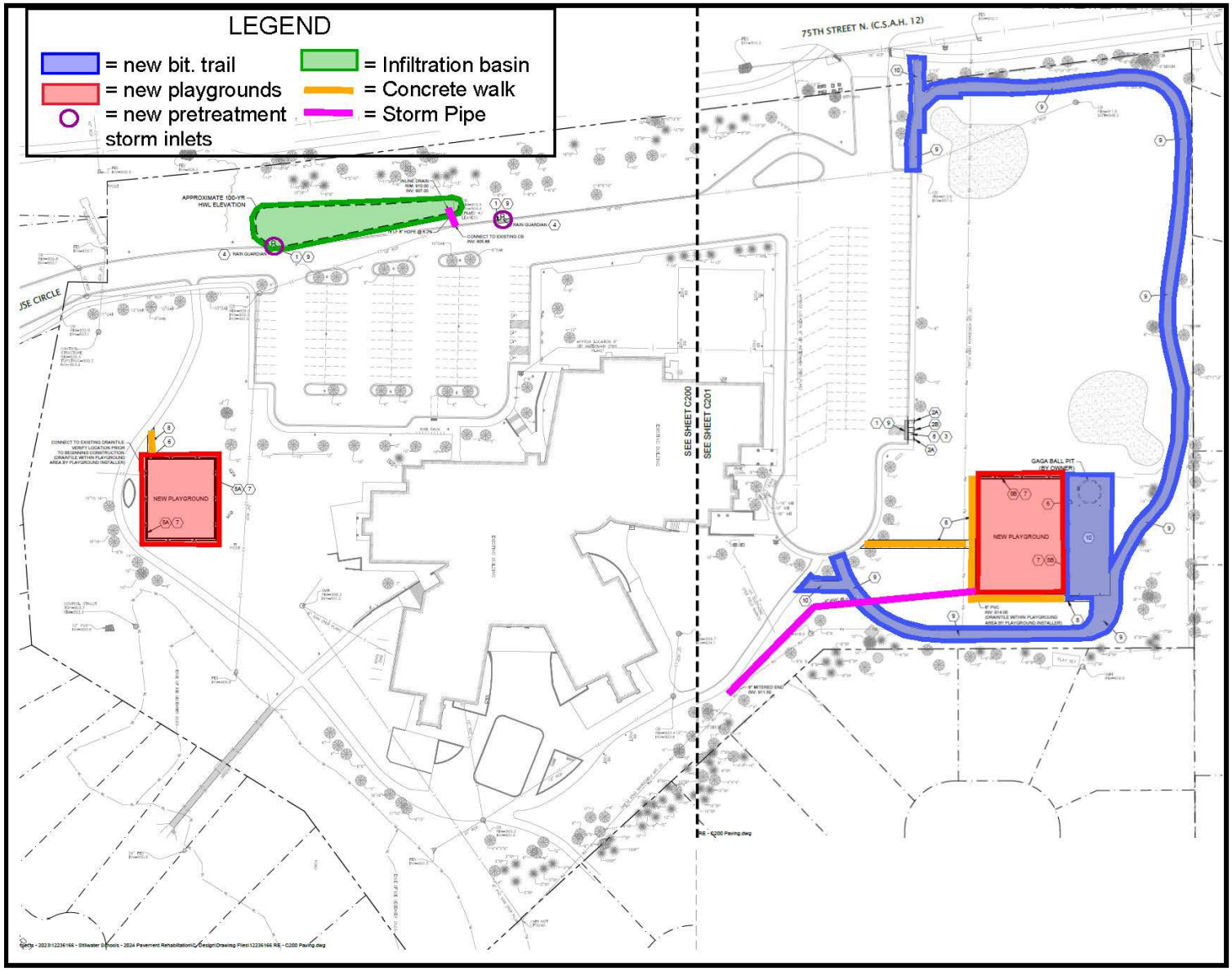


Figure 1: Site Plan

Rule 2.0—STORMWATER MANAGEMENT

Under 2.2(b) of the rules, the proposed project triggers the application of Rule 2.0 Stormwater Management because it is a redevelopment creating impervious surface that, aggregated with existing impervious on the site, equals 6,000 square feet (sf) or more on a site within the surface water contributing area of a groundwater-dependent natural resource. Because the proposed activity will disturb less than 50 percent of existing impervious surface, the criteria will apply only to reconstructed and net additional impervious surface, and all disturbed areas on the project site. The site is located within the Diversion Structure Subwatershed, so the stormwater criteria in subsection 2.4.1(b) apply.

The stormwater management plan for the project includes:

- *Constructing an infiltration basin to treat runoff from the school parking lot.*
- *Rain Guardian pretreatment inlets for the infiltration basin.*

The existing drainage of the project site consists of three discharge points: north, east, and west. Two drainage areas on the north side of the site totaling 0.78 acres in size drain overland to the north discharge point through turf grass and a wooded area into the ditch along 75th St. N. then travel from the ditch by culvert to a 0.67-acre wetland located at the northwest corner of the site. The east discharge point is fed by one drainage area that is 0.33 acres in size. The stormwater runoff sheet flows over turf grass discharging onto the adjacent property to the east. The west discharge point consists of an existing stormwater retention basin, Rutherford Pond, that was constructed with the initial construction of Rutherford Elementary and a 0.67-acre wetland immediately to the north. The west discharge point is fed by nine drainage areas on site totaling 13.4 acres in size. Stormwater runoff to the west runs overland through turf grass directly to the pond and wetland, and sheet flows over turf grass and impervious surfaces into existing storm sewer discharging into Rutherford Pond.

Under proposed conditions, drainage to the east discharge point will remain the same. Stormwater discharge to the north will be reduced with the construction of the infiltration basin but continuing to overland sheet flow through the turf grass and wooded areas. The Stormwater discharge to the west will decrease due to runoff diverting from flowing in existing storm sewer to Rutherford Pond to the infiltration basin, the mechanisms of reaching the discharge point will remain the same. All the new and reconstructed impervious surfaces on the site are within drainage areas that drain to the west discharge point.

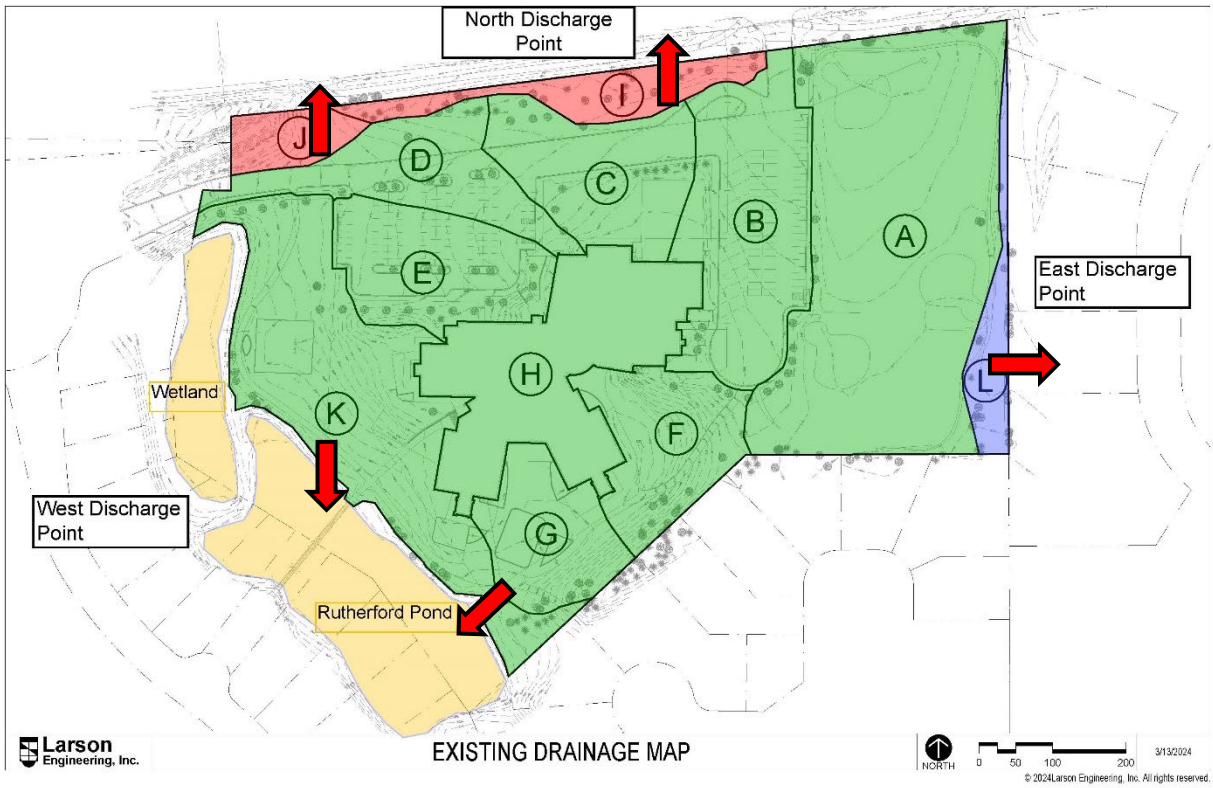


Figure 2: Existing site drainage.

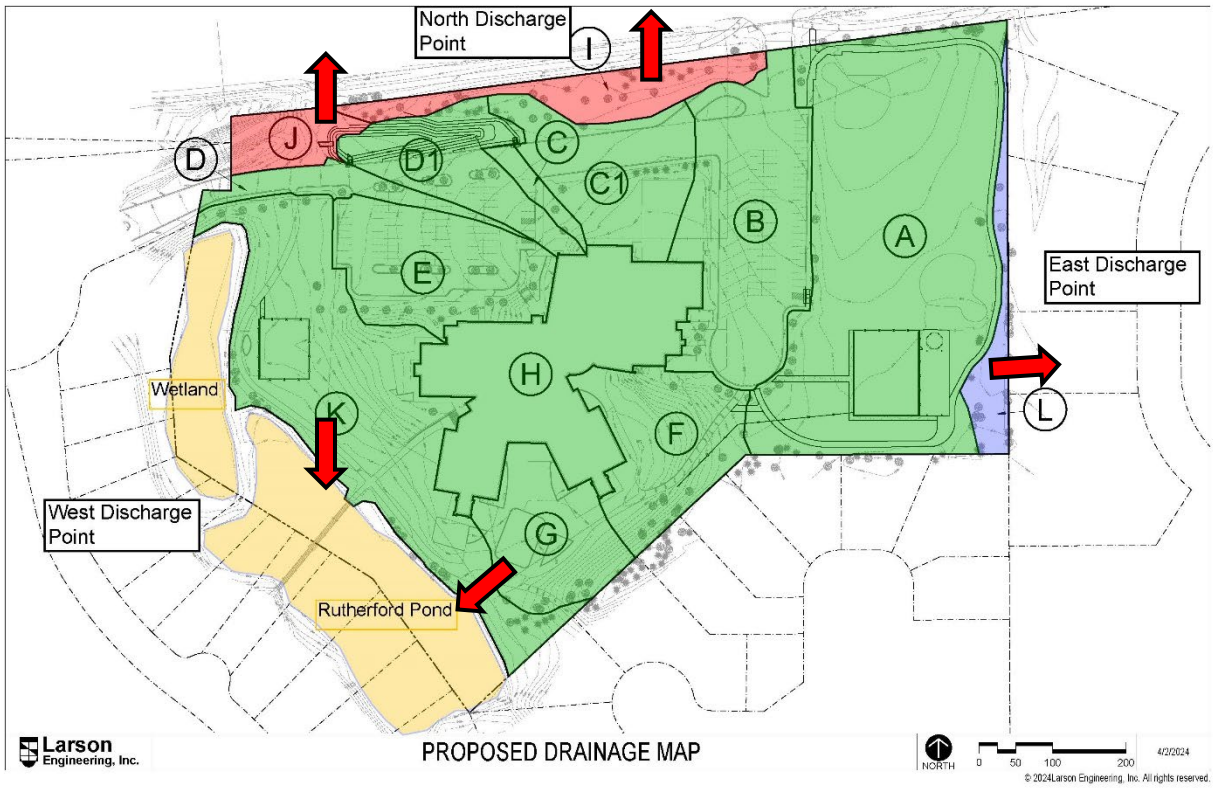


Figure 3: Proposed site drainage.

Rate Control

According to BCWD Rule 2.4.1(b)(i), an applicant must submit a stormwater-management plan providing no increase in the existing peak stormwater flow rates from the site for a 24-hour precipitation event with a return frequency of two, 10 or 100 years for all points where discharges leave the site.

☒ Rule Requirement met.

The stormwater management plan developed for the site was evaluated using a HydroCAD model of existing and post-development site conditions. A comparison of the modeled peak flow rates from existing to proposed conditions for the North, East, and West discharge points is included in Table 1, Table 2, and Table 3

Table 1 – Peak Discharge Rate "North"

Event	*Existing Runoff Rate (cfs)*	*Proposed Runoff Rate (cfs)*
2-year (2.80")	0.9	0.9
10-year (4.17")	2.0	2.0
100-year (7.23")	4.9	4.9

Table 2 - Peak Discharge Rate "East"

Event	*Existing Runoff Rate (cfs)*	*Proposed Runoff Rate (cfs)*
2-year (2.80")	0.4	0.3
10-year (4.17")	0.8	0.6
100-year (7.23")	1.9	1.5

Table 3 - Peak Discharge Rate "West"

Event	*Existing Runoff Rate (cfs)*	*Proposed Runoff Rate (cfs)*
2-year (2.80")	26.5	24.0
10-year (4.17")	44.7	40.0
100-year (7.23")	88.9	85.3

Volume Control

According to BCWD Rule 2.4.1(b)(ii), an applicant must submit a stormwater-management plan providing retention onsite of 1.1 inches of stormwater volume from the regulated impervious surface on the site.

☐ Rule Requirement Not Met. *See analysis of variance request under Rule 10.0 section below.*

The proposed activities onsite will disturb less than 50 percent of the existing impervious surfaces onsite. Therefore, the stormwater criteria will apply only to reconstructed and net additional impervious surface, and all disturbed surfaces on the project site. The total regulated impervious surface to be treated onsite equals 14, 254 sf. The applicant is proposing to implement an infiltration basin along the north side of the property for volume control. The infiltration practice will be treating and storing water that drains from the parking lot that is not proposed to be disturbed in drainage areas C1 and D1 as shown on the proposed drainage map in Figure 3. The volume control requirement is not met, and the applicant has requested a variance to this requirement because the infiltration basin is not treating stormwater runoff from any of the new or reconstructed impervious surfaces. The stormwater from the new and reconstructed impervious surfaces is captured by existing storm sewer and discharged into Rutherford Pond. A summary of the required stormwater volume is shown in Table 4 *.*

The infiltration basin has been oversized to provide stormwater management for 18,582 sf of future impervious surface re/development. Such future redevelopment and stormwater management will need to be evaluated against the BCWD Rules in place at the time of the future submittal.

Table 4 - Summary of Volume Requirements

Impervious Surface Area (sf)	*Required Volume (cf)*	*Provided Volume (cf)*
14,254	1,306	7,294

Infiltration Pretreatment

According to BCWD Rule 2.5.2 surface flows to infiltration facilities must be pretreated for long-term removal of at least 50 percent of sediment loads.

☐ Rule Requirement Not Met. *See analysis of variance request under Rule 10.0 section below.*

Lake/Wetland Bounce

According to BCWD Rule 2.4.1(b)(iii), an applicant must submit a stormwater-management plan providing no increase in the bounce in water level or duration of inundation for a 24-hour precipitation event with a return frequency of two, 10 or 100 years in the subwatershed in which the site is located, for any downstream lake or wetland beyond the limit specified in Appendix 2.1.

☒ Rule Requirement Met.

Wetland bounce and inundation was analyzed for the 2-year, 10-year, and 100-year 24-hour rainfall events using the submitted HydroCAD analysis for pre-development vs. proposed conditions. The wetland onsite has not been classified, therefore the applicant assumed the wetland to be classified as a "preserve", the most conservative assumption. Preserve wetlands have a permitted bounce of pre-development, and a permitted inundation of existing. Table 5 and Table 6 show that the standards are met for rule 2.4.1(b)(iii).

Table 5 - Wetland Bounce Summary

Wetland	*Existing HWL (ft)*	*Proposed HWL (ft)*	*Bounce (ft)*
Preserve	903.96	903.94	-0.02

Table 6 - Wetland Inundation Summary

	Pre-Development Duration of Inundation (hrs)			*Proposed Duration of Inundation (hrs)*			*Change in Duration of Inundation (hrs)*		
Wetland	*2-year*	*10-year*	*100-year*	*2-year*	*10-year*	*100-year*	*2-year*	*10-year*	*100-year*
Preserve	56.4	88.0	142.6	52.2	83.8	141.4	-7.4	-4.8	-1.2

Basins in Contributing Area to Groundwater-Dependent Natural Resources

According to BCWD Rule 2.5.3, a stormwater basin within the surface contributing area to a groundwater-dependent natural resource must contain and infiltrate the volume generated by a two-year, 24-hour storm event, if feasible.

☒ Rule Requirement Met.

The proposed infiltration basin contains and infiltrates the entire volume of the two-year, 24-hour storm event satisfying this requirement.

Rule 2.0 Conditions:

2-1. Provide BCWD with the final Civil Plan Set (BCWD 2.7.9).

2-2. Enter into an agreement for stormwater maintenance.

Rule 3.0—EROSION CONTROL

According to BCWD Rule 3.2, all persons undertaking any grading, filling, or other land-altering activities which involve movement of more than fifty (50) cubic yards of earth or removal of vegetative cover on five thousand (5,000) square feet or more of land must submit an erosion control plan to the District, and secure a permit from the District approving the erosion control plan. The proposed project triggers the application of Rule 3.0 Erosion Control because of land altering activities involving movement of more than fifty cubic yards of earth and removal of vegetative cover on five thousand square feet or more of land.

☒ Rule Requirements Met with Conditions

The erosion and sediment control plan includes:

- *Silt fence*
- *Redundant silt fence*

- *Rock construction entrance*
- *Inlet protection*
- *Rip rap at stormwater outflows*
- *Temporary seeding and blanketing*

The following conditions must be addressed in the erosion and sediment control plan to comply with the District's requirements:

Rule 3.0 Conditions:

3-1. Provide the contact information for the erosion and sediment control responsible party during construction once a contractor is selected. Provide the District with contact information for the Erosion Control Supervisor and the construction schedule when available (BCWD 3.3.2).

3-2. Provide stabilization measures for final restoration of areas that are being seeded.

Rule 4.0—LAKE, STREAM, AND WETLAND BUFFER REQUIREMENTS

According to BCWD Rule 4.2.1, Rule 4.0 applies to land that is (a) adjacent to Brown's Creek; a tributary of Brown's Creek designated as a public water (Minnesota Statutes section 103G.005, subdivision 15); a lake, as defined in the rules; a wetland one acre or larger; or a groundwater-dependent natural resource; and (b) that has been either (i) subdivided or (ii) subject to a new primary use for which a necessary rezoning, conditional use permit, special-use permit or variance has been approved on or after April 9, 2007, (for wetlands and groundwater-dependent natural resources other than public waters) or January 1, 2000 (for other waters).

☐ Rule Not Applicable to Permit. *There are no lakes or streams within the site. The one wetland on the project site does not require a buffer as it is less than one acre in size and is not a groundwater dependent natural resource.*

Rule 5.0—SHORELINE AND STREAMBANK ALTERATIONS

According to BCWD Rule 5.2, no person may disturb the natural shoreline or streambank partially or wholly below the ordinary high water mark of a waterbody, without first securing a permit from the District.

☐ Rule Not Applicable to Permit. *There are no proposed shoreline or streambank alterations.*

Rule 6.0—WATERCOURSE AND BASIN CROSSINGS

According to Rule 6.2, no person may use the beds of any waterbody within the District for the placement of roads, highways and utilities without first securing a permit from the District.

☐ Rule Not Applicable to Permit. *There are no proposed watercourse or basin crossings.*

Rule 7.0—FLOODPLAIN AND DRAINAGE ALTERATIONS

According to Rule 7.2, no person may alter or fill land below the 100-year flood elevation of any waterbody, wetland, or stormwater management basin, or place fill in a landlocked basin, without first obtaining a permit from the District. No person may alter stormwater flows at a property

boundary by changing land contours, diverting or obstructing surface or channel flow, or creating a basin outlet, without first obtaining a permit from the District.

Rule 7.0 is not triggered because there is no floodplain fill or drainage alterations at the property boundary. Rule 7.3.2 applies because rule 2.0 stormwater management is applicable.

☒ Rule Requirements Met

According to BCWD rule 7.3.2 all new and reconstructed buildings must be constructed such that the lowest floor is at least two feet above the 100-year high water elevation or one foot above the emergency overflow (EOF) of a constructed basin.

The 100-year high water elevations, EOFs, and lowest adjacent building elevations were evaluated and meet the District's low floor requirement as demonstrated in Table 6. Stormwater flows at property boundaries remain the same from existing to proposed conditions.

Table 6 - Freeboard Requirement Summary

Stormwater Facility	*EOF*	*100-Year HWL*	*Allowable Lowest Floor*	*Rutherford Elementary Lowest Floor*
Infiltration Basin	910.00	910.52	912.52	915.33

Rule 8.0—FEES

As the Stillwater School District is a government entity, the applicant is exempt from permit fees.

Rule 9.0—FINANCIAL ASSURANCES

As the Stillwater School District is a government entity, the applicant is exempt from financial assurances.

Rule 10.0—VARIANCES

According to BCWD Rule 10.0, the Board of Managers may hear requests for variances from the literal provisions of these Rules in instances where their strict enforcement would cause undue hardship because of the circumstances unique to the property under consideration. The Board of Managers may grant variances where it is demonstrated that such action will be keeping with the spirit and intent of these rules. Variance approval may be conditioned on an applicant's preventing or mitigating adverse impacts from the activity.

The Permit Applicant has submitted a request for a variance from the following rule provision:

1. *BCWD Rule 2.4.1(b)(ii) states, "Within the Diversion Structure Subwatershed… an applicant must submit a stormwater-management plan providing: (ii) Retention onsite of 1.1 inches of stormwater volume from the regulated impervious surface."*

As noted under Rule 2.0, the proposed infiltration basin provides retention of 7,294 CF, exceeding the volume required by Rule 2.4.1(b)(ii). However, the stormwater volume is coming from existing impervious (parking lot) instead of regulated impervious and therefore requires a variance.

The permit applicant has asserted the following regarding the feasibility of treating regulated impervious.

- *Due to the linear nature of the trail, it was not feasible to capture the runoff directly from the trail in a stormwater BMP.*
- *The BMP would have needed to consist of swales and pipes to route runoff from the trail to a proposed BMP.*
- *The athletic field downstream of the proposed trail and playground improvements would become smaller to fit the BMP, which is not desirable.*
- *The proposed location of the infiltration basin was chosen due to its ability to easily capture runoff from the existing parking lot.*
- *Parking lot runoff will typically have more sediment and pollutants than a walking trail. By capturing runoff from the existing parking lot, the applicant asserts that significantly more benefit to downstream waterbodies will be achieved.*
- *Although the runoff directly from the new trail will not be treated in the proposed infiltration basin, runoff from the trail will flow over the large grass field prior to entering the existing storm sewer system.*

The project includes an infiltration basin designed to meet the stormwater requirements in an in-lieu fashion (rate, volumes, and water quality). Therefore, pretreatment is required for runoff directed to this facility. All runoff directed to the infiltration basin will first be directed to two Rain Guardian Turret pretreatment inlet structures. According to the University of Minnesota St. Anthony Falls Laboratory Project Report No. 586, the Rain Guardian Turret structures capture 75% of sediment loads, demonstrating compliance with Rule 2.5.2.

The BCWD engineer concurs that it would have been more technically complex to design a BMP to treat the regulated impervious but disagrees that it is infeasible. However, the BCWD engineer concurs that the proposed design provides greater protection to the downstream waterbodies than would a BMP designed to treat the walking trail. The annual phosphorus load originating from the parking lot is anticipated to exceed that from the recreational trail. This is primarily attributable to the greater diversity of phosphorus and pollutant deposition sources present in the parking lot environment. For instance, vehicular traffic, in conjunction with pedestrian activity, contributes to a higher pollutant load compared to the recreational trail. Based on the above, the BCWD engineer finds that the applicant has provided a sufficient factual and analytical basis for the managers to grant the variance request. If the managers decide to grant the variance, the applicant will need to acknowledge that compliance with BCWD (and other) stormwater-management and water resource-protection requirements for future redevelopment work will need to account for the noncompliance here (e.g., a portion of the capacity of the stormwater facility would be already "used" under this application) and may be made more difficult.

Rule 10.0 Conditions:

10-1. Applicant acknowledgement that 1,306 cf of stormwater runoff from regulated impervious has been accounted for with the proposed improvements, leaving 1,704 cf of stormwater runoff of available capacity to be used in future development.

10-2. Applicant acknowledgement that future development or redevelopment will need to be evaluated against the BCWD Rules in place at the time of the future submittal.

RECOMMENDED CONDITIONS OF THE PERMIT:

The following is a summary of the remaining tasks necessary to bring the project into compliance with the BCWD Rules in all respects other than where variances are requested as discussed above:

1. Provide documentation from Washington County approving the trail connection.
2. Address all stormwater management requirements (Conditions 2-1 to 2-2).
3. Address all erosion control requirements (Conditions 3-1 to 3-2).
4. Address all variance requirements (Conditions 10-1 to 10-2).

STIPULATIONS OF APPROVAL:

1. Note that the permit, if issued, will require that the applicant notify the District in writing at least three business days prior to commencing land disturbance. (BCWD Rule 3.3.1)
2. To ensure that construction is carried out according to the approved plan, provide verification that construction standards have been met for all infiltration basins. This includes but is not limited to confirmation that infiltration basin sub-cut reaches soil material reflected in the geotechnical report and that the vegetation establishment procedures have been followed per the landscaping/restoration plan. This can be achieved by scheduling a BCWD inspection during the excavation of the basins, independent geotechnical engineer observation and note of confirmation, or clear photographic evidence by the onsite engineer along with collected survey elevations of the basins.
3. Provide the District with As-built record drawings showing that the completed grading and stormwater facilities conform to the grading plan.

Project Name |	Brown's Creek Biological Assessments	**Date** |	04/03/2024
To / Contact info |	BCWD Board of Managers		
Cc / Contact info |	Karen Kill, District Administrator		
From / Contact info |	Mike Majeski, Conservation Biologist		
Regarding |	Macroinvertebrate Data Summary_2015-2023		

Background

The BCWD has been conducting routine fish and macroinvertebrate assessments since 2015 to monitor changes in the biological community of Brown's Creek following implementation of numerous water quality projects in the watershed (see implementation activity under Stream Management, Goal A of the 2017-2026 Watershed Management Plan). The goals of BCWD's routine fish and macroinvertebrate assessments are to develop a more robust understanding of the variability of species composition over time and to develop a long-term trend analysis of changes to the biological community in Brown's Creek in response to on-going water quality projects implemented in the watershed. Macroinvertebrate assessments have been conducted annually as populations and species diversity can change quickly due to changes in their environment, in part due to their short life spans and sensitivities to changes in water quality. Conversely, fish have longer lifespans and populations are generally slower to respond to changes in their environment compared to macroinvertebrates. The last fish survey was conducted in 2021 by MNDNR fisheries staff.

The Minnesota Pollution Control Agency (MPCA) has been using this data to assess the watershed's specific water quality standards and designated uses as part of their long-term Intensive Watershed Monitoring Plan. As part of MPCA's biological assessment, fish and macroinvertebrate-based indices of biological integrity (IBI) have been developed to track long-term trends in the biological community of each watershed studied. Fish and macroinvertebrate IBI's are based on the number and diversity of fish and macroinvertebrate species present in a stream compared to what the stream is expected to support. The following is a summary of macroinvertebrate data collected from 2015-2023.

2023 Macroinvertebrate Assessment

Macroinvertebrates were sampled from three sites along Brown's Creek including the Headwaters, Middle Reach, and Gorge (Figure 1). In 2023, the sampling was only conducted in the fall (September) based on input and recommendations from MPCA staff. The fall period is when most macroinvertebrate sampling is conducted since the overall macroinvertebrate community is better represented in the fall (e.g., more species are present in the fall compared to the spring).

Macroinvertebrate specimens were sent to RMB for taxonomic identification to the genus level, and a subsequent report was completed by RMB summarizing the macroinvertebrate IBI scores and results from the 2015-2023 surveys (Appendix A). Key findings from the macroinvertebrate surveys are provided below.

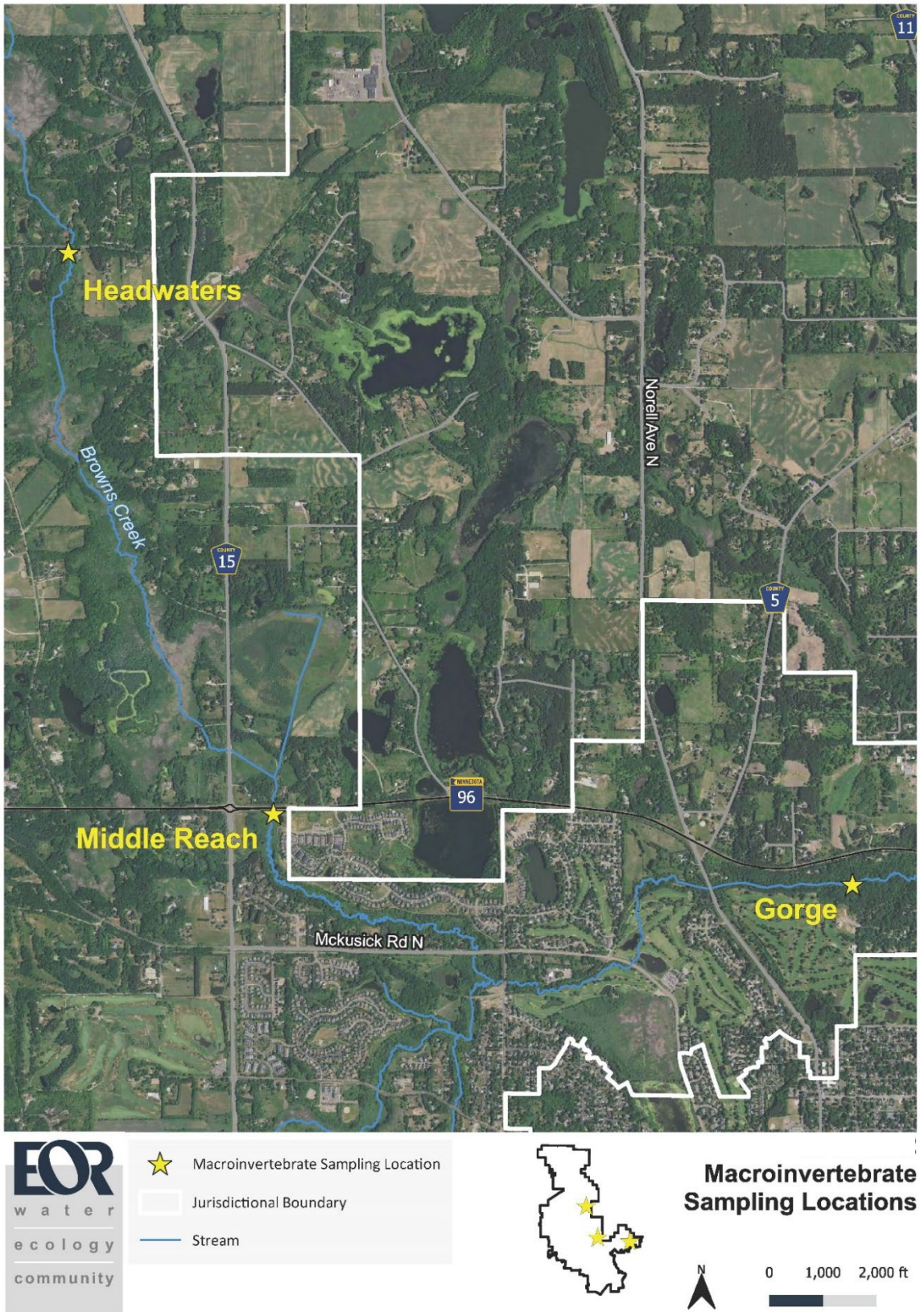


Figure 1. Macroinvertebrate sampling locations in the BCWD, 2015-2023

Key Findings

- Data collected from 2015-2023 indicates an overall upward (improving) trend in stream health and macroinvertebrate community quality.

- The calculated IBI scores from all 3 sites from 2015-2023 indicate a stable and improving macroinvertebrate community since 2015, with most macroinvertebrate IBI scores occurring between the General Use and Exceptional Use thresholds for the Southern Coldwater Streams region (Figure 2). In particular, the Gorge IBI scores have improved the most during the study and have remained above the Exceptional Use threshold since 2019. Of the 17 samples that have scored above the Exceptional Use Threshold over the course of the project, 14 of those samples have occurred since 2019. Most notably, all three fall 2019 samples were above the Exceptional Use Threshold.

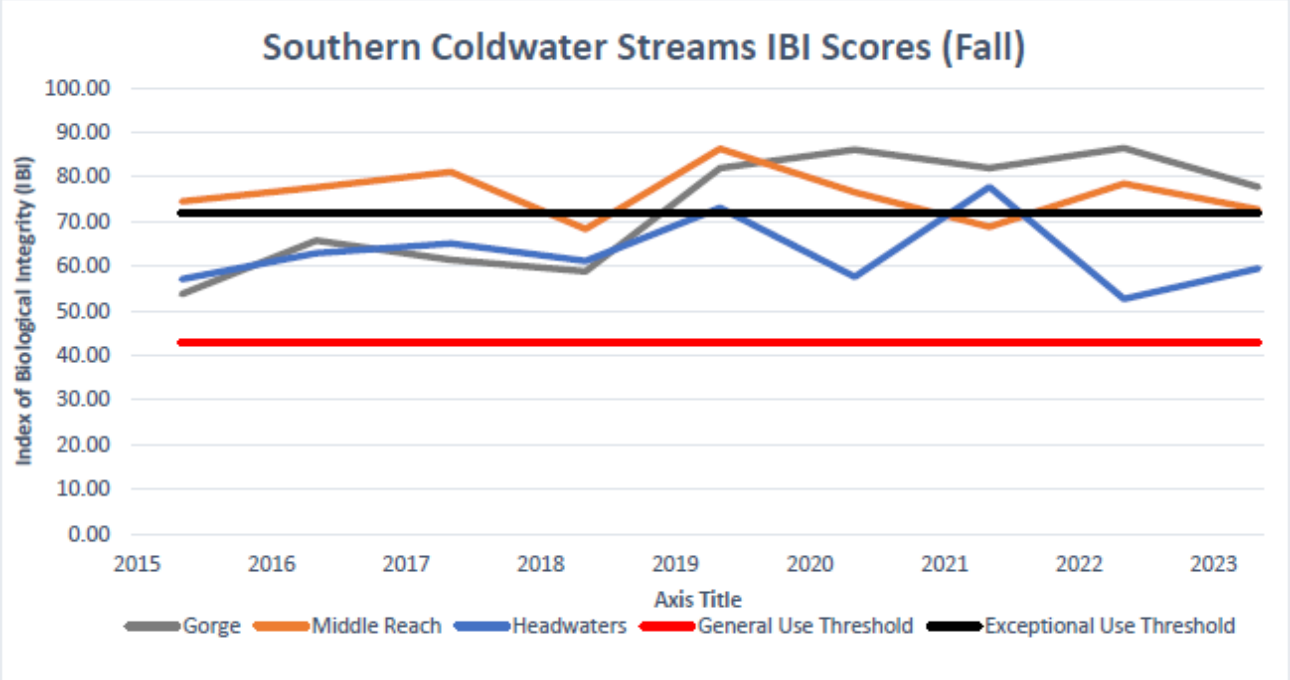


Figure 2. Fall season IBI scores from Brown's Creek and associated General Use and Exceptional Use thresholds. Source: RMB Macroinvertebrate Stream Monitoring Assessment 2015-2023 (Figure 6, Appendix A)

- The total number of taxa sampled from 2015-2023 indicates a diversity of species present across all 3 sites (140 unique taxa to date), with the three most dominant taxa having a medium-level tolerance to pollution. However, good numbers of intolerant taxa (species intolerant of pollution) are also present which indicates the stream provides ample habitat and water quality to support these sensitive species.

- The Perlodid stonefly has been collected every year from the Gorge site, indicating the creek provides ample habitat and oxygen levels for this pollution intolerant species. Perlodid stoneflies were also collected from the Middle Reach from 2020-2022.
- The average pollution tolerance score has decreased since 2015, indicating the creek is supporting a greater number of species that are considered intolerant to pollution (Figure 3). This trend is also reflective in the population size of intolerant species, with the number of pollution intolerant specimens steadily increasing since 2015 (Figure 4). Pollution intolerant taxa are present in good numbers at all 3 sampling sites and suggest Brown's Creek is providing suitable habitat and water quality for macroinvertebrates throughout the creek corridor.

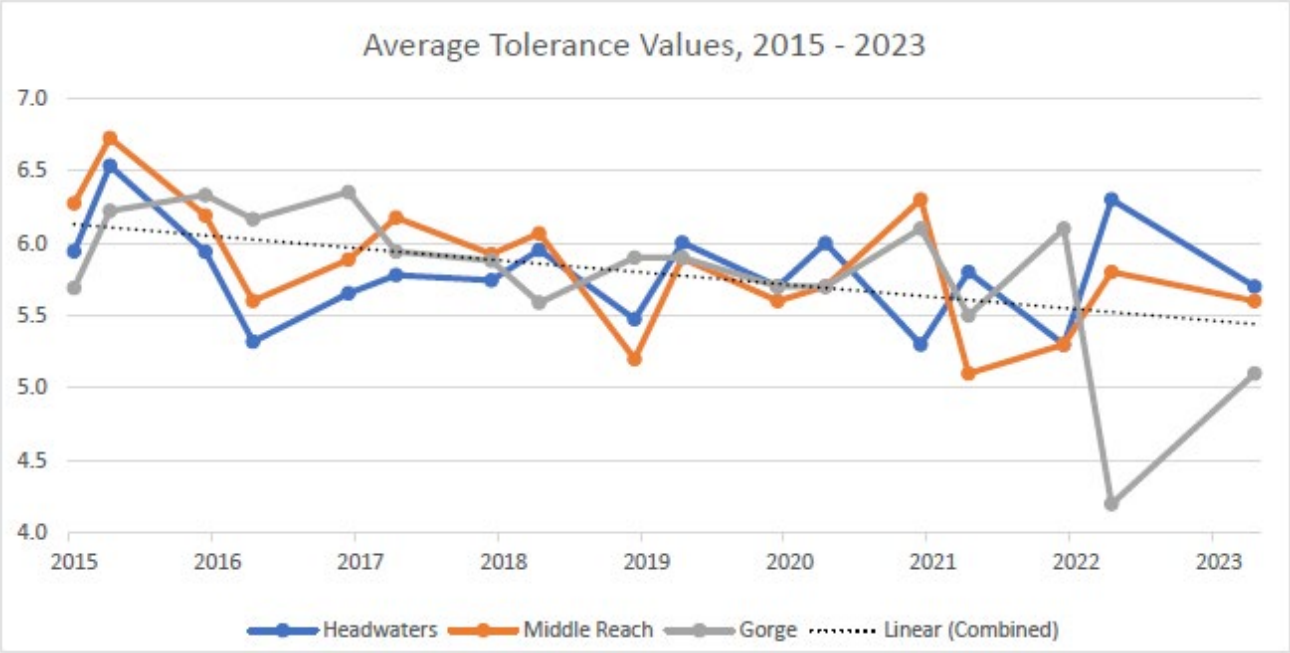
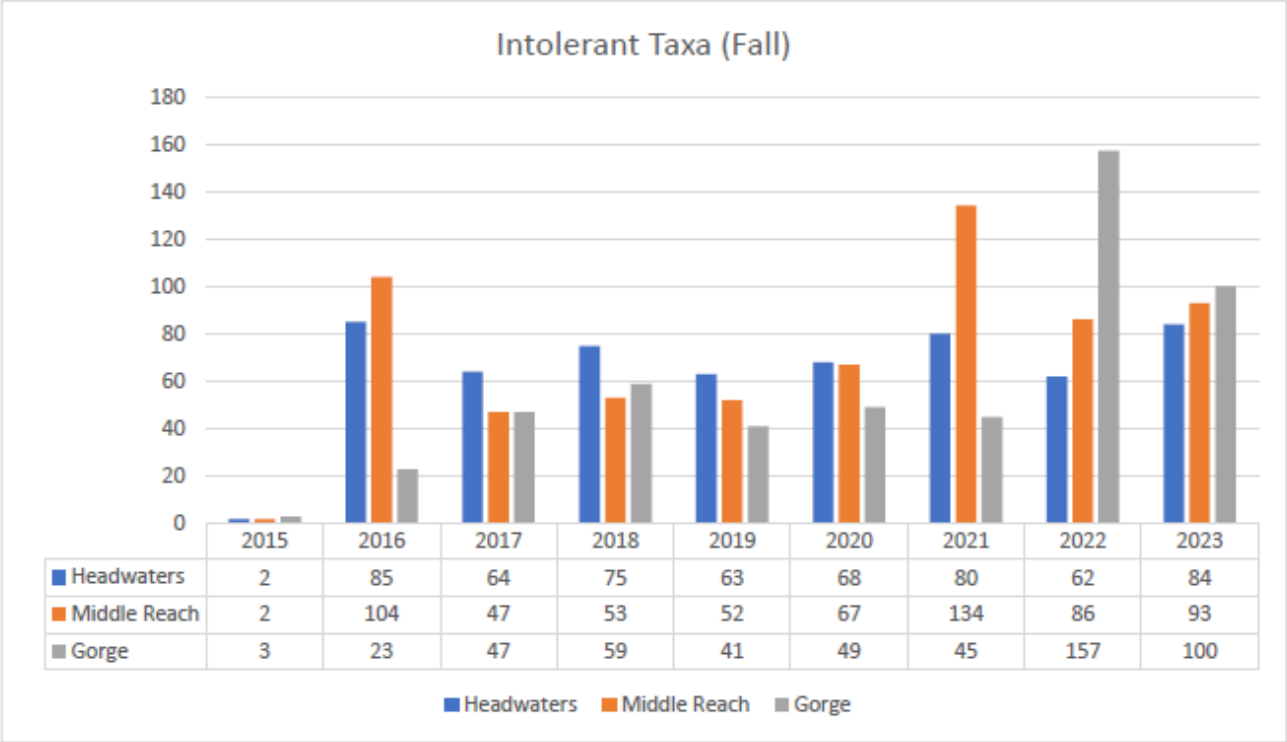


Figure 3. Average pollution tolerance values for Brown's Creek macroinvertebrates from 2015-2023. Source: Source: RMB Macroinvertebrate Stream Monitoring Assessment 2015-2023 (Figure 4, Appendix A)



	2015	2016	2017	2018	2019	2020	2021	2022	2023
Headwaters	2	85	64	75	63	68	80	62	84
Middle Reach	2	104	47	53	52	67	134	86	93
Gorge	3	23	47	59	41	49	45	157	100

Figure 4. Comparison of total numbers of intolerant taxa collected in Brown's Creek from 2015-2023 (Fall samples only). Source: RMB Macroinvertebrate Stream Monitoring Assessment 2015-2023 (Figure 9, Appendix A)

Appendix A

RMB Report: Macroinvertebrate Stream Monitoring Assessment 2015-2023

Macroinvertebrate Stream Monitoring Assessment 2015 – 2023

Emmons & Olivier Resources, Inc.

April 2nd, 2024

RMB Environmental Laboratories

Authored by: Jefferey Kasowski

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22796 County Highway 6
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Report Date: April 2nd, 2024

To: Mike Majeski
Emmons & Olivier Resources, Inc.
1919 University Ave W Suite 300,
St. Paul, MN 55104

Subject: Macroinvertebrate Assessment of Brown's Creek

From: Jefferey Kasowski
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Acknowledgements: James DiGiulio, Aquatic Biology Associates, Inc: taxon identification and taxon quality control verification

Joel Chirhart, Minnesota Pollution Control Agency: IBI calculations

Kaira Kamke: Report

Moriya Rufer: Report

Table of Contents

Introduction

Macroinvertebrates provide a valuable insight into the health of a stream ecosystem since most taxa require specific conditions to survive and thrive. Stream parameters like temperature, flow speed, substrate type, dissolved oxygen, and pollution inputs can all impact which invertebrates will be found at a site. Evaluating the invertebrate community in a stream or river can reveal impacts to the aquatic ecosystem and trends in the water quality.

From 2015 – 2022, aquatic macroinvertebrates were collected in May or June and September from Brown's Creek in Washington County, Minnesota. In 2023, aquatic macroinvertebrates were collected September only. The Minnesota Pollution Control Agency (MPCA) Index of Biotic Integrity (IBI) was calculated for all stream sites to assess the water quality and compare sites. Samples were collected along the stream reach at the Headwaters, Middle Reach, and Gorge sites to evaluate how the quality changes along the gradient (Figure 1). Brown's Creek is located within the Southern Coldwater Streams invertebrate class (Figure 2). Samples were repeated each year beginning in 2015 to evaluate changes over time. The collection of this data is essential for compiling a baseline dataset of

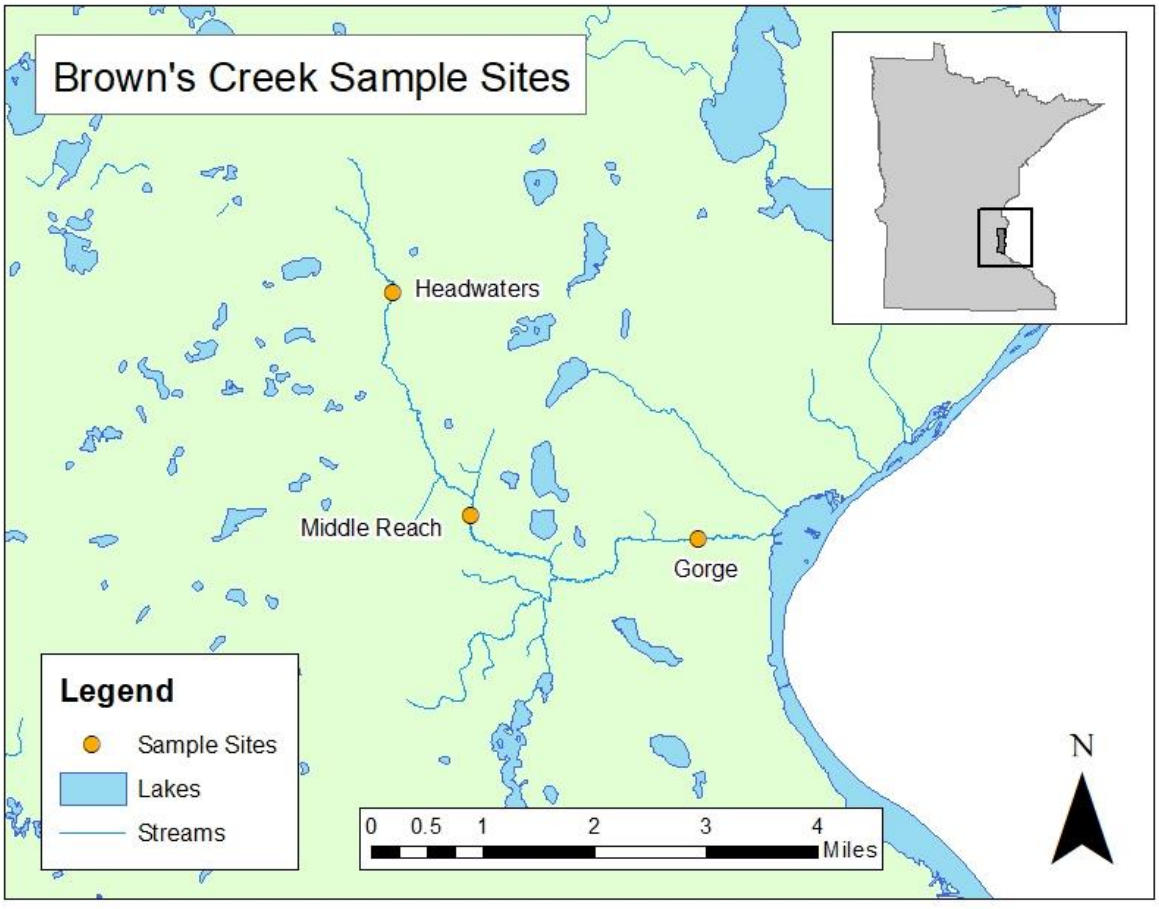


Figure 1: Macroinvertebrate monitoring sites in Brown's Creek, 2015-2023

invertebrates found in this region, which can be used for assessments of impacts or future restoration projects on this stream.

Methods

Sample Collection

The aquatic macroinvertebrate samples collected from 2015 – 2023 were located at the Headwaters, Middle Reach, and Gorge sites of Brown's Creek. Samples were collected with a D-frame net following the MPCA's Standard Operating Procedure (SOP) for multi-habitat collection of stream invertebrates (MPCA). They were then preserved and delivered to RMB Environmental Laboratories, Inc. (RMBEL) in Detroit Lakes, MN for laboratory processing and data analysis.

Laboratory Processing

The macroinvertebrate samples were processed following MPCA methods, including sorting random subsamples to a target specimen count of 300. All taxa were enumerated and identified to genus level, with leeches and snails identified to species where possible. Representative taxa were retained in a project collection for internal quality control. Subsample picking and taxa identifications were both held to 95% efficiency in internal quality control checks.

Data Management and Assessment

The final data for each sample was entered into a spreadsheet and sent to Joel Chirhart at the MPCA to run the IBI database calculations. RMBEL staff used the macroinvertebrate community data to calculate general invertebrate metrics to accompany the IBI values and facilitate comparison among sites along the stream gradient and across years. Sites were mapped in ArcMap to regionally compare the samples, which are within the Southern Coldwater Streams invertebrate class (Class 9). These classes are derived from the Minnesota Department of Natural Resources (DNR) Ecological Classification System provinces and were developed based on major climate zones, native vegetation, and biomes.

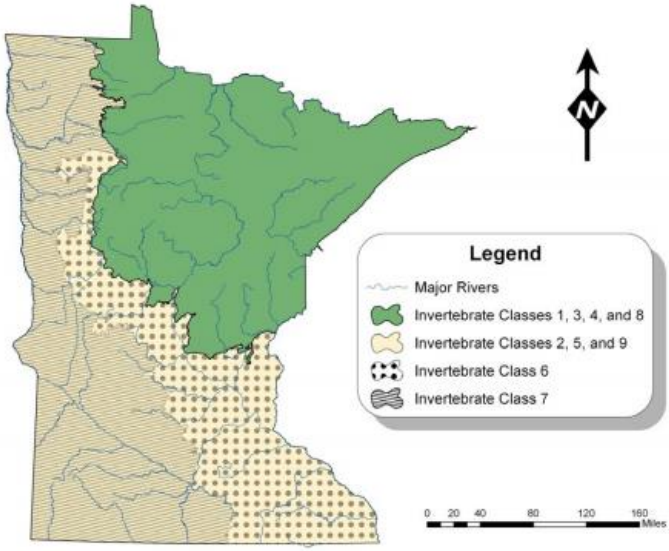


Figure 2: Map of Minnesota Pollution Control Agency invertebrate classes (MPCA)

Results

Macroinvertebrate Metrics

Macroinvertebrate metrics can provide a general overview of the health of a stream ecosystem relating to which taxa are dominant in a sample and how many taxa are intolerant to pollution impacts. Overall taxa richness is a common metric for water quality, since unimpacted stream systems typically show much more diversity than those with heavy impacts. The taxa richness values in this report include only unique taxa, and specimens that are immature or damaged and left at a higher taxonomic level were omitted from the metric. This may present some discrepancies from previous reports sent, in which all taxa were included in the richness values, regardless of whether they were unique to the rest of the community composition. Evaluating certain taxa groups that generally prefer specific conditions can give an idea of whether the stream quality is higher or lower than other sites. These include Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies), which typically are found in unpolluted waters, as well as Chironomidae (midges) which tend to dominate in highly impacted sites. Additionally, the presence of taxa that are intolerant to pollution can indicate higher quality waters. These metrics are explained in Table 1; they have been calculated for all the samples throughout this project and are listed in Tables 2 – 7.

Table 1. Explanations of the macroinvertebrate metrics

Metric	Explanation	Response
Taxon Richness	**The total number of taxa found in the sample (genus level, family level for Chironomidae)**	**Higher numbers indicate better water quality and habitat quality**
EPT Richness	**The total number of Ephemeroptera (mayflies), Plecoptera (Stoneflies), and Trichoptera (caddisflies) in the sample. These taxa are considered generally intolerant to pollution.**	**Higher numbers indicate better water quality and habitat quality**
Plecoptera Richness	**The total number of Plecoptera (stoneflies) taxa in the sample. Plecoptera are intolerant to pollution and are clean water indicators.**	**Higher numbers indicate better water quality and habitat quality**
Percent Chironomidae	**Generally, the more chironomids in a sample, the more impacted the site is.**	**Lower numbers indicate better water quality and habitat quality**
Average Tolerance	**The average tolerance value of all the taxa in the sample on a 0-10 scale, with 0 being intolerant to organic pollution and 10 being tolerant to organic pollution**	**Lower numbers indicate better water quality and habitat quality**
Intolerance	**Number of taxa with tolerance values less than or equal to 4**	**Higher numbers indicate better water quality and habitat quality**

2015 Results

This macroinvertebrate survey began in 2015 with two samples collected per year at the Headwaters, Middle Reach, and Gorge sites of Brown's Creek. Overall, there were 53 unique taxa found in the samples this year. Most of the samples showed high taxon richness values, with the most diversity found at the Headwaters and Middle Reach sites (Table 2). All samples had at least two taxa in the EPT group, which represent higher quality water. Plecoptera (stonefly) richness is a metric that can indicate unimpacted streams. Only one immature stonefly specimen was found at the Gorge site during this year of sampling. Stoneflies typically prefer to live in fast, cold waters with riffles, and even a stream with moderate impacts can be unsuitable for them.

The percent Chironomidae metric showed results from 0% up to only 11.7% in 2015. This taxa group tends to dominate in heavily impacted streams, so this low proportion of the community means that there are minimal high-impact pollutant sources affecting the stream. The average tolerance values of all taxa found in each sample were predominantly greater than 5.0, which indicates that most of the taxa are tolerant to higher levels of pollution or other impacts to the streams.

Every sample in 2015 included intolerant taxa in the community, which are specimens with a tolerance value of 4 or less. Even though most of the samples had dominating species with high tolerance values, the presence of intolerant taxa indicates the sites are also providing suitable conditions.

Table 2. Metrics for each sample site in 2015

Site	Taxon Richness	EPT Richness	Plecoptera Richness	Percent Chironomidae	Average Tolerance	Intolerance
Headwaters	**39**	**8**	**0**	**8.1%**	**6.1**	**2**
June	28	7	0	11.7%	5.9	2
September	18	4	0	1.1%	6.5	1
Middle Reach	**27**	**6**	**0**	**1.2%**	**6.5**	**2**
June	21	4	0	4.3%	6.3	2
September	28	5	0	0.0%	6.7	1
Gorge	**22**	**4**	**1**	**1.3%**	**5.8**	**4**
June	16	3	0	1.5%	5.7	3
September	11	2	1	0.9%	6.2	2

2016 Results

In 2016, the samples had a total of 55 different taxa found. The taxon richness values for each sample were mostly above 20, which represents a diverse community of invertebrates (Table 3). Only the Gorge sample from September showed a lower taxa richness than the other samples, with only 15 unique taxa. The EPT richness was also found to be high, with every sample having at least 3 different taxa from one of those insect groups. The Plecoptera richness was comparable to the 2015 samples, with only the Gorge site having stoneflies present, but they were found in both the May and September samples this year.

The percent Chironomidae was low again for the samples in 2016, with the highest only reaching 14.2%. However, the average tolerance values were slightly above 5.0 again, indicating the domination of tolerant taxa in the samples. Like 2015, each of the samples displayed intolerant taxa, so each site does not show the high impact levels that would prevent those species from occurring there.

Table 3. Metrics for each sample site in 2016

Site	Taxon Richness	EPT Richness	Plecoptera Richness	Percent Chironomidae	Average Tolerance	Intolerance
Headwaters	**36**	**8**	**0**	**6.0%**	**5.6**	**3**
May	20	4	0	7.6%	5.9	1
September	28	6	0	4.5%	5.3	3
Middle Reach	**36**	**7**	**0**	**6.8%**	**5.8**	**3**
May	20	3	0	14.2%	6.2	1
September	23	5	0	1.4%	5.6	3
Gorge	**27**	**3**	**1**	**11.6%**	**6.2**	**2**
May	21	3	1	12.2%	6.3	1
September	15	3	1	1.1%	6.2	1

2017 Results

The macroinvertebrate samples taken in 2017 again showed high-quality water overall, with 60 unique taxa found across all the sites (Table 4). The taxon richness was higher for most of the samples than in previous years, and all sites had several EPT taxa present. Plecoptera were again found only at the Gorge site, but in both the spring and fall samples. The Chironomidae proportion was higher in some of the sites this year than in previous years, with the most being present in the Headwaters sample from May. However, most of the midge taxa found were *Diamesa* and *Parametriocnemus*, which both have moderate tolerance values of 5.0 and 5.2, respectively. Midges that dominate in heavily impacted streams tend to have tolerance values much higher than those found in this sample. The average tolerance values for the samples were like previous years in the 5.5 – 6.5 range, and each site had some intolerant taxa found.

Table 4. Metrics for each sample site in 2017

Site	Taxon Richness	EPT Richness	Plecoptera Richness	Percent Chironomidae	Average Tolerance	Intolerance
Headwaters	**31**	**6**	**0**	**33.2%**	**5.7**	**4**
May	18	3	0	51.5%	5.7	2
September	23	4	0	4.8%	5.8	3
Middle Reach	**37**	**8**	**0**	**8.9%**	**6.1**	**5**
May	19	3	0	19.6%	5.9	2
September	28	6	0	1.3%	6.2	4
Gorge	**34**	**6**	**1**	**20.5%**	**6.1**	**3**
May	20	3	1	34.5%	6.4	1
September	27	5	1	11.7%	5.9	3

2018 Results

The metrics for 2018 sample sites show high stream quality, most like 2017 than previous years, and the samples included 64 different taxa across all samples (Table 5). All samples showed exceptionally high taxon richness values, with the Gorge site being at a similar level to the other sites. All sites had at least two EPT taxa present, and again the only Plecoptera specimens found this year were at the Gorge site in both samples. The percent Chironomidae metric was slightly lower across most of the sites compared to previous years. Like 2017, the highest percent Chironomidae value was in the May Headwaters sample, but again the community consisted mostly of moderate-tolerance species. The average tolerance values are like previous years, and all samples had some intolerant taxa present this year, so the sites also provide suitable conditions for these species.

Table 5. Metrics for each sample site in 2018

Site	Taxon Richness	EPT Richness	Plecoptera Richness	Percent Chironomidae	Average Tolerance	Intolerance
Headwaters	**35**	**6**	**0**	**18.7%**	**5.9**	**4**
May	24	2	0	35.8%	5.7	2
September	26	5	0	4.9%	6.0	3
Middle Reach	**37**	**6**	**0**	**7.3%**	**6.0**	**4**
May	21	3	0	13.8%	5.9	2
September	25	4	0	0.9%	6.1	3
Gorge	**36**	**8**	**1**	**11.5%**	**5.7**	**5**
May	27	6	1	17.9%	5.9	3
September	24	5	1	5.4%	5.6	3

2019 Results

In 2019, the samples included 58 unique taxa and showed an ongoing trend of high stream quality (Table 6). The taxon richness values continue to show high levels of diversity throughout Brown's Creek. The May Headwaters community had a richness level higher than any sample in this project so far with over 30 unique taxa. The Middle Reach and Gorge sites showed diversity like previous years. All samples had at least 3 unique EPT taxa present, with the Gorge site showing the only Plecoptera specimens. However, this year both *Isoperla* and *Haploperla* were found at this site, which have moderately low tolerance values of 4.2 and 4.0, respectively.

The Chironomidae proportion was slightly higher in 2019 than in previous years in the Headwaters and Middle Reach sites with half to two-thirds of the May samples comprised of midges. This level of community domination would generally indicate a higher level of impact, although the majority of the Chironomidae community was again represented by *Diamesa*. The average tolerance values are also slightly lower than in previous years with all the samples remaining below 6.0, and all sites included intolerant taxa. This indicates that the stream community is stable and continuing to support the species that are intolerant to stream impacts.

Table 6. Metrics for each sample site in 2019

Site	Taxon Richness	EPT Richness	Plecoptera Richness	Percent Chironomidae	Average Tolerance	Intolerance
Headwaters	**39**	**8**	**0**	**40.3%**	**5.7**	**4**
May	32	4	0	67.0%	5.5	2
September	23	6	0	16.9%	6.0	3
Middle Reach	**32**	**9**	**0**	**28.4%**	**5.6**	**5**
May	19	3	0	54.8%	5.2	3
September	20	7	0	4.0%	5.9	4
Gorge	**31**	**9**	**2**	**11.3%**	**5.9**	**4**
May	24	6	1	25.3%	5.9	3
September	17	5	1	1.8%	5.9	2

2020 Results

In 2020, the samples included 54 unique taxa and showed an ongoing trend of high stream quality (Table 7). The taxon richness values continue to show high levels of diversity throughout Brown's Creek. All samples had at least 3 unique EPT taxa present. The Middle Reach and Gorge sites both showed Plecoptera specimens. This is the first year that Plecoptera has been found in the Middle Reach which could represent higher water quality in that area than in years past.

The average tolerance values for the samples were similar to 2019, with numbers falling between the 5.6 – 6.0 range which are slightly lower than in previous years. Each site had some intolerant taxa found which indicates that the stream community is stable and continuing to support the species that are intolerant to stream impacts.

This year there was a higher number of taxa with moderately low tolerance values ranging from 4.1 to 4.5. *Isoperla (TV=4.2)* was found in both Middle Reach and Gorge, *Ptilostomis (TV=4.4)* and *Pycnopsyche (TV=4.5)* were found in Headwaters, and *Antocha (TV=4.1)* was found in Gorge. A higher number of taxa with moderately low tolerance values is another indicator of good water quality.

The Chironomidae proportion was lower in 2020 compared to 2019 where we saw the highest numbers of any year sampled. Similar to 2019, the majority of the Chironomidae community was again represented by *Diamesa,* which has a moderate tolerance value compared to other midges.

Table 7. Metrics for each sample site in 2020

Site	Taxon Richness	EPT Richness	Plecoptera Richness	Percent Chironomidae	Average Tolerance	Intolerance
Headwaters	**36**	**7**	**0**	**23.8%**	**5.8**	**2**
May	22	3	0	35.9%	5.7	2
September	25	6	0	11.4%	6.0	3
Middle Reach	**32**	**10**	**1**	**18.1%**	**5.7**	**5**
May	16	6	1	28.5%	5.6	3
September	22	5	0	18.1%	5.7	3
Gorge	**29**	**7**	**1**	**14.2%**	**5.7**	**5**
May	20	5	1	21.1%	5.7	2
September	22	7	1	6.6%	5.7	5

2021 Results

In 2021, the samples included 52 unique taxa and showed an ongoing trend of high stream quality (Table 8). The taxon richness values continue to show high levels of diversity throughout Brown's Creek. All samples had at least 4 unique EPT taxa present. The Gorge site showed Plecoptera specimens for both sample occurrences.

The average tolerance values for the samples in 2021 were similar to 2020, with numbers falling between the 5.6 – 6.0 range which are slightly lower than in previous years. Each site had some intolerant taxa found which indicates that the stream community is stable and continuing to support the species that are intolerant to stream impacts.

This year again there was a higher number of taxa with moderately low tolerance values ranging from 4.1 to 4.5. *Ptilostomis (TV=4.4)* was found in Headwaters. *Isoperla (TV=4.2), Pycnopsyche (TV=4.5)* and *Antocha (TV=4.1)* were found in Gorge. A higher number of taxa with moderately low tolerance values is another indicator of good water quality.

The Chironomidae proportion was lower in 2021 compared to 2020 and substantially lower to 2019 where we saw the highest numbers of any year sampled. The majority of the Chironomidae community was represented by *Polypedilum,* which has a high tolerance value compared to other midges. The second highest number of midges were represented by Diamesa which has a lower tolerance value and has been the most prevalent genus found in past years. The lower Chironomidae numbers this year are a good sign since most of MN had experienced low water conditions over the summer of 2021. Lower water conditions usually result in warmer water temperatures which helps Chironomidae development. EPT richness remained stable from Spring to fall sampling and increased in the Middle Reach which is similar to past years and a great sign that taxa can maintain richness even in low water conditions.

Table 8. Metrics for each sample site in 2021

Site	Taxon Richness	EPT Richness	Plecoptera Richness	Percent Chironomidae	Average Tolerance	Intolerance
Headwaters	**28**	**8**	**0**	**6.0%**	**5.5**	**5**
May	20	5	0	9.7%	5.3	4
September	21	5	0	2.4%	5.8	3
Middle Reach	**40**	**9**	**0**	**15.6%**	**5.7**	**5**
May	25	4	0	30.8%	6.3	3
September	24	7	0	3.1%	5.1	3
Gorge	**28**	**7**	**1**	**14.7%**	**5.8**	**3**
May	22	5	1	24.9%	6.1	2
September	16	5	1	4.5%	5.5	2

2022 Results

In 2022, the samples included 50 unique taxa and showed an ongoing trend of high stream quality (Table 9). The taxon richness values continue to show high levels of diversity throughout Brown's Creek. All samples had at least 5 unique EPT taxa present. All samples had at least 20 unique taxa with the highest being 28 representing a heathy and diverse community of invertebrates. The Gorge site showed Plecoptera specimens for both sample occurrences. Middle Reach showed plecoptera specimens for its spring sample.

The average tolerance values were like years past for Headwaters and Middle Reach. Gorge site had a normal average tolerance in the spring; but showed a much lower average tolerance value for its fall sample due to the abundance of the caddisfly Glossosoma (TV=1.1), Protoptila (TV=1.4) and riffle beetle Optioservus (TV=3.1). Each site had at least 5 intolerant taxa which indicates that the stream community is stable and continuing to support the species that are intolerant to stream impacts.

The Chironomidae proportion was average for Headwaters which typically shows higher numbers than the other two sites. The majority of the Chironomidae community was represented by Diamesa (TV=5.0), which has a lower tolerance value and has been the most prevalent genus found in past years. Middle Reach and Gorge came back with lower-than-average Chironomidae numbers which are similar to 2015 where we had the lowest numbers of all year's sampled.

Table 9. Metrics for each sample site in 2022

Site	Taxon Richness	EPT Richness	Plecoptera Richness	Percent Chironomidae	Average Tolerance	Intolerance
Headwaters	**32**	**7**	**0**	**26.2%**	**6.0**	**8**
May	25	5	0	41.4%	5.3	6
September	22	5	0	10.8%	6.3	6
Middle Reach	**37**	**10**	**1**	**4.5%**	**5.6**	**7**
May	25	8	1	5.1%	5.3	5
September	28	7	0	4.0%	5.8	6
Gorge	**33**	**10**	**1**	**3.9%**	**5.1**	**8**
May	26	7	1	3.5%	6.1	5
September	20	8	1	4.2%	4.2	7

2023 Results

In 2023, the samples included 44 unique taxa and showed an ongoing trend of high stream quality (Table 10). The taxon richness values continue to show high levels of diversity throughout Brown's Creek. All samples had at least 5 unique EPT taxa present. All samples had at least 20 unique taxa with the highest being 26 representing a heathy and diverse community of invertebrates. The Gorge and Middle Reach sites showed Plecoptera specimens for each sample occurrence.

The average tolerance values were like years past for all three sites. Each site had at least 3 intolerant taxa which is consistent with past years indicating that the stream community is stable and continuing to support the species that are intolerant to stream impacts.

The Chironomidae proportion was average for Headwaters which typically shows higher numbers than the other two sites. The majority of the Chironomidae community was represented by Tvetenia Bavarica Group (TV=5.0), which has a lower tolerance value than other midges. Middle Reach and Gorge came back with lower-than-average Chironomidae numbers.

Table 10. Metrics for each sample site in 2023

Site	Taxon Richness	EPT Richness	Plecoptera Richness	Percent Chironomidae	Average Tolerance	Intolerance
Headwaters						
September	20	5	0	10.3%	5.7	3
Middle Reach						
September	26	7	1	4.0%	5.6	**3**
Gorge						
September	21	8	1	5.4%	5.1	4

2015 – 2023 Comparisons

General macroinvertebrate metrics are best used in combination to determine the health of a stream ecosystem. However, a few of the metrics can give an overall glimpse into how stream health is changing over time. The taxa richness represents how many unique specimens are present in a sample, which is an indication of biological community stability. Streams with high taxa richness are better able to respond to and recover from impacts to the water quality. In this project, the taxa richness for all samples ranges from 11 to 32, and over the years of this project, the communities present appear to be stable and showing an increasing trend in richness (Figure 3). This indicates that the stream ecosystem is healthy and successfully recovering from any disturbances or impacts that may have occurred in the years prior to the survey. Several of the 2015 samples did not meet the target specimen count of 300 specimens when the entire sample was sorted, and this can affect the metric results. However, even with these low counts, the spring samples still showed a high taxa richness that is comparable to the community sampled in the following years. The Headwaters sample from May 2019 showed 32 unique taxa, which was higher than in any of the previous

samples, indicating that the stream has a very stable and diverse community present. Samples from 2021 showed lower taxa richness than 2019 but remained comparable with earlier years of sampling. 2022 showed continued improvement. We had a record low for average tolerance from the fall Gorge site which also resulted in a record high in IBI scoring from that same site. The total tolerance comparison across all years shows a strong increase in intolerant taxa along with a decrease in tolerant taxa. Decreasing tolerance values along with stable taxa richness and lower Chironomidae numbers are all great indicators that conditions are improving for Brown's Creek. When comparing 2023's results with past numbers for taxa richness, average tolerance and IBI scoring; consistent stable numbers appear to be the trend which is a great sign that no new impairments have been introduced to Brown's Creek and the stream seems to be maintaining a health macroinvertebrate community.

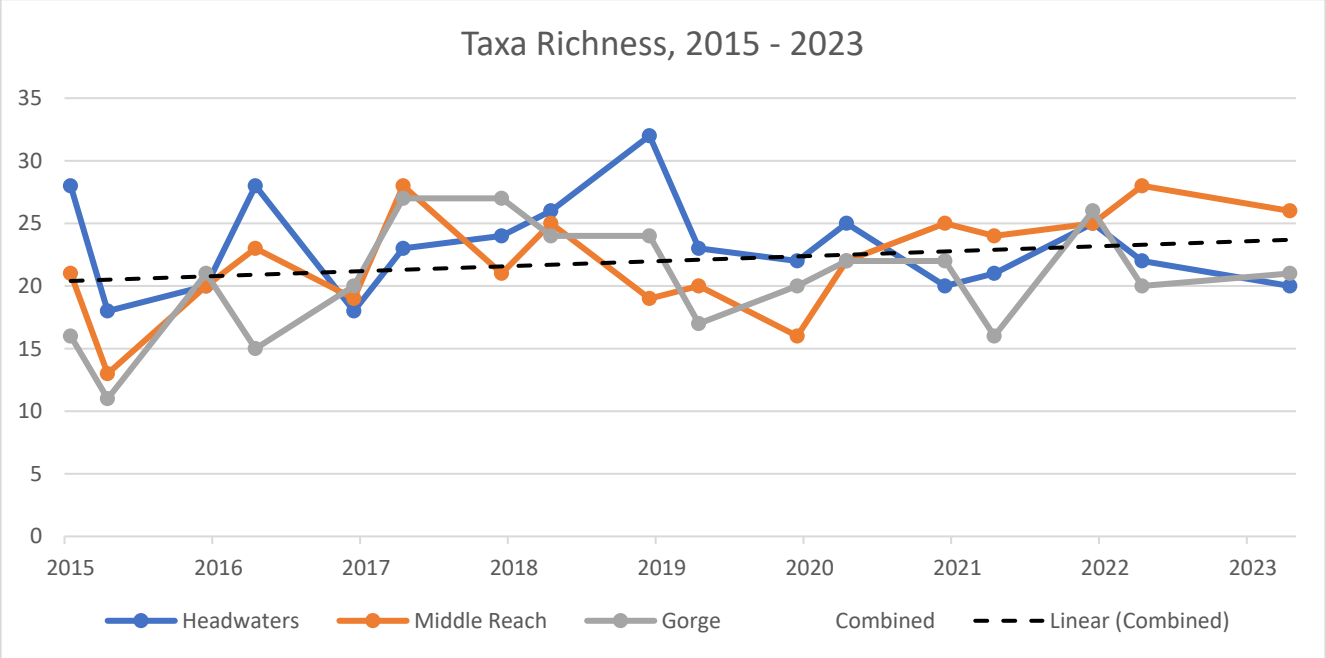


Figure 3: Taxa richness values for Brown's Creek samples from 2015 to 2023

The average tolerance value metrics can also give a good insight into stream health since it consists of a weighted average calculation. The Brown's Creek samples show an interesting pattern over the course of the years surveyed (Figure 4). In 2015, there were high values across the sites, and then some fluctuation in the tolerance values over the rest of the years. Natural fluctuations in community composition can occur year to year and are a normal occurrence in this tolerance range of 5.5 to 6.5. There is a slight decreasing trend developing over the years, showing that the stream community can support more specimens that are intolerant to impacts. This is an indication of good water quality and a stable aquatic ecosystem. The Headwaters and Middle Reach sites tend to follow the same pattern throughout the sample period, indicating similar conditions at those two sites.

However, the Gorge samples follow a different pattern, showing a higher tolerance score in 2016 and 2017 when the other two sites showed much lower scores. This could be due to a disturbance or impact occurring to Brown's Creek between the Middle Reach and Gorge sample sites. However, the disturbance is not severe enough to have strongly altered the other metrics in the Gorge samples, so the stream community is able to recover before reaching this last sample site. In 2020 & 2021, we see more consistent taxa in Headwaters and Middle Reach. Gorge showed more variation than in years past when compared with the other two sites; this could be due to low water levels in the fall. There is a down trend in average tolerance values and it seems that the numbers of intolerant taxa have been rising year after year which is a great sign that conditions are improving. Even thou numbers of unique taxa have declined since 2018 in Brown's creek, the taxa with lower tolerance values have been increasing. As conditions improve in Brown's creek it allows taxa with lower tolerance values a chance to rebound and increase their populations from past numbers.

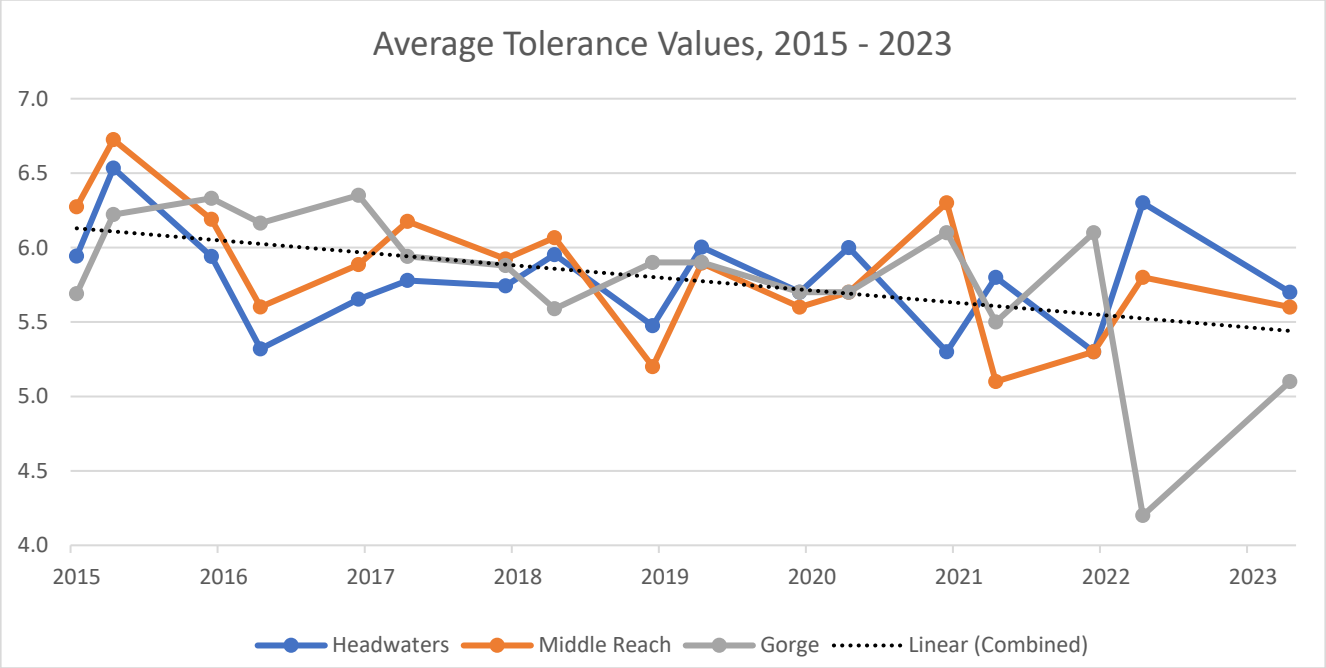


Figure 4: Average tolerance values for Brown's Creek samples from 2015 to 2023

Index of Biological Integrity (IBI)

The MPCA has developed a state-wide method of evaluating stream health using aquatic macroinvertebrates. This index gives each sample a numerical value that can be used to compare one site to another. It can also be used to monitor individual sites over time to determine whether the stream condition is improving or declining.

Due to the geographic differences throughout Minnesota and the variability in stream types, the state has been divided up into three regions that comprise nine different invertebrate stream classes (Figure 2). Each class has a different IBI calculation that best represents the invertebrate

communities typically found within the region. They are based primarily on region, watershed size, thermal regime, and stream gradient (MPCA). The study area in this project is located within the Southern Coldwater Streams invertebrate class.

Tiered Aquatic Life Uses (TALU)

Stream health throughout Minnesota is evaluated for its capacity to sustain aquatic life, including the macroinvertebrates, fish, plants, and other organisms. The MPCA developed models with threshold IBI values that represent how well the stream can sustain aquatic life. These include *Exceptional Use* for high-quality streams, *General Use* for streams with light impacts, and *Modified Use* for areas with heavy impacts to the streams (Table 7). Each invertebrate stream class has different threshold levels based on the invertebrate communities typically found in that region. In this project, almost all samples were above the General Use Threshold, and several were above the Exceptional Use Threshold.

Table 11: Tiered Aquatic Life Uses as determined by the MPCA (MPCA 2014)

Use Category	Description
Exceptional Use	**Evident changes in structure due to loss of some rare native taxa; shifts in relative abundance; ecosystem level functions fully maintained**
General Use	**Overall balanced distribution of all expected major groups; ecosystem functions largely maintained through redundant attributes**
Modified Use	**Sensitive taxa markedly diminished; conspicuously unbalanced distribution of major taxonomic groups; ecosystem function shows reduced complexity and redundancy**

Table 12: Index of Biological Integrity (IBI) scores for Brown's Creek samples from 2015 to 2023

Sample Date		Headwaters	Middle Reach	Gorge
2015	June	53	64.6	62.2
	September	57.1	74.5	53.8
2016	May	51.7	44.8	41
	September	63	77.7	65.8
2017	May	49.8	56.1	35.2
	September	65.1	81.1	61.4
2018	May	53.8	66.6	52.4
	September	61.2	68.4	58.9
2019	May	49.9	48.9	51
	September	73.1	86.4	82
2020	May	63.3	64.5	53.2
	September	57.6	76.6	86.2
2021	May	72.5	43.3	48.4
	September	77.8	68.9	82
2022	May	59.1	75.1	78
	September	52.7	78.5	86.5
2023				
	September	59.5	72.7	77.8

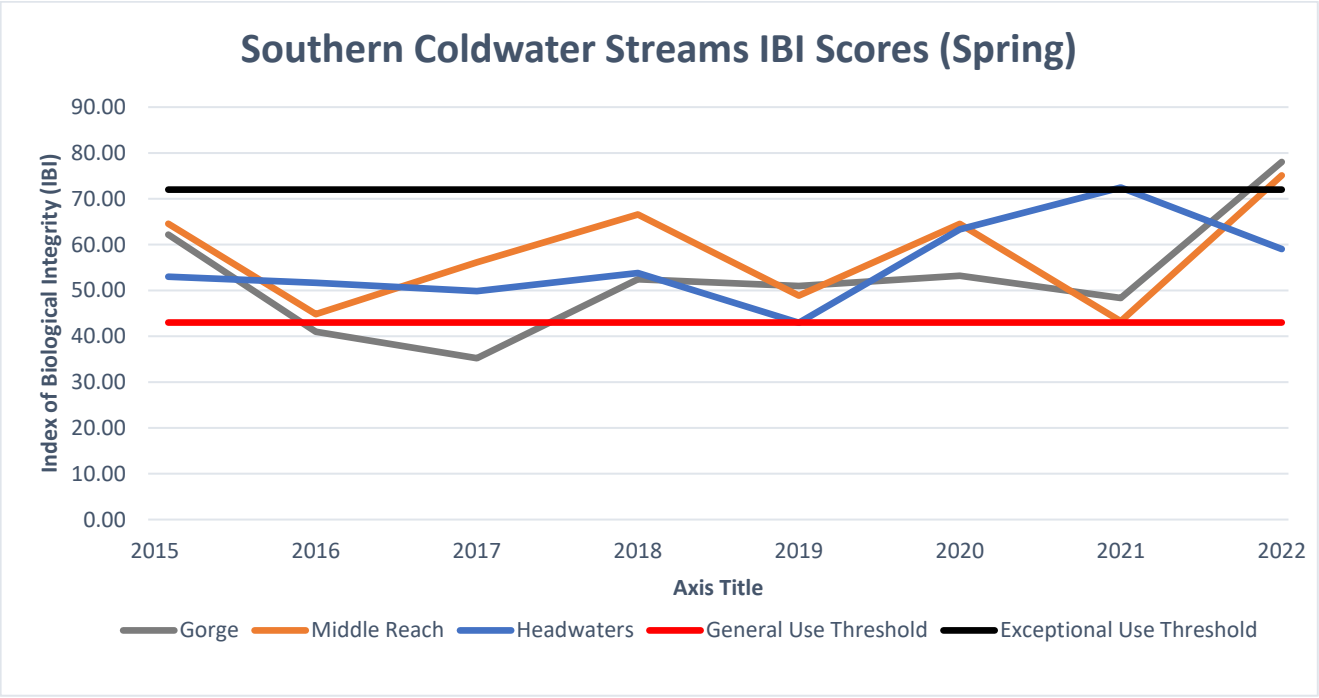


Figure 5: IBI scores, General Use Threshold, and Exceptional Use Threshold for Brown's Creek samples within the Southern Coldwater Streams class in spring 2015 - 2022

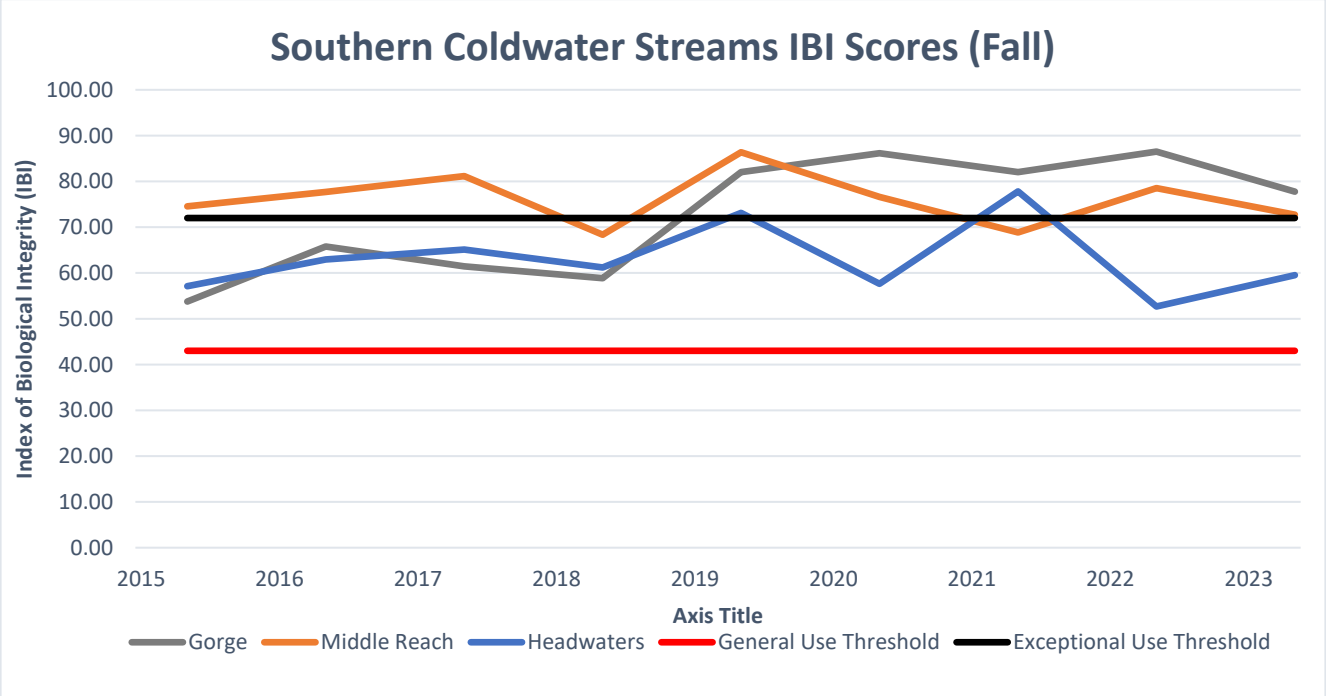


Figure 6: IBI scores, General Use Threshold, and Exceptional Use Threshold for Brown's Creek samples within the Southern Coldwater Streams class in fall 2015 - 2023

Southern Coldwater Streams region represents areas in the southern portions of Minnesota with deciduous broadleaf forests. This invertebrate class has an IBI General Use Threshold of 43 and an Exceptional Use Threshold of 72. In this project, almost all samples met the General Use Threshold, and several of the Middle Reach & Gorge samples exceeded the Exceptional Use Threshold as well as all the sites in September of 2019 (Table 7, Figure 5). The highest score was 86.5 from the September 2022 sample of the Gorge site and the lowest was 35.2 from the May 2017 sample of the Gorge site. There are natural fluctuations in the invertebrate community, causing the IBI scores to change over time. The samples taken in the fall of each year usually show a higher score than the spring samples, but overall, the scores are between the General and Exceptional Use Thresholds, indicating a stable aquatic community. Some of the samples in 2015 fell below the total specimen count of 265 recommended for the IBI calculation, which can affect the score outcome. However, even with the low counts, the IBI scores from 2015 still appear comparable to the results in the later years of this project.

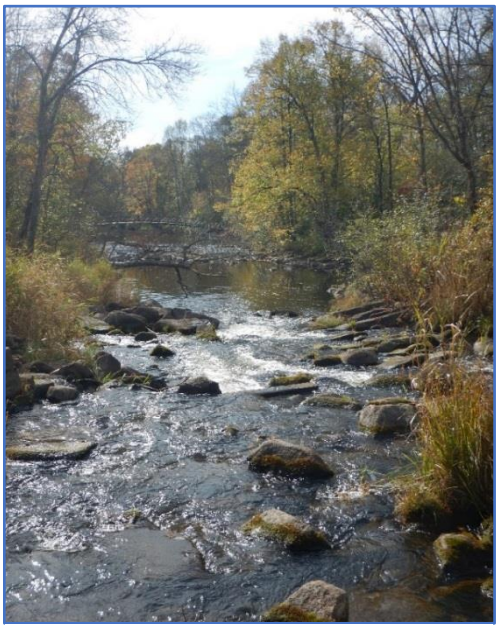
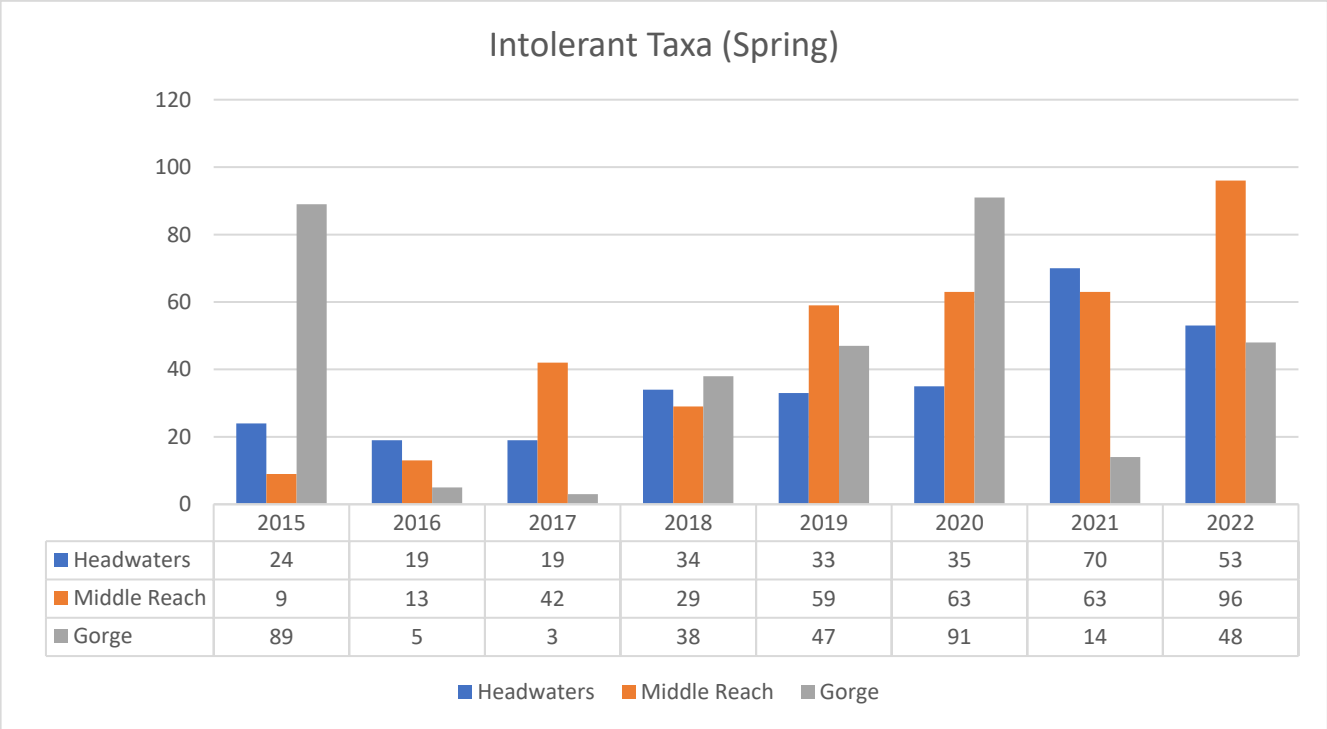


Figure 7: Example of a Southern Coldwater Stream sample site



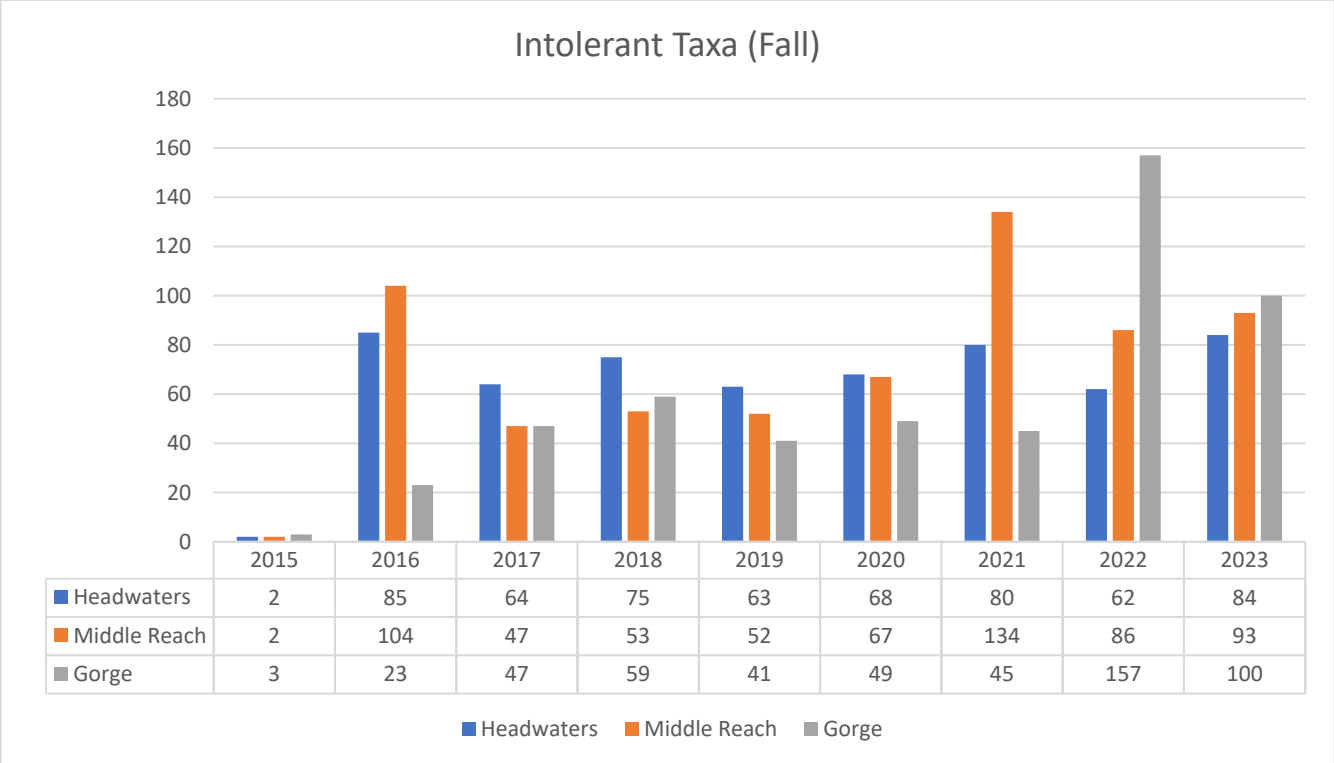


Figure 8 & 9: Comparison of Intolerant taxa spring vs fall for Brown's Creek 2015 - 2023

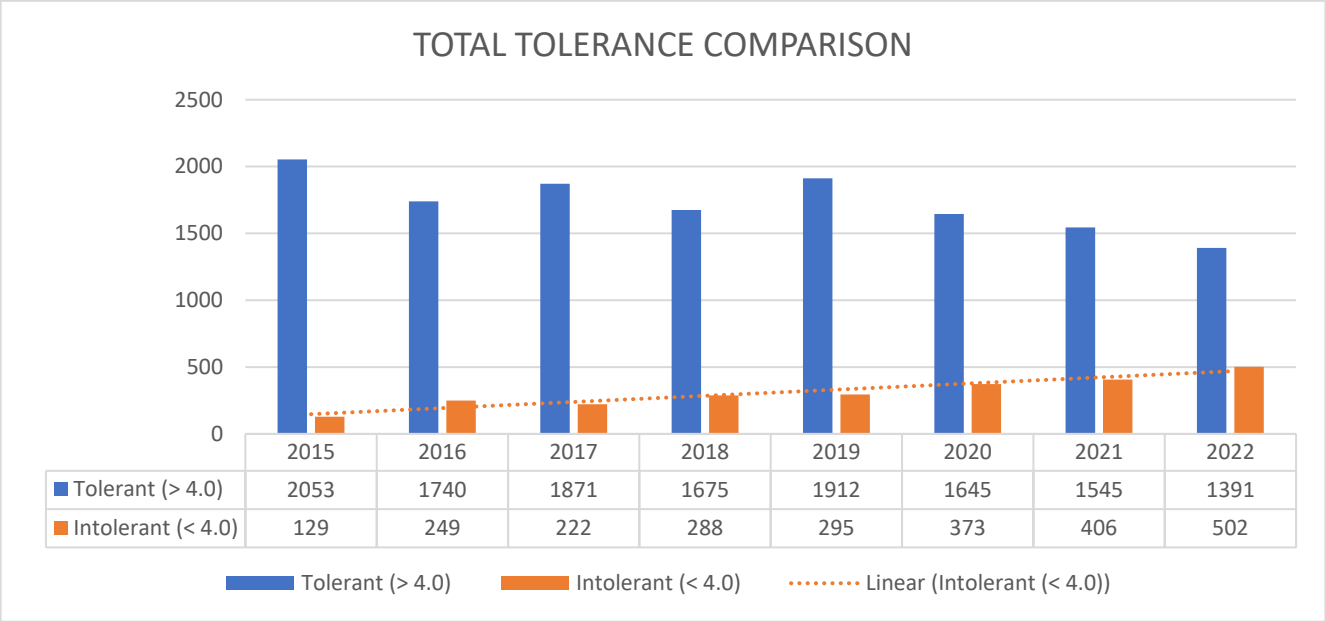


Figure 10: Comparison of Tolerant from Intolerant Taxa for Brown's Creek 2015 - 2022

Discussion

General Metrics

The macroinvertebrate communities sampled throughout this project included a wide variety of species, and the sample sites showed a range of metric results. Overall, there were 140 unique taxa across all the years of sampling, meaning that the Brown's Creek sites have diverse communities with seasonal fluctuations in the community composition (Appendix 1). The most prevalent taxa overall were scuds (*Gammarus*), blackflies (*Simulium*), and mayflies (*Baetis*). These taxa have medium-level tolerance values, so they are often found in higher densities in streams with moderate impacts. The dominance of tolerant taxa like these can cause the average tolerance value of a sample to be high. Most of the samples in this project had an average tolerance value between 5 and 7, with the lowest being 5.2 in the May 2019 Middle Reach sample and the highest being 6.7 in the September 2015 Middle Reach sample.

Despite the prevalence of tolerant species, all the samples included some intolerant taxa, indicating that the level of impacts on the streams was not high enough to prevent the sensitive species from living there. The next most abundant taxon was a riffle beetle (*Optioservus*) which is intolerant to impacts with a tolerance value of only 3.1. The abundance of these riffle beetles indicates that the stream is clean and fast enough to support a strong community of intolerant taxa. Intolerant taxa are any species with a tolerance value (TV) of 4 or less. In this project, these included the riffle beetle *Optioservus* (TV = 3.1), caddisflies *Neophylax* (TV = 3.2), *Glossosoma* (TV = 1.1) and Protoptila

(TV=1.4). This combination of taxa shows that while these streams likely have some urbanization impact, they also have pockets of good microhabitat and sufficient oxygen.

The EPT metric evaluates the diversity of Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies) in the samples. These insect groups are generally indicators of less impacted waters since they contain many intolerant species. In this project, the EPT values ranged from 2 to 7 unique taxa in each sample. While there are no definitive thresholds with this metric, sites with few or no EPT taxa likely have a substantial number of impacts and may be targeted for management practices to improve the watersheds that flow into these sites. The Plecoptera subset of the EPT metric is also evaluated since the stonefly group contains mostly intolerant species, and typically they require high-quality, well-oxygenated water. Two unique stonefly species were found during this project (*Isoperla* and *Haploperla*), and they have only been found in the Gorge & Middle Reach Sites. This group of insects is typically not very diverse in stream samples without strong riffles present to keep the water full of dissolved oxygen.

The Chironomidae fraction of a sample can also indicate general water quality. Even though this group is very diverse and includes midge species with tolerance values ranging from 0 to 10, generally they only dominate a sample at a site with heavy pollution impacts. The samples in this project ranged from 0% to 67% Chironomidae present, with some of the largest proportions seen in the May 2019 samples. Since most healthy streams have a diverse community of macroinvertebrates, the high numbers of midges seen in the spring samples initially seems like an indication of impact. However, with the change in community throughout the year and with such low Chironomidae proportions in the fall samples, Brown's Creek likely has minimal pollution impacts affecting the water quality, especially when looking at all the metrics in combination.

Invertebrate Stream Classes

Minnesota is divided up into invertebrate stream classes based on three geographic regions so the IBI values can be compared to streams within similar regions. These regions include Northern Forest Streams, Southern Streams, and Prairie Streams. The regions are then further divided based on whether the sample was taken from a site with riffle habitats present or only with glides and pools. This survey was located within the Southern Coldwater Streams class. Samples were taken from 3 dominant habitat types in a given reach per season (Either from riffles, pools, runs, glides, undercut banks, leaf packs, or wood debris.)

Each stream class has unique threshold values indicating the level of support for biological communities living there. The highest tier is the Exceptional Use Threshold which represents the highest quality streams that are providing maximum support for aquatic organisms. The next level is the General Use Threshold, which is the target level for streams that are healthy and functioning

despite any impacts to them. The lowest level is the Modified Use Threshold, which represents streams with heavy impacts that may be struggling to adequately support the aquatic communities living in them. Sites with IBI scores at or below the Modified Threshold should be prioritized over others for management practices or restorations to improve the stream health.

The Brown's Creek sites within the Southern Coldwater Streams region have been regularly fluctuating with the seasonal sampling over the years of this project. Most IBI scores fall between the General and Exceptional Use Thresholds. The pattern across the three sites shows increased scores in the fall with numbers closer to the Exceptional Use Threshold. The Spring samples show slightly lower scoring with numbers closer to the general use threshold. This pattern is normal for most streams with fall samples showing a better display of a stream's true macro community. With improving IBI scoring occurring over the summer, it's unlikely that any major pollution impacts are occurring along Brown's Creek between the sample points.

Limitations and Future Projects

This project contained a few limitations that may have affected some of the resulting data and statistics. During laboratory processing, some of the 2015 samples were completely sorted with the total number of specimens falling below the required 265 count needed for best application of the MPCA IBI calculation. This can slightly skew the resulting IBI score for those sites, but the taxa and tolerance values are still accurate and representative of the sample.

Further monitoring of these sites is recommended to continue establishing the baseline data for these aquatic communities. Each site is dynamic and seasonally changing, so continuing to collect data helps to eliminate the differences due to natural fluctuations in invertebrate communities. Additionally, if there are suspected pollution inputs to a stream or restoration projects in progress, monitoring before and after these impacts is recommended to assess how the biological community is affected.

Literature Cited

MPCA. 2014. Development of a macroinvertebrate-based Index of Biological Integrity for assessment of Minnesota's rivers and streams. Minnesota Pollution Control Agency, Environmental Analysis and Outcomes Division, St. Paul, MN.

MPCA. 2014. Development of biological criteria for tiered aquatic life uses: Fish and macroinvertebrate thresholds for attainment of aquatic life use goals in Minnesota streams and rivers. Minnesota Pollution Control Agency, Environmental Analysis and Outcomes Division, St. Paul, MN.

Appendix 1: Project Taxa List

Order	Family	*Genus*	*Species*
Acari/Hydracarina			
	Sperchontidae	*Sperchon*	
	Limnesiidae	*Limnesia*	
Amphipoda	Crangonyctidae	*Crangonyx*	
	Gammaridae	*Gammarus*	*lacustris*
	Hyalellidae	*Hyalella*	
Coleoptera	Dytiscidae	*Agabus*	
		Ilybius	
		Liodessus	
		Uvarus	
	Elmidae	*Macronychus*	
		Optioservus	
		Stenelmis	
	Gyrinidae	*Gyrinus*	
	Haliplidae	*Peltodytes*	
	Hydraenidae	*Hydraena*	
	Hydrophilidae	*Enochrus*	
		Hydrobius	
		Hydrochara	
		Hydrochus	
		Tropisternus	
	Scirtidae	*Scirtes*	
Collembola			
Decapoda	Cambaridae		
Diptera	Ceratopogonidae	*Bezzia/Palpomyia*	
		Ceratopogon	
		Dasyhelea	
		Mallochohelea	
	Chironomidae	*Brillia*	
		Cardiocladius	
		Chaetocladius	
		Cladotanytarsus	
		Conchapelopia	
		Corynoneura	
		Cricotopus	
		Cryptochironomus	
		Diamesa	
		Diplocladius	
		Eukiefferiella	

		Eukiefferiella	*claripennis gr.*
		Eukiefferiella	*devonica gr.*
		Eukiefferiella	*tirolensis gr.*
		Limnophyes	
		Meropelopia	
		Micropsectra	
		Microtendipes	
		Nanocladius	
		Orthocladius (Orthocladius)	*lignicola*
		Orthocladius (Symposiocladius)	
		Paracricotopus	
		Parametriocnemus	
		Paratanytarsus	
		Paratendipes	
		Polypedilum	
		Prodiamesa	
		Rheocricotopus	
		Rheotanytarsus	
		Saetheria	
		Stenochironomus	
		Tanytarsus	
		Thienemanniella	
		Thienemannimyia gr.	
		Tvetenia	
		Tvetenia	*bavarica gr.*
		Zavrelimyia	
	Dixidae	*Dixa*	
	Empididae	*Chelifera*	
		Hemerodromia	
		Neoplasta	
		Metachela	
	Ephydridae		
	Limoniidae	*Antocha*	
		Helius	
		Molophilus	
	Pediciidae	*Dicranota*	
	Simuliidae	*Simulium*	
		Prosimulium	
	Stratiomyidae	*Odontomyia*	
	Syrphidae	*Chrysogaster*	
	Tabanidae	*Chrysops*	
	Tipulidae	*Antocha*	

		Dicranota	
		Hexatoma	
		Limnophila	
		Limonia	
		Ormosia	
		Pedicia	
		Pilaria	
		Tipula	
Ephemeroptera	Baetidae	*Baetis*	
Gastropoda	Ancylidae	*Ferrissia*	
	Lymnaeidae	*Stagnicola*	
	Physidae	*Aplexa*	
		Physa	*acuta*
		Physa	*gyrina*
		Physella	
	Planorbidae	*Gyraulus*	*parvus*
		Micromenetus	
	Valvatidae	*Valvata*	*perdepressa*
Hemiptera	Belostomatidae	*Belostoma*	
	Corixidae	*Hesperocorixa*	
		Sigara	
	Gerridae	*Aquarius*	
		Gerris	
	Nepidae	*Ranatra*	
	Pleidae	*Neoplea*	
	Veliidae	*Microvelia*	
Hirudinida	Erpobdellidae	*Dina*	*parva*
	Erpobdellidae	*Erpobdella*	*punctata*
	Glossiphoniidae	*Glossiphonia*	*complanata*
		Helobdella	*stagnalis sp. group*
		Placobdella	
Isopoda	Asellidae	*Caecidotea*	
		Oniscus	
Lepidoptera	Pyralidae		
Mermithida	Mermithidae		
Odonata	Aeshnidae	*Aeshna*	
		Boyeria	
Odonata	Calopterygidae	*Calopteryx*	
	Coenagrionidae		
Plecoptera	Chloroperlidae	*Haploperla*	
	Perlodidae	*Isoperla*	
Trichoptera	Brachycentridae	*Brachycentrus*	

	Glossosomatidae	*Glossosoma*	
		Protoptila	
	Hydropsychidae	*Ceratopsyche*	
		Cheumatopsyche	
		Hydropsyche	
		Parapsyche	
	Hydroptilidae		
	Lepidostomatidae	*Lepidostoma*	
	Leptoceridae	*Oecetis*	
	Leptoceridae	*Triaenodes*	
	Limnephilidae	*Anabolia*	
		Limnephilus	
		Pycnopsyche	
	Philopotamidae	*Chimarra*	
	Phryganeidae	*Ptilostomis*	
	Polycentropodidae	*Polycentropus*	
	Psychomyiidae	*Lype*	
	Rhyacophilidae	*Rhyacophila*	
	Uenoidae	*Neophylax*	
Tricladida			

GROUNDWATER MONITORING PROGRAM

Date |	05/02/2024
To / Contact info |	BCWD Board of Managers; Karen Kill, District Administrator
From / Contact info |	Stu Grubb, PG; John Sarafolean, EOR
Regarding |	2023 Groundwater Elevations and Trends

Background

BCWD has established a network of wells for measuring groundwater levels. The network includes residential wells, golf course wells, and DNR observation wells. Water level measurements are collected annually at the residential wells and golf course wells. Water level measurements are recorded hourly at the DNR observation wells using data loggers.

The data has been collected since 2012. The data is used to identify trends in groundwater levels and changes to groundwater flow over time. Changes to levels and groundwater flow can have significant effects on Brown's Creek and other groundwater dependent natural resources, flooded areas such as Kimbro Basin, and stormwater infiltration basins.

The well network was established to cover the entire watershed district, and also to monitor each of the major drinking water aquifers in the watershed district. The distribution of wells by aquifer is:

- Quaternary (Glacial) – 7
- St. Peter - 1
- Prairie du Chien – 10
- Jordan/St. Lawrence – 2
- Tunnel City Group – 4
- Multi-Aquifer – 1

Analysis

Residential Wells

Groundwater elevation data from the golf course wells, residential wells, and DNR observation wells) are shown in Table 1. Groundwater elevations decreased from 2022 to 2023 with an average decrease of 0.97 feet. The decrease is not surprising considering below average rainfall and snowfall in 2022 and 2023.

DNR Observation Wells

DNR measures water elevations monthly in four observation wells:

- Brown's Creek Park – Deep well completed in the Jordan aquifer
- Brown's Creek Park – Shallow well completed in the Quaternary (glacial) aquifer
- Brown's Creek Park – Middle well completed in a confined Quaternary aquifer
- Withrow School – Well completed in the Prairie du Chien aquifer
- Kimbro – Shallow well completed in the Quaternary (glacial) aquifer

Groundwater elevation data from the DNR observation wells are shown on Figure 1. The data for the Withrow well shows that the water level has been dropping since reaching a high level of 960.05 in June 2020. The groundwater elevation in the Brown's Creek Park – Shallow well does not fluctuate much from year to year (due to its hydraulic connection and influenced by the elevation of Brown's Creek) but has also been dropping since mid-summer 2020. The Brown's Creek Park – Shallow well was abandoned and sealed in 2021. The Brown's Creek Park – Deep well groundwater

elevations have also dropped during the recent time period and can fluctuate by as much as six feet over short time periods. This observation is the result of pumping from a nearby well (probably Oak Glen Golf Course) and will be investigated more in the upcoming months. The Brown's Creek Park – Middle well shows dropping groundwater elevations since the beginning of the observation period in October, 2020. Note that the 2023 data is still considered provisional at this time. The Kimbro – Shallow well was added to the report this year and the groundwater elevations decreased from 2021 to 2022, increased in late spring 2023 to a high of 930.31, and decreased into 2023.

Golf Course Wells

The golf course wells showed similar trends to the other wells.

Change in Water Levels in Each Aquifer

Groundwater levels in each aquifer were compared to identify trends over time. Residential well and DNR observation well levels were used for the analysis. The golf course wells have not been measured for as long, and the water level readings tend to be less reliable due to the large pumping volume.

Quaternary (Glacial) Aquifer

Groundwater levels in the shallow Quaternary aquifer wells are shown on Figure 2. Three of the wells show an increase of about 8 feet since 2012 (although down slightly from 2020). Three of the wells show significantly less increase, about 3 feet. Two wells shows very little increase, less than two feet. The well that shows the least increase is located in Brown's Creek Park, near Brown's Creek. The water level in the well is stabilized by the relatively constant water level in the Creek and the discharge of groundwater from the aquifer to the Creek. The variation in water levels among the wells indicates the importance of having water level readings from several areas across the watershed.

Prairie du Chien Aquifer

Groundwater levels in the Prairie du Chien aquifer are shown in Figure 3. Most of the wells showed a consistent increase of 8 to 10 feet from 2012 to 2020 and then dropped from 2021 to 2023. One well, the Wiersma well, shows less of an increase. This well has a shallow depth to water and is located closest to Brown's Creek (about 300 feet). The relatively stable water level may indicate that this well and this aquifer are influenced by Brown's Creek.

Other Aquifers

Groundwater levels from the St. Peter, Jordan, and Tunnel City Group aquifers are shown on Figure 4. The wells show similar trends over time, a rise from 2012 to 2020 followed by a drop from 2021 to 2023.

Recommendations

BCWD should continue to collect groundwater elevation data on an annual basis. The long-term data and analyses are important for understanding groundwater conditions and groundwater/surface water interactions throughout the District. The data will be particularly useful for understanding the thermal impairment of Brown's Creek and water level fluctuations in landlocked areas such as the Kimbro Basin.

Table 1. Groundwater Elevations

Unique Number	Name	2016 Water Elevation	2017 Water Elevation	2018 Water Elevation	2019 Water Elevation	2020 Water Elevation	2021 Water Elevation	2022 Water Elevation	2023 Water Elevation	Change since last measure
Approximate Date		Oct-16	Oct-17	Oct-18	Oct-19	Oct-20	Oct-21	Oct-22	Oct-23	
Golf Course Wells										
515171	Applewood Hills	891.84	895.42	894.14		897.65	895.58	891.45	890.67	-0.78
151580	Oak Glen Country Club	825.50	825.88	823.56	826.12	825.63	823.00			
151581	Oak Glen Country Club	829.71	830.12	828.16	828.23	828.78	829.19	827.95	828.41	0.46
208038	Stillwater Country Club	769.17	>200	>200	>200					
Stillwater Oaks 1	Stillwater Oaks Golf Club	910.31	913.42	910.11	912.41					
Stillwater Oaks 2	Stillwater Oaks Golf Club	908.89	910.27	909.05	913.60	913.72	909.95			
Stillwater Oaks 3	Stillwater Oaks Golf Club	910.27	911.26	910.07	911.90	912.46	911.02			
Stillwater Oaks 4	Stillwater Oaks Golf Club	963.06	Artesian	957.69	970.29	970.16	970.81			
566145	Logger's Trail Golf Course	904.41	905.62	904.16	905.93	907.20				
667998	Logger's Trail Golf Course	911.29	906.28	905.10	907.34	908.40	905.30	905.08	903.48	-1.60
761112	Logger's Trail Golf Course	900.53	901.16	900.09	901.94	903.55	900.71	899.18	898.15	-1.03
Domestic Wells										
428563	Ed and Laurie Francis	900.51	902.53	900.91	903.36	906.14	903.71	900.80	898.79	-2.01
410987	Dan and Lori Gunderson	904.96	906.98	905.62	907.22	910.22	908.10	905.35	903.18	-2.17
196839	Louis J. Bruno	862.92	867.75	866.75	866.40	870.28	868.23	931.72		
Leiser	Craig Leiser	932.63	935.11	933.99	935.85	937.65	934.01	932.67	931.34	-1.33
James	Alan and Molly James	939.62	941.71	940.20	942.14	944.20	940.56	938.70	937.55	-1.15
184049	Kirk and Tracy Hillquist	942.27		942.48	944.77	945.61	941.11	939.87	939.12	-0.75
Thatcher	Jyneen Thatcher	953.76	955.68	953.19	957.18	958.63	953.89	951.60	950.91	-0.69
138188	Rick Vanzwol	937.89	940.02	939.36	941.45	943.96	940.84	937.81	936.11	-1.70
479665	John and Michelle Weaver	907.27	907.41	906.86	907.77	908.87	907.23	905.85	907.22	1.37
493250	Mark and Sharon Olien	721.88	719.97	721.50	721.54	721.89	721.01	711.66		
525197	James and Marilyn Opp	912.08	913.88	913.02	914.69	917.18	914.69	912.42	910.66	-1.76
505390	Larry J and Pamela J Larson	928.67	930.48	929.18	932.29	933.50	932.93	930.09	927.93	-2.16
153485	John P and Carolyn A Rydel	897.42	899.51	898.47	899.31	901.08	897.14	896.83		
138904	Duane and Margaret Burmeister	829.25	829.91	828.41	830.33	832.27	828.69	827.62	827.55	-0.07
406204	Michael and Rita Wiersma	941.10	941.38	940.98		942.78	940.28	939.17	938.86	-0.31
Boughten	Larry Boughten		953.73	951.32	954.28	956.81	949.52	948.51	947.53	-0.98
DNR Observation Wells										
595649	Brown's Creek Park - Deep	866.32	864.77	865.81	868.11	868.20	866.17	865.21	864.38	-0.83
623066	Brown's Creek Park - Shallow	875.53	875.77	875.05	876.84	876.88	875.30	875.01		
551565	Withrow Elementary School	954.17	956.88	954.91	958.64	959.50	954.83	951.99	951.10	-0.89
834170	Brown's Creek Park - Middle					875.59	874.15	873.43	873.09	-0.34
281129	Kimbro - Shallow						929.73	926.75	926.82	0.07
							Average			-0.97

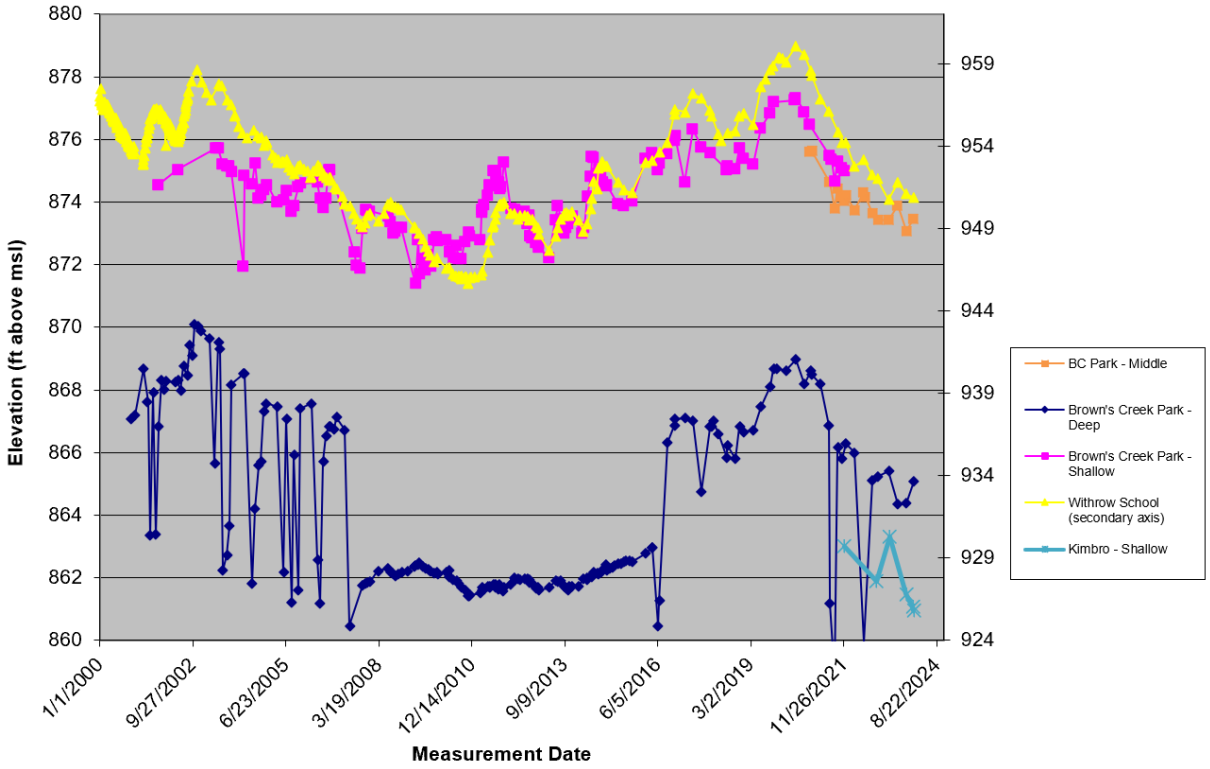


Figure 1. Groundwater Elevations – DNR Observation Wells

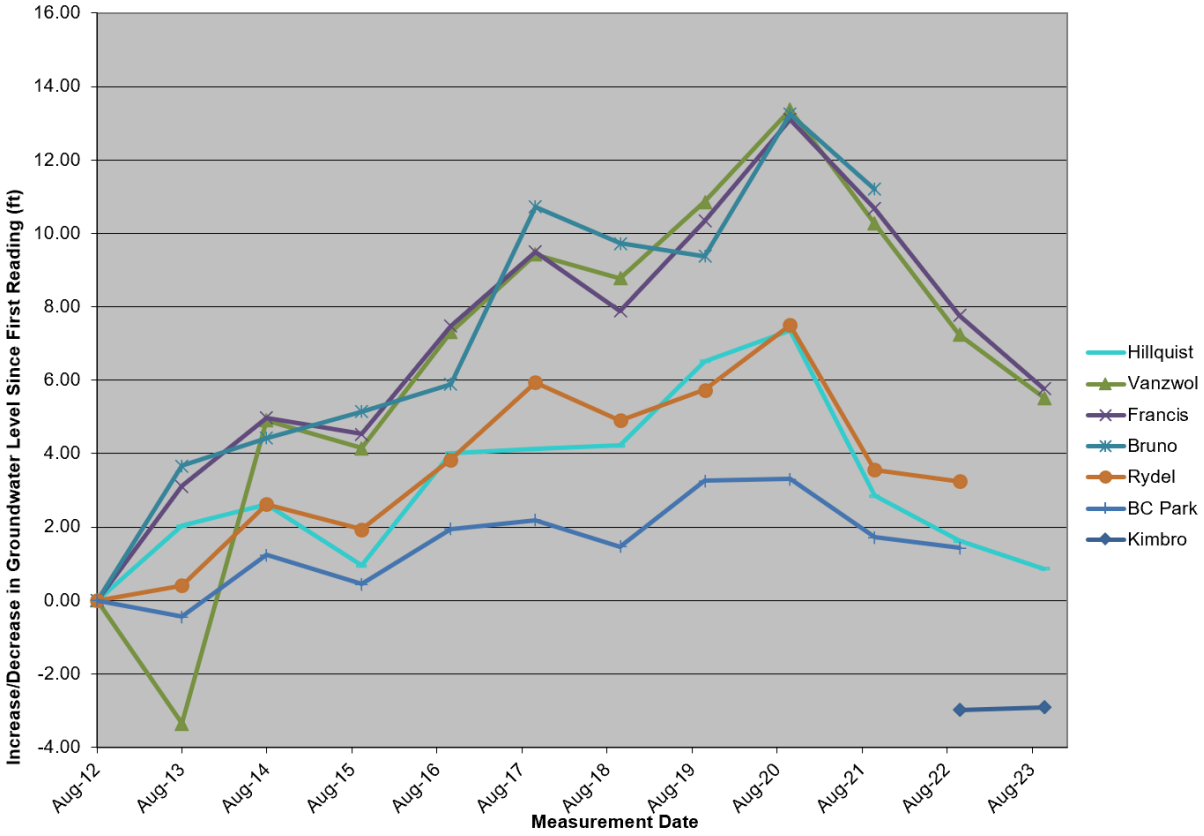


Figure 2. Groundwater Level Change Over Time - Quaternary (Glacial) Aquifer Wells

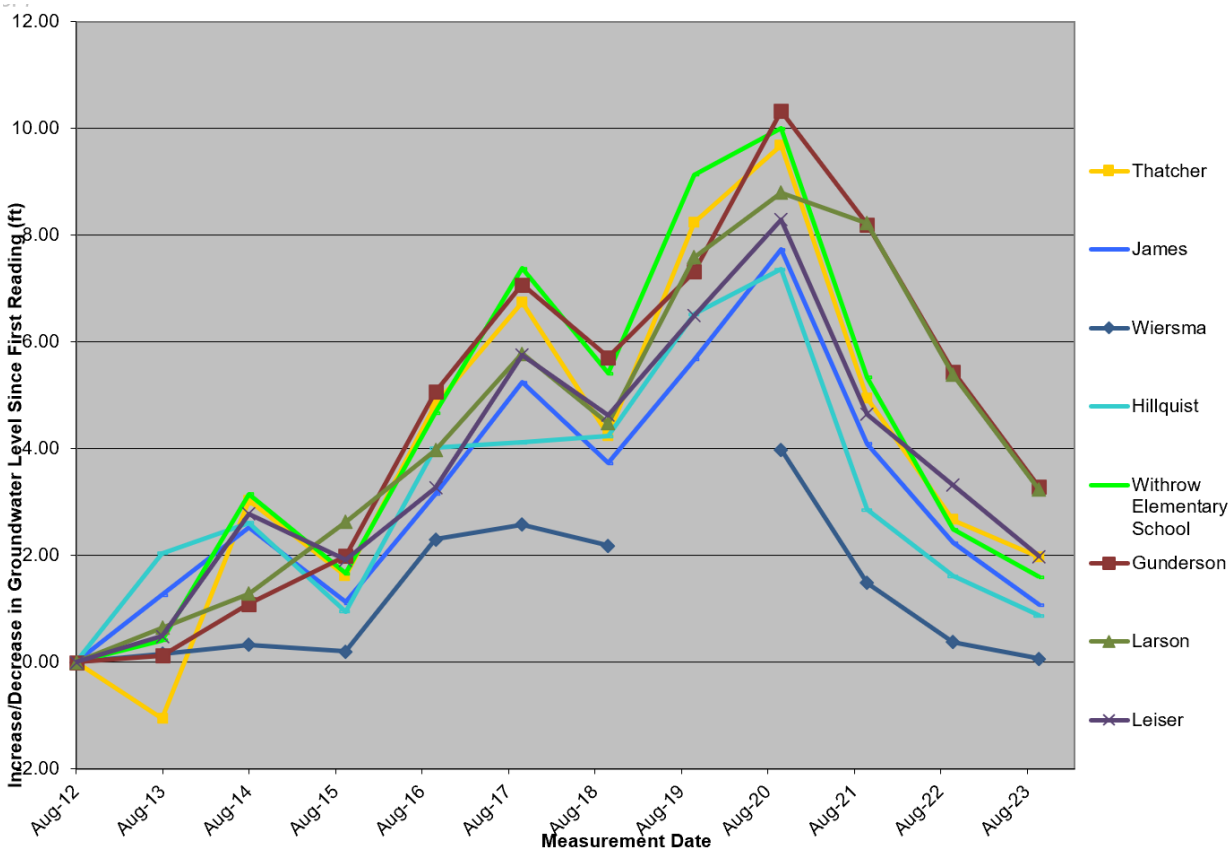


Figure 3.Groundwater Level Change Over Time – Prairie du Chien Aquifer Wells

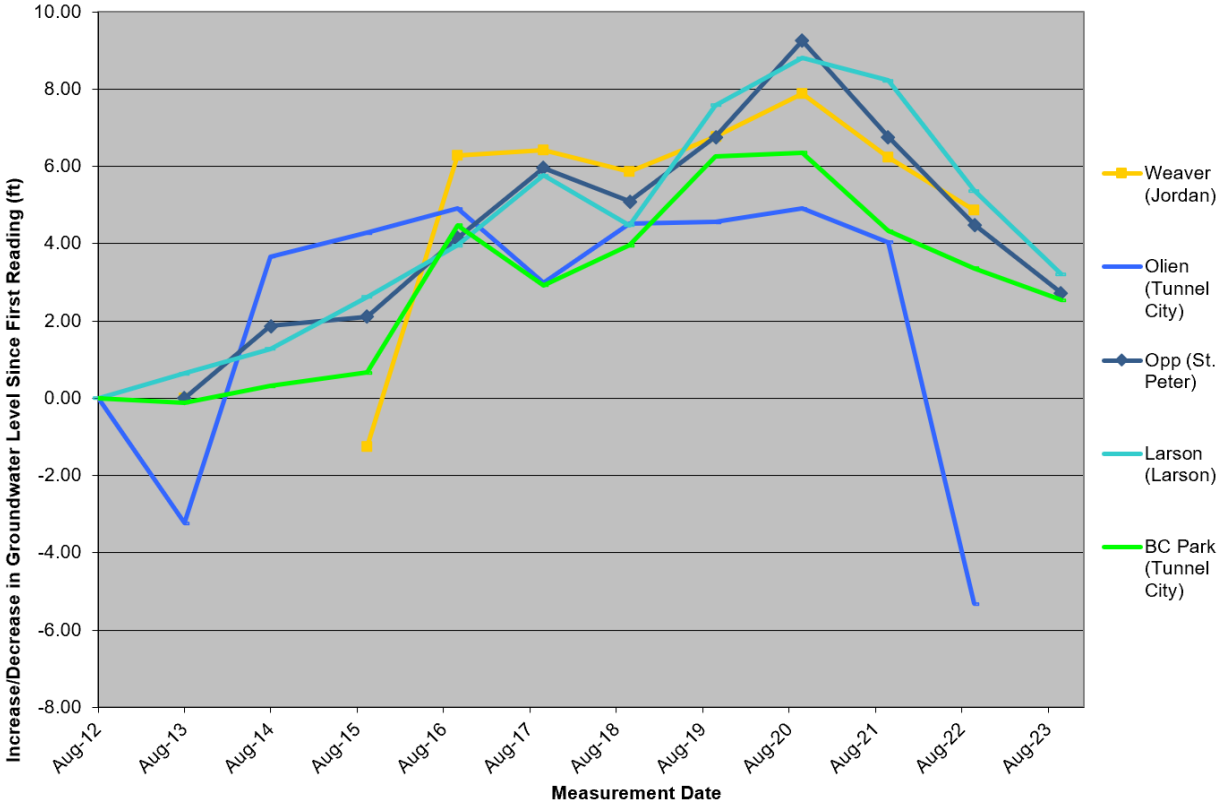


Figure 4. Groundwater Level Change Over Time - Wells in All Other Aquifers

memo

Project Name |	Settlers Glen Iron Enhanced Sand Filter	**Date** |	5/1/2024
To / Contact info |	BCWD Board of Managers		
Cc / Contact info |	Karen Kill, District Administrator		
From / Contact info |	Ryan Fleming, PE & John Sarafolean		
Regarding |	Project Performance & Cost Summary with 2024 Scope of Services		

Background

The purpose of this memorandum is to provide a project performance and cost summary of the Settlers Glen Iron Enhanced Sand Filter (IESF). This project was constructed in 2013, with its first season of operation in 2014. It was the first application of its kind using stream stage to control a pump that charges the IESF (Stormwater "Pump-and-Treat"). In 2023, the Board requested that the annual performance report provide a summary of project costs and overall performance to date.

2022 – 2023 Performance Evaluation

1. Overview

The experimental nature of the project led the District to implement a monitoring program that included influent and effluent sampling of a variety of pollutants. Due to consistent filter performance during the first seven years of monitoring, only the effluent concentration has been sampled since 2021. This was done to monitor whether the average total phosphorus concentration leaving the filter exceeds 0.07 mg/L which may suggest the phosphorus binding capability of the iron is diminished[1].

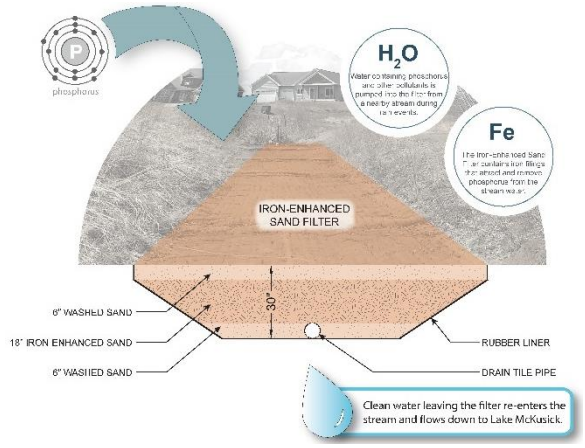


Figure 1: IESF Cross-Section

[1] The Minnesota Stormwater Manual Suggests that total phosphorus at the outlet of an iron-sand filter that consistently exceeds 0.06 to 0.07 milligrams per liter may be used as an indicator that the phosphorus binding capacity of the iron-enhanced sand bed has been consumed.

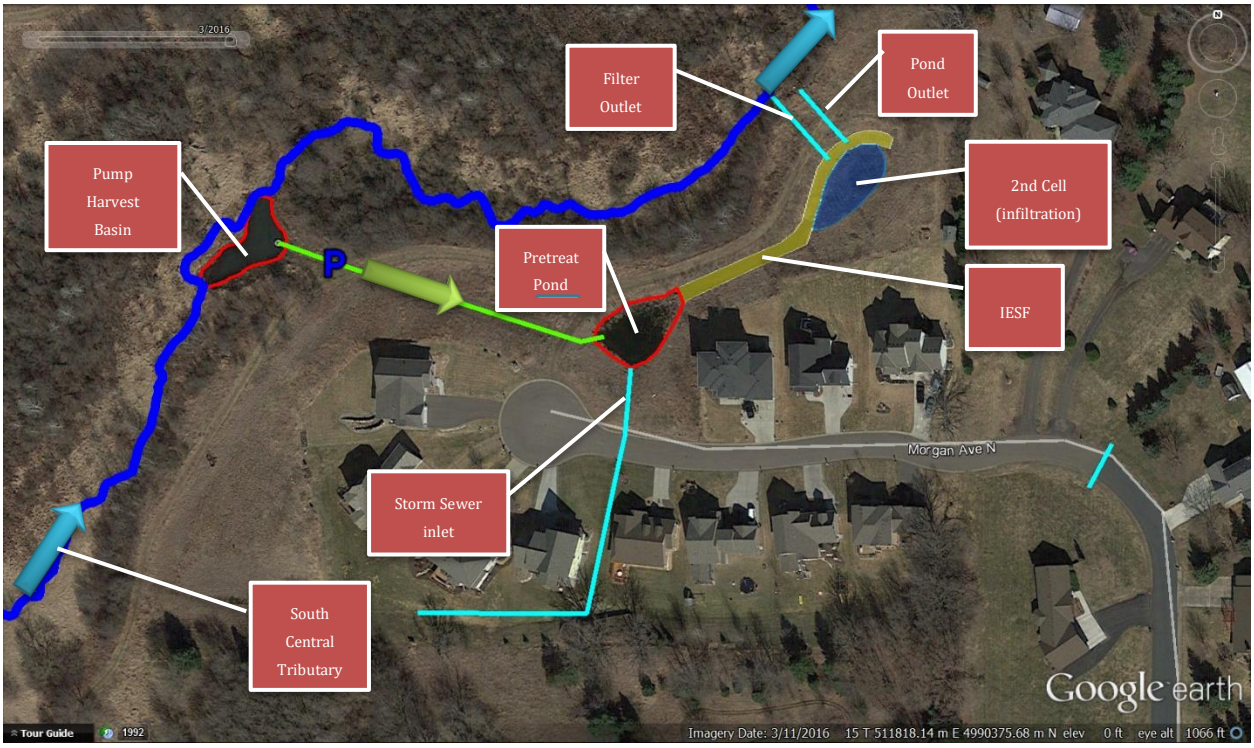


Figure 2: IESF Project Layout

2. Performance Analysis

Evaluation of the filter performance was not completed in 2022, therefore, this report combines the performance observed in 2022 and 2023. Four water quality sample events occurred in 2022 and seven occurred in 2023. They included manual grab sampling (discrete time) as well as automatic sample capture (spans a duration of time) during a rain event.

a. Inflow

Though the influent concentration has not been sampled since 2020, a reasonable assumption is that previously sampled average influent concentration of 0.235 mg/L is representative of the current inflow given very few changes occurred in the contributing drainage area. This concentration can be applied to the amount of water that passed through the filter to estimate the annual phosphorus load to the filter.

There are two sources of water entering the IESF:

a) Morgan Avenue neighborhood runoff (7-acre drainage area)
b) Pumped from the tributary (1,200-acre drainage area)

The water from these two sources mixes in a small, permanently inundated pretreatment pond prior to entering the IESF (Pretreat Pond in Figure 2).

The phosphorus load and removal in pounds can be estimated by comparing the volume of flow and phosphorus concentration into the filter with what left the filter. Water pumped to the filter is recorded by the lift station. However, the volume of water contributed to the filter from the Morgan Avenue neighborhood cannot be measured due to backflow of the pretreatment pond into the catch basin structure. Using the precipitation record and the District's calibrated

hydrologic and hydraulic model, the runoff volume from the Morgan Avenue neighborhood can be estimated.

An analysis of precipitation records, combining data from the BCWD weather station (for April-October) and NOAA Minneapolis-St. Paul (for November-March), reveals that the years 2022 and 2023 received approximately 28 and 33 inches of precipitation, respectively. When examining these data sets, it was found that the runoff volume from the Morgan Avenue neighborhood constituted about 19 percent of the total volume passing through the filter. The remaining 81 percent was pumped from the stream.

b. Outflow

Flow leaving the filter is measured during the growing season using a sensor which records depth and velocity of the water leaving the underdrain of the filter. The total phosphorus concentration leaving the filter ranged from less than the reporting limit of 0.05 mg/L to 0.105 mg/L with an average concentration of 0.075 mg/L as shown in Table 1. The high concentration on 8/19/2022 of 0.105 mg/L was significantly higher than what has typically been observed; other factors may have been influencing the concentration such as the untreated stream backing into the outflow pipe. The monitored depth at the discharge pipe does not indicate mixing with the stream occurred at that time, therefore the result is still considered valid, and it is included in this performance analysis. However, given the low number of sampling events, this value skews the annual average removal performance to be lower. Table 1 includes the range and average sample concentrations that were observed.

Table 1: Observed Phosphorus Concentrations

Location	Minimum [mg/L]	Average [mg/L]	Maximum [mg/L]
*Inlet (2016 to 2020)	0.172	**0.235**	0.482
Outlet (2022-2023)	<0.05	**0.075**	0.105

*Reflects range of years influent, representative of the two water sources to the filter, was monitored

During 2022 and 2023, the discharge volume from the filter was approximately 31 percent of the combined Morgan Avenue neighborhood runoff and the pumped inflow. Figure 3 & Figure 4 display the pump inflow in red and the effluent discharge rate blue on the bottom graph. The discrepancy is likely a result of following:

1. Infiltration occurring in the 2nd cell of the stormwater pond. Water begins to pond in this cell when the inflow rate exceeds the filtration rate through the sand filter. This infiltration is not represented in the monitoring record.
2. Water bypassing the monitoring equipment has been observed during periods of high flow as it splashes out the sides of the pipe apron.
3. The flow monitoring equipment was malfunctioning in 2023 until it was replaced on August 30, 2023. Therefore, the shortened monitored period may not be representative of that entire season.

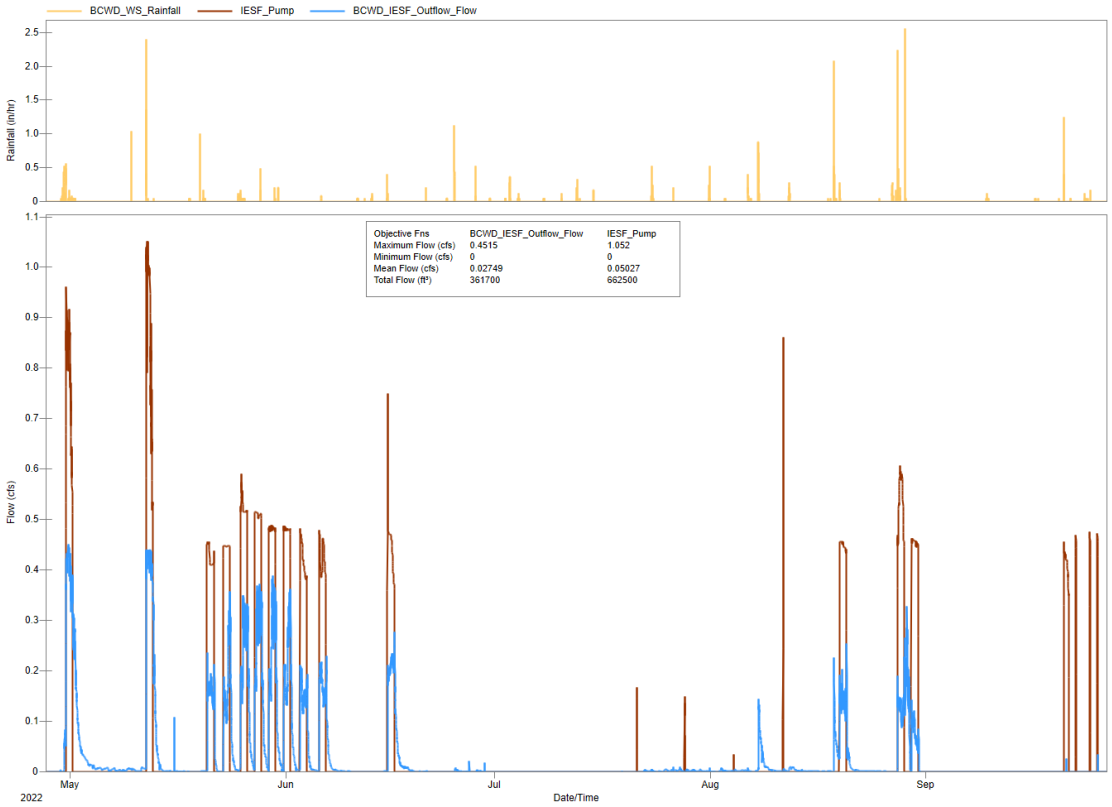


Figure 3: 2022 Precipitation, Pump Inflow, and Filter Outflow

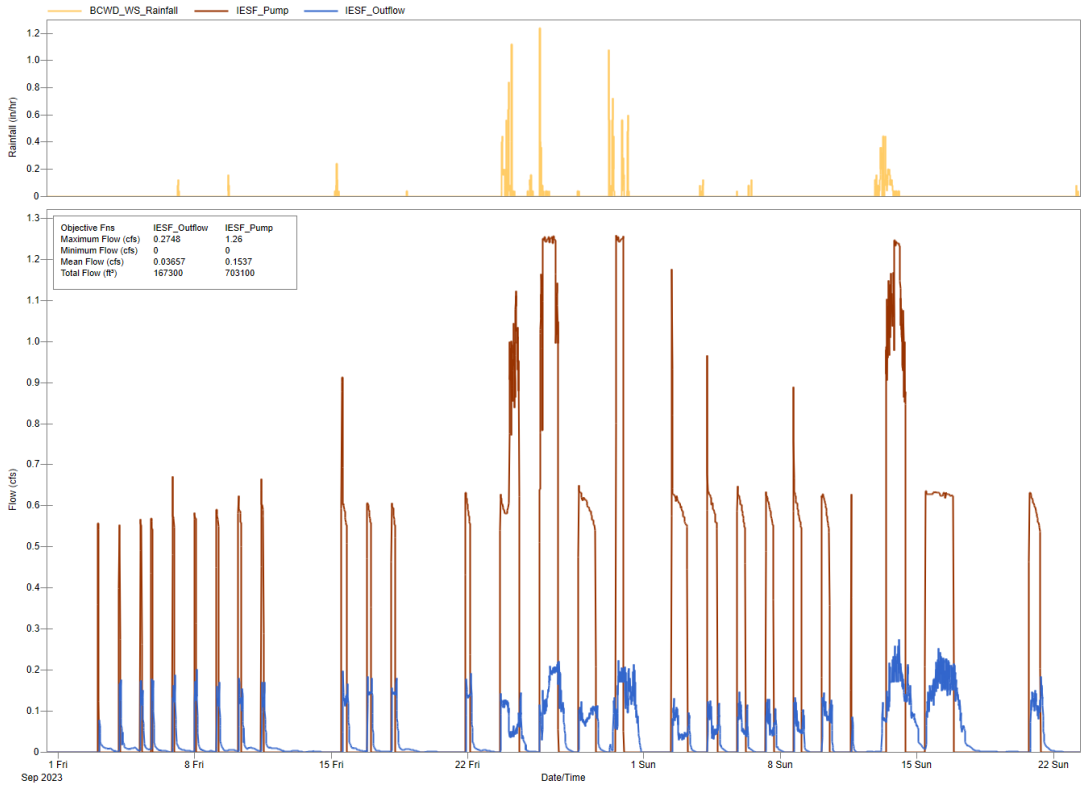


Figure 4: 2023 Precipitation, Pump Inflow, and Filter Outflow

Due to the discrepancy between inflow and outflow, two methods were used to estimate the phosphorus removal of the filter. The first method, which may overestimate the system's efficiency, assumes correct discharge volume monitoring, 69% inflow infiltration in the pond's 2nd cell with full phosphorus treatment, and 31% discharge at the average effluent concentration. The second method, likely underestimating the system's efficiency, assumes all runoff entering the filter is discharged and treated at a 69% removal rate, despite known infiltration in the pond's second cell. Table 2 displays the estimated range of phosphorus removal for these two calculation methods.

Table 2: 2022 & 2023 Total Volume and Phosphorus Treatment Summary

	Method 1: Over-Estimate		Method 2: Under-Estimate	
Influent/Effluent Description	**Volume [acre-feet]**	**Total Phosphorus [Pounds]**	**Volume [acre-feet]**	**Total Phosphorus [Pounds]**
Total Flow In (Pumped & Direct Runoff)	75.5	48.3	75.5	48.3
Discharged from Filter	23.4	4.7	75.5	15.0
Total Removed	**52.1**	**43.6**	**0.0**	**33.3**
System Treatment Efficiency		**90%**		**69%**

3. 2022 – 2023 Performance Conclusions

The total phosphorus removal for 2022 and 2023 is in the lower range of the observed annual treatment over the last ten years, as shown in Figure 5. The following factors are believed to be the driving influences for this:

1. The pump flow rate is variable based on the water level in the pump harvest pond. Lower volume and intensity rainfall does not "bounce" the pond to higher stages that would result in greater pump flow rates during events. Adjustments were made to the pump program to increase to the maximum flow rate for lower stream stages, but the adjustment can only compensate so far before drawing the pond down to the point where the pump turns off, which triggers a 24-hour filter drying period holdout.
2. There were fewer rainfall events in 2022 and 2023 than in previous years. There were 26 pumping events each year compared with 30 to 54 per year between 2019 and 2021.
3. Nearly half of the rainfall volume in 2023 occurred in the months of October thru March, when ice over the pump harvest pond interferes with the ability of water to be drawn into the lift station. As shown in Figure 6, October was the wettest month of 2023, however most of the rainfall occurred in two large events which results in volume bypassing the pump intake since the inflow exceeds the pump capacity. Therefore, less of the runoff was able to be treated through the filter.
4. Encouragingly, the dissolved phosphorus concentration leaving the filter was at or below the analysis reporting limit of 0.05 mg/L for four of the eleven sampling events. Conditions leading up to these events varied, with some following a weeklong dry period, and one followed 2.5 inches of rain two days before. This suggests that the filter still has the capacity to perform with a great deal of efficiency in certain conditions. However, on average, the effluent phosphorus concentration has been increasing over the last several years, with the

average concentration leaving the filter of 0.075 mg/L being the highest observed over the ten years of monitoring. This may suggest the binding capacity of the iron is reduced as discussed in the next section.

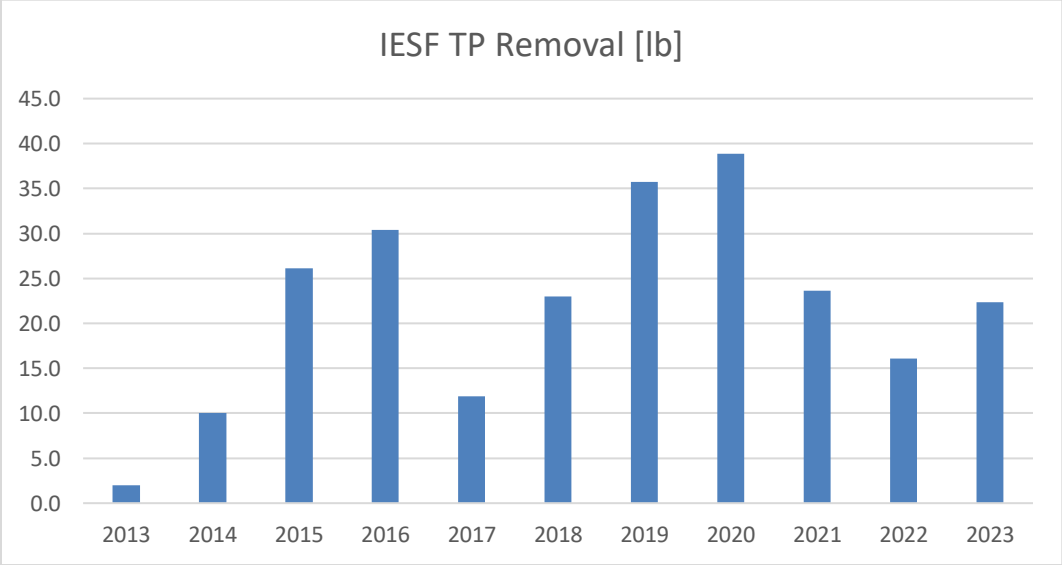
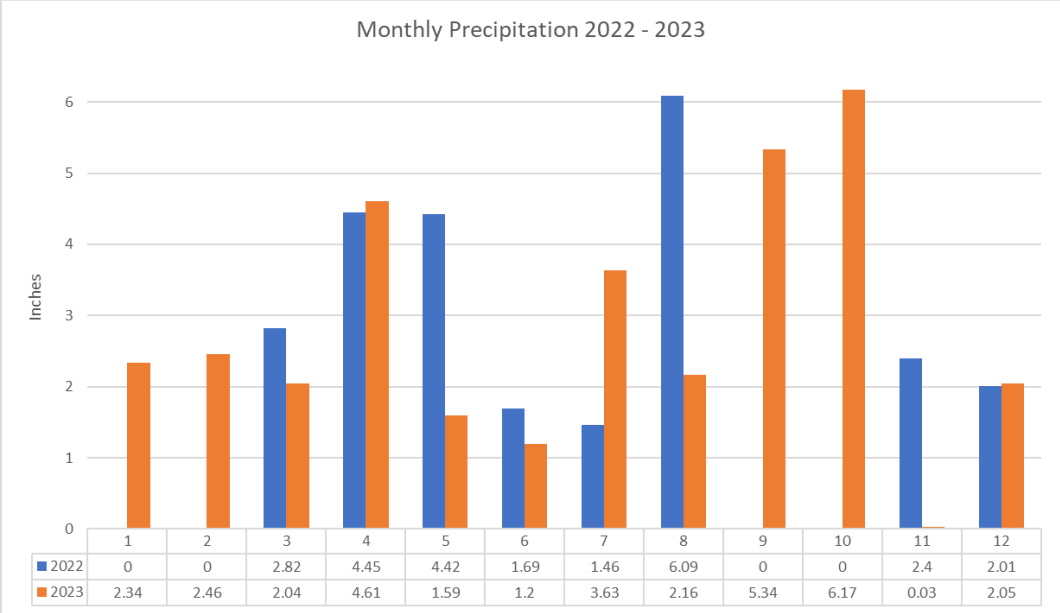


Figure 5: IESF Annual Total Phosphorus Estimate.



	1	2	3	4	5	6	7	8	9	10	11	12
2022	0	0	2.82	4.45	4.42	1.69	1.46	6.09	0	0	2.4	2.01
2023	2.34	2.46	2.04	4.61	1.59	1.2	3.63	2.16	5.34	6.17	0.03	2.05

Figure 6: 2022 & 2023 Monthly Precipitation (MnDNR)

10-Year Project Cost/Benefit Summary

1. Background

The Board of Managers requested a summary outlining all project costs including maintenance activities and overall phosphorus removal benefit that's been realized for downstream resources. All costs that have been incurred for the project are outlined below, beginning after the site was selected through the 2009-2010 feasibility process.

2. Cost Summary

Table 3 summarizes all the costs including sub-categories of the activities falling within the Engineering, Construction, Major Maintenance and Upgrades, Utilities, and Routine Operation & Maintenance. Table 4 indicates when the activities have occurred over the course of the project. On-going costs are indicated with an asterisk (*). These ongoing items have included:

- Routine operation and maintenance items:
  - Adjustments to the pump system based on fluctuating water levels in the stream (via remote monitoring and site visits)
  - Vegetation maintenance (Subcontracted invasive management)
  - Filter surface raking (Coordinated by EOR & WCD Staff)
  - Pump & lift station performance inspection (Subcontracted pump & control specialist)
- Periodic maintenance items:
  - Pump harvest pond dredging ($25,000 to $40,000)
    - Cost depends on findings of sediment sampling
    - Five-year frequency; it's possible it will be less frequent now that the tributary stabilization is in place.
- Utilities
  - Cellular data for remote monitoring & control
  - Electricity to the lift station

In addition, the following maintenance items may be required over the project life. Cost estimates are provided, though combining this work with the periodic dredging of the pump harvest pond may result in a cost savings:

- Removal/replacement of the 6-inch sand filter surface maintenance layer (~$24,000)
  - Depending on the depth that organic material has worked down into the maintenance layer, only removal of the top 2" may be required (to be explored in 2024).
- Removal and replacement of the sand filter media (~$115,000).

Table 3: IESF Project Cost Summary by Category

Cost Sub-Category	Sum of Amount
Construction	$ 203,095
Engineering	
Preliminary Design	$ 45,871
Construction Documents	$ 56,730
Construction Admin	$ 33,651
Sub-Total $136,252	
Major Maintenance/Upgrades	
Outlet Repair	$ 4,336
Pond Dredge*	$ 64,911
Pump Repair	$ 5,500
Pump SCADA & Flow Meter	$ 12,577
Stream Stabilization	$ 19,030
Sub-Total $106,354	
Utilities	
Cellular & SCADA*	$ 4,074
Electrical*	$ 4,500
Sub-Total $8,574	
Routine Operation & Maintenance	
O&M*	$ 137,821
Pump Inspection*	$ 2,355
Vegetation Maintenance*	$ 8,805
Sub-Total $148,981	
Grand Total	**$ 603,257**

*On-going cost

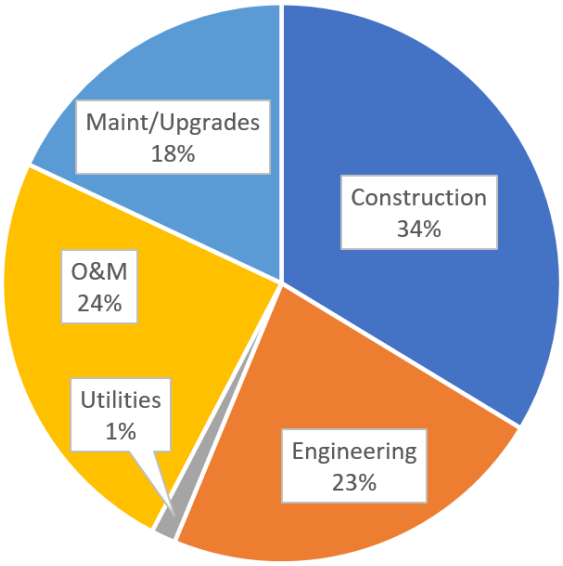


Table 4 IESF Project Cost Summary by Year

Year	Sum of Amount	Description
2010	$ 45,871	*Prelim Design*
2012	$ 56,730	*Const. Documents*
2013	$ 196,743	*Construction*
2014	$ 20,867	*O&M/Upgrades*
2015	$ 25,287	" "
2016	$ 30,072	" "
2017	$ 22,867	" "
2018	$ 56,197	*O&M + Dredging*
2019	$ 14,612	*O&M/Upgrades*
2020	$ 38,430	" "
2021	$ 13,181	" "
2022	$ 12,916	" "
2023	$ 69,483	*O&M + Dredging*
Grand Total	**$ 603,257**	

3. Treatment & Benefit Summary

The total phosphorus removal has been estimated each year based on the methodology outlined in the 2022-2023 Performance Analysis above. Table 5 shows that the IESF system has removed approximately 240 pounds of phosphorus since project installation. What sets the IESF system apart is the ability to remove dissolved phosphorus, the form that poses a significant threat to aquatic ecosystems. The observed ratio of 25 percent dissolved phosphorus in the sampling record implies that the IESF system has captured an estimated 60 pounds of dissolved phosphorus. This is particularly noteworthy considering that dissolved phosphorus is effectively removed by a select few systems, including IESF, other enhanced filtration media, or infiltration systems.

In addition to the phosphorus removal through the IESF, dredging maintenance of the pump harvest pond is also attributed to prevention of phosphorus from discharging downstream into Lake McKusick. Based on the dredged volume and sampled total phosphorus concentration of the sediment, approximately 1,400 pounds of total phosphorus was removed from the pump harvest pond each time it was dredged.

Table 5: Annual Total Phosphorus Removal by IESF System

Year	IESF TP Removal
2013	2.0
2014	10.0
2015	26.1
2016	30.4
2017	11.9
2018	23.0
2019	35.8
2020	38.9
2021	23.7
2022	16.1
2023	22.4
Total	**240**

Table 6: Total Phosphorus Removal with Dredging

Treatment Method	TP Removal [lb]
IESF	240
Pond Maintenance	2,810
Total	**3,050**

4. Cost Benefit Summary

A common metric for assessing a water quality project value is to determine the cost per pound of phosphorus removed. There are several ways in which to look at it through the timeline of the project and they often include many different cost components such as construction, land acquisition, and maintenance over different durations depending on the life expectancy of the project. The 10-year life period project cost per pound of removed phosphorus is calculated in Table 7, and derived from a total of $603,257 and the removal amounts in Table 6.

Table 7:Phosphorus Cost per Pound (10-year period)

Treatment Method	Phosphorus $/lb
IESF	$ 2,513
IESF & Dredging	$ 198

For reference, treatment system lifecycle (25-30 years) returns of < $1,000/lb of phosphorus are favorable as an industry general rule of thumb. Considering major cost items like the lift station, piping, electrical, and pond excavation will not repeat through the lifecycle, this project cost per pound is expected to decrease over time assuming the on-going and periodic maintenance mentioned above.

2023 Filter Media Sampling

1. Background

The Minnesota Stormwater Manual Suggests that total phosphorus at the outlet of an iron-sand filter that consistently exceeds 0.06 to 0.07 milligrams per liter may be used as an indicator that the phosphorus binding capacity of the iron-enhanced sand bed has been consumed. Six of the sampling events exceeded this range, three were within this range, and two events were below this range for the 2022 and 2023 seasons. Due to observing an increasing effluent phosphorus concentration trend in the last several years, sampling and testing the filter media for phosphorous binding capacity was conducted in 2023. The samples were tested for both remaining iron binding capacity, and phosphorous leaching potential from the media.

Following guidance from Saint Anthony Fall Laboratory (SAFL), five locations were sampled at depths of 8 and 20 inches along the length of the filter shown in Figure 7. These depths were specified such that the iron-sand media near the surface, but beneath the six-inch sand "maintenance" layer was sampled, as well as at a depth just above the perforated drain tile, to determine whether there is a vertical gradient of iron remaining or a gradient of phosphorus leaching potential. Likewise, samples were spaced along the filter to determine whether there is a horizontal gradient of treatment capacity given the linear orientation of the filter where the west end of it has been subject to more influent volume than the eastern end. Below is summary of the report that is attached to this memorandum.

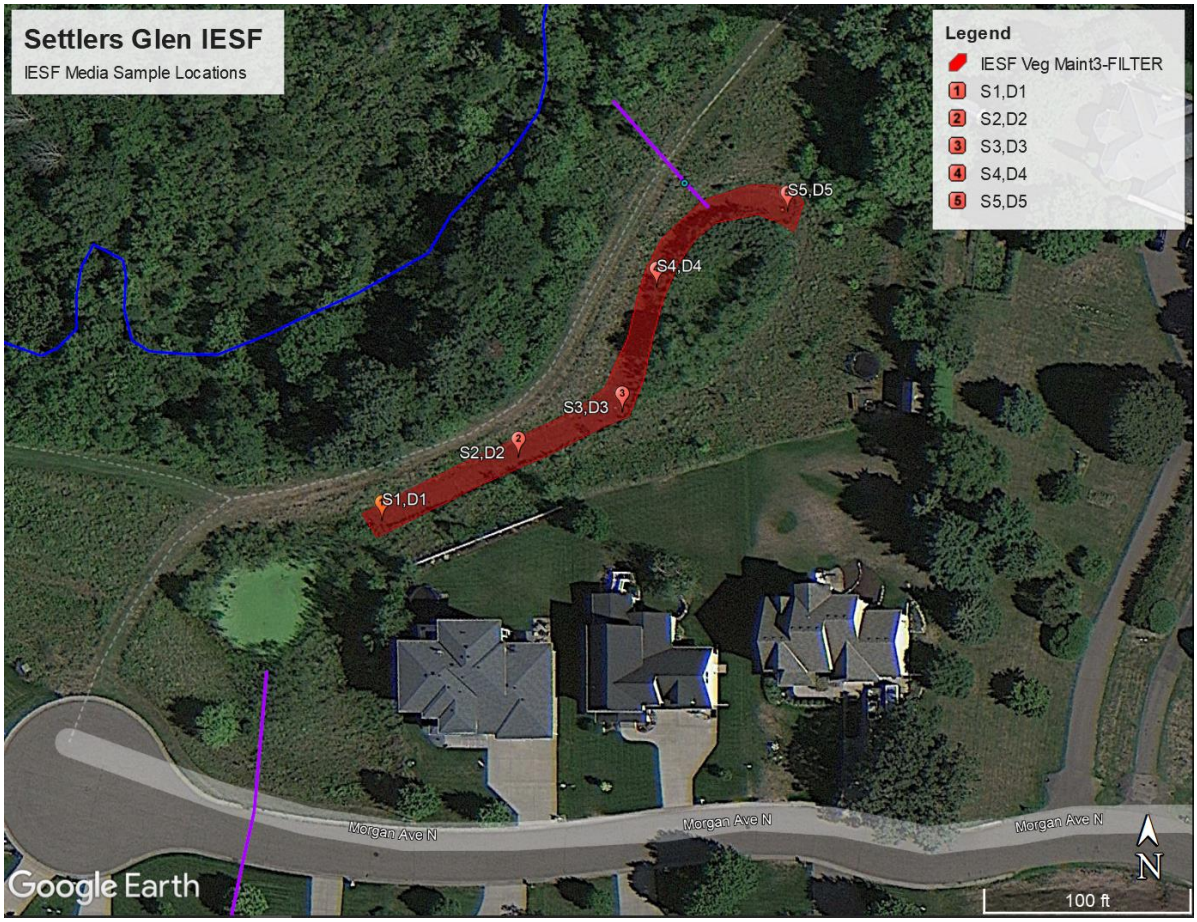


Figure 7: IESF Media Sample Locations

2. Method

Batch experiments were conducted that subjected the samples to a known concentration of phosphorus and analyzed for soluble reactive phosphorus concentrations remaining in the water at durations from 1 to 96 hours of mixing period. Next, the phosphate leaching potential of the IESF media was determined by mixing the samples in water that did not contain phosphate and analyzed for soluble reactive phosphorus in the water following a protocol similar to the batch sorption experiment.

3. Results

The batch study results showed that the IESF media still has the ability to remove phosphate, but that the capacity is substantially reduced when compared to column analysis studies conducted in a lab setting, i.e. not a real-world/field setting. The removal capacity varied depending on the location in the IESF filter. The surface media generally showed lower removal than the bottom media, and the phosphate sorption capacity varied more greatly across the surface than at the bottom. This is expected for a vertical flow filter system.

The phosphate leaching experiment showed that a small amount of phosphate may release from the IESF media into solution over time and at a very low concentration (<0.02 mg/L increase). The phosphate leaching results are in agreement with the sorption results, i.e., the surface media

is already holding onto more phosphate than the bottom media. Also, the western, upstream end of the filter does not exhibit as high of sorption capacity than the eastern, downstream end of the filter. This may be since the upstream end has been subject to more stormwater volume over the past 10 years than the downstream end, where the filter takes more time to become inundated throughout a rain event.

This was the first media that has been analyzed from an IESF facility, and the impact the reduced adsorption capacity has on sorption rates is currently a research topic that SAFL is studying.

Given the remaining sorption capacity of the sampled filter media, we estimate the remaining total phosphorus capture capacity to be approximately 80 pounds. Dividing this amount by the average annual removal of 25 pounds yields Three years remaining before the capacity for the iron to adsorb dissolved phosphorus is extinguished. Once this has occurred, the filter will still function to remove particulate phosphorus until the iron-sand media is replaced.

Maintenance Update & Recommendations

1. The filter surface was aerated and raked monthly from April to September to loosen the upper portion of the sand and encourage movement of water into, rather than across, the filter. It is recommended the Washington Conservation District seasonal BMP maintenance staff continue to conduct this maintenance at this frequency.
2. The monitored discharge and inflow discrepancy has increased for the past two years (though the limited 2023 monitoring period may be a factor). Discharge from the pond normal outlet pipe is not monitored but evidence that it has occurred has been observed, albeit infrequently. EOR will time routine system inspections with rain and pumping events to establish if discharge out the normal outlet is becoming a normal occurrence and establish whether it is due to larger volume rainfall, frequency of rainfall and pumping, or clogging of the filter bed.
3. The stream where the filter underdrain discharges widened significantly prior to the tributary stabilization project. This widening and downcutting was improved by the tributary stabilization project, however, it is suggested that the immediate area around the outfall be stabilized with class 1 riprap. This maintenance work is included in the IESF 2024 Operation and Maintenance Scope of Services below.
4. Vegetation management to control invasive species on all areas that were disturbed by the project should continue to be conducted throughout the year (this is being conducted under the Districtwide vegetation maintenance contract with Natural Shores Technologies approved at the March 2024 Regular Meeting of the Board of Managers).
5. Due to the observation of a gradient in the remaining capacity potential during the batch testing by SAFL, it is recommended that a valve be installed midway down the underdrain to avoid short circuiting of flow through the upstream, more used portion of the filter media, to force flow through the less used, downstream areas of filter before reaching the underdrain. SAFL concurred with this approach to improve the phosphorus removal efficiency during the remaining filter life. The cost to install this valve is included in the IESF 2024 Operation and Maintenance Scope of Services below.

IESF 2024 Scope of Services

The budgeted amount for the approved **1/11/2023** IESF Operation and Maintenance Scope of Services was 100% invoiced as of March 2024, prior to fulfilling all the 2023 outlined tasks. The overrun was attributed to several unanticipated items throughout the year such as replacement of the cellular modem in the control cabinet, field review of the lift station for leakage and addressing a sinkhole, coordination with UofM RAL and SAFL, as well as responding to beaver activity causing raising water levels and leading to design review for the submerged inlet conditions.

At the direction of the Administrator, EOR continued to fulfill the tasks included in the 2023 scope, and include the cost overrun as Task 1 of the following scope of services.

The on-going operation and maintenance of the project involves remote desktop monitoring and adjustment of the pump settings based on stream stage and weather conditions, site visits to check operation, vegetation, sediment accumulation, erosion, and filter surface condition. EOR will coordinate with WCD staff to maintain the filter surface with monthly raking and aeration as well as install additional armor at the filter outfall where the stream has widened and eroded the bank. EOR staff will also install the underdrain valve as described earlier.

An end of year performance evaluation from the sampling results will be supplied as well as updating the project operation and maintenance manual based on the activities throughout the year (pump on/off or variable speed drive setting alterations, additional maintenance performed outside of the norm, etc.).

Scope

The following table outlines the hours and cost anticipated for the 2024 season.

Task	Description	Hours	Cost
1. 2023 Scope Overrun	Unanticipated tasks and continued operation and maintenance through April 2024	24	$5,440
2. System Status	Remote desktop monitoring & pump setting adjustments, Monthly site visits, mileage, and documentation	35	$4,860
3. Site Maintenance	Filter surface maintenance coordination, riprap armor placement at outfall, valve installation	35	$5,870
4. Performance Report, O&M Manual Update	Review of 2024 monitoring data, system performance evaluation, and reporting. Update project Operation & Maintenance Manual	38	$5,400
Total		**108**	**$21,570**

*Given the weather-dependent nature of the work, the costs are estimates only. Additional project needs will be brought to the attention of the District Administrator and outlined in a separate scope of work. Vegetation maintenance of this project is included in a separate, District-wide vegetation maintenance scope.

Requested Action

Consider approval of this scope of services for an estimated cost of $21,570 from account 948-0000.

ST. ANTHONY
FALLS LABORATORY

Evaluation of Iron-Enhanced Sand Filter Media for Phosphorus Removal: Results of Batch Studies

Technical Memorandum

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October 2023
Minneapolis, Minnesota

COLLEGE OF Science & Engineering
UNIVERSITY OF MINNESOTA

Evaluation of Iron-Enhanced Sand Filter Media for Phosphorus Removal: Results of Batch Studies

Objective

The objective of this study is to estimate the remaining ability of an existing iron-enhanced sand filter installation to remove dissolved phosphorus from storm water runoff using results from laboratory batch studies. The iron-enhanced sand filter (IESF) is part of a pump and treat BMP located in Stillwater in the Brown's Creek Watershed District. The IESF has been in operation since 2014, resulting in nine years of operation. Filter media samples collected from the IESF facility were tested for phosphorus adsorption capacity and phosphorus leaching potential under controlled conditions in the laboratory.

Method

Filter media sample collection

Filter media samples were collected from the IESF facility by EOR personnel. Media from five locations distributed across the filter's surface and the filter's bottom were collected (total samples = 10).

Batch experiments

The batch studies were performed using acid-washed Nalgene bottles (500 mL capacity) and a Labline orbital shaker at room temperature. Based on typical phosphorus concentrations in stormwater runoff (Maestre and Pitt 2005), a concentration of 0.30 mg/L dissolved phosphorus was selected for the batch experiments to represent extreme phosphate loading conditions. A standard phosphate solution was prepared by mixing potassium phosphate (KH_2PO_4) in Milli-Q (ultrapure) water to a mean concentration of 0.29 mg/L (± 0.056 Std Dev.), and 300 mL of this solution was filled into each batch bottle. The experiment was performed using a media:solution ratio of 1:20 (by weight), with three replicates for each media sampling location (total batch bottles = 3 replicates x 10 locations = 30). An initial sample (0 hour) was collected before the addition of the media samples from 50% of the batch bottles to verify the initial phosphate solution concentration. The batch test bottles with media and blank bottles (no media) were placed on the shaker table at 150 RPM, and water samples were collected after 1-, 24-, 48-, and 96-hour mixing period. The water samples were filtered through a 0.45-micron filter to remove particulates and analyzed for soluble reactive phosphorus (orthophosphate) concentrations using the ascorbic acid method (Standard Methods 4500 P, APHA 1995).

The phosphate leaching potential of the IESF media was also determined by mixing the media samples in MilliQ water that did not contain phosphate. Media samples from five locations in the filter (two surface and three bottom media samples) were tested in this experiment (total batch

bottles = 3 replicates x 5 locations = 15), following a protocol similar to the batch sorption experiment described above.

Results

Phosphate sorption experiment

The batch study results (Figure 1) showed that the IESF media still has the ability to remove phosphate (PO_4–P), but the PO_4–P adsorption capacity varied depending on the location in the IESF filter. The surface and bottom media samples tested removed approximately 8.2 to 22% (10% mean ± 6.8 % Std. Dev.) of the available phosphate (0.288 mg PO_4–P/L) after a short contact time of one hour. Over time, the PO_4–P removal increased to 11 to 65% (38% mean ± 17 % Std. Dev.) after 24 hours, and then 21 to 83% (55% mean ± 19 % Std. Dev.) after 48 hours. At the end of 96 hours, the media removed 39 to 89% (68% mean ± 16 % Std. Dev.) of the initial PO_4–P mass in solution. The surface media generally showed lower removals than the bottom media.

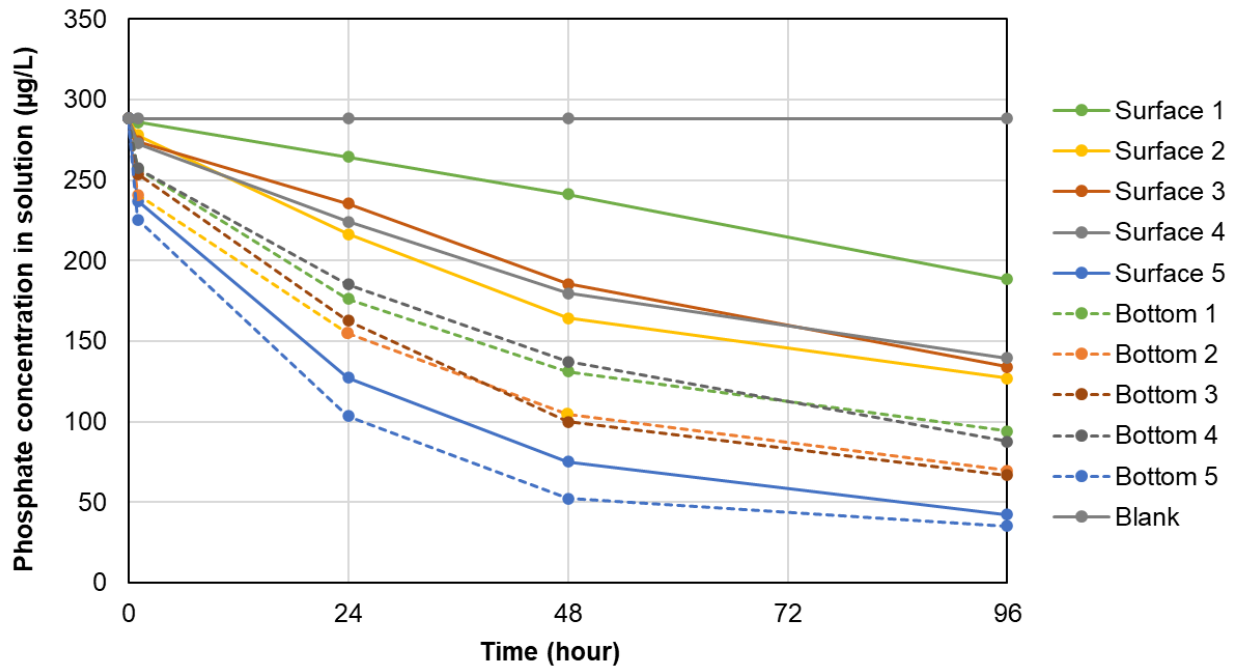


Figure 1. Phosphate removal by filter media samples collected from the IESF BMP located in Burnsville. The media samples (15 ± 0.0091 g) were added to a standard phosphate solution (initial concentration =~300 ppb) and mixed for 96 h to determine the phosphate sorption capacity of the media. Blank test bottles did not receive any media. Concentrations shown are mean for three replicates for each sample.

The PO_4−P sorption capacity (mg PO_4−P / g of media) calculated for 96-hour mixing duration is summarized in Table 1. Differences in PO_4−P removal capacities were more apparent across the filter surface than at the bottom. The mean sorption capacities of 0.59 mg/g (± 0.17 Std. Dev.) in the surface media and 0.77 mg/g (± 0.074 Std. Dev.) in the bottom media indicate that there is lower PO_4−P removal capacity remaining in the surface than at the bottom portion of the IESF. This result is consistent with a vertical-flow filtration system.

Table 1. Phosphate adsorption capacity of the filter media samples (mg PO_4−P / g of media) collected from an IESF BMP located in Burnsville. The calculated phosphate adsorption capacity is based on the results of the batch experiments performed by mixing the media (15 g) in a standard phosphate solution (initial concentration =~300 ppb) for 96 hours. Media:solution ratio = 1:20 (by weight). Values reported are mean for three replicates per media sample.

PO_4−P sorption capacity of surface media samples (mg/g)					**PO_4−P sorption capacity of bottom media samples (mg/g)**				
1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
0.394	0.592	0.569	0.551	0.865	0.698	0.777	0.785	0.719	0.887

Phosphate leaching experiment

Batch experiments with MilliQ water containing no phosphate were performed to determine the maximum phosphate (PO_4−P) leaching potential of the media. The experiment results (Figure 2) showed that a small amount of PO_4−P may release from the IESF media into solution over time. The resulting PO_4−P concentration in the solution was very low (< 0.02 mg/L increase) for all media samples after one hour contact. Only one surface media sample (location 1) leached PO_4−P at the end of 96-hour contact, and concentrations were still low for the bottom media samples. Phosphate release from the media was not observed beyond 48-hour contact time for all samples. The PO_4−P leaching results are in agreement with the PO_4−P sorption results; i.e., the existing surface media is already holding on to more phosphate than the bottom media.

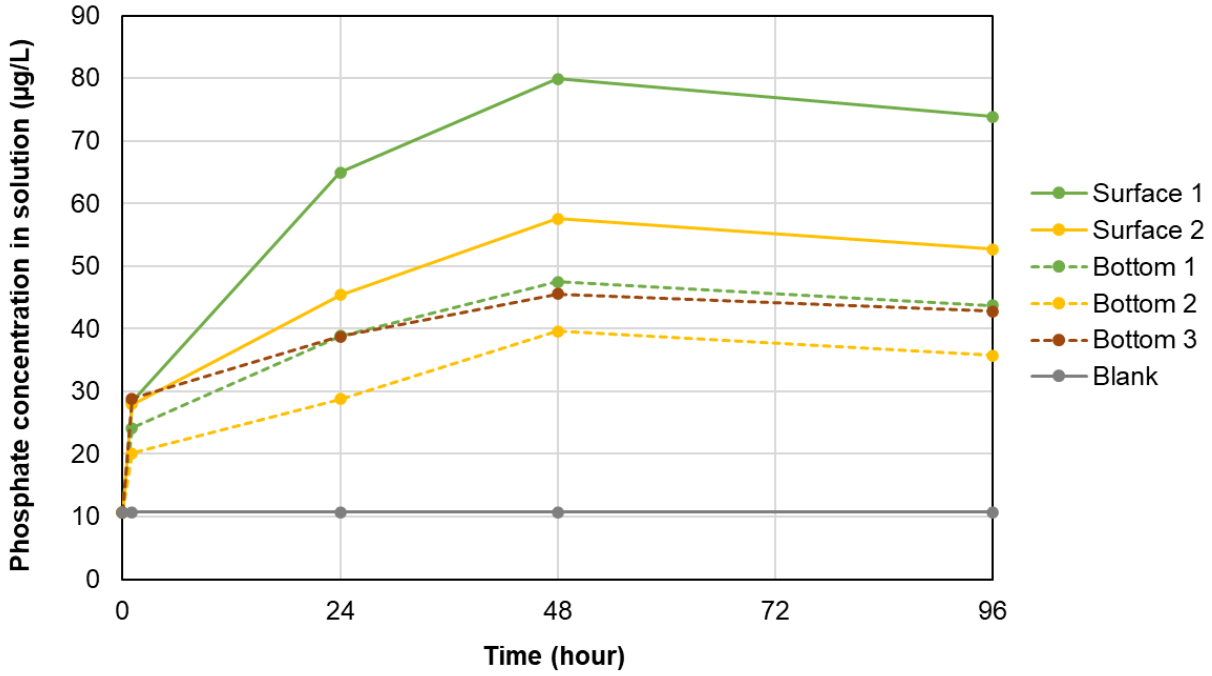


Figure 2. Results of the batch phosphate leaching studies on five filter media samples collected from an IESF BMP located in Burnsville. The media samples (15 ± 0.0096 g) were added to ultrapure water (initial phosphate concentration ~ 10 ppb) and mixed for 96 h to determine the phosphate leaching potential of the media. Blank test bottles did not receive any media. Concentrations shown are mean for three replicates for each sample

Analysis

Erickson et al. (2012) found in column studies that a maximum of 4.8 mg of phosphate could be retained on each gram of iron filings of the size used in most IESFs. The bottom media phosphate adsorption capacities of 0.77 mg/g (± 0.074 Std. Dev.) indicates that the iron sorption sites have been substantially reduced. The impact on sorption rates, however, has not been determined and is currently a research topic. This is also the first media that has been analyzed from an IESF facility, and comparison with other IESF media would also be illuminating. It is apparent, however, that the media is still adsorbing phosphate.

Conclusions

1. The batch studies showed that the filter media tested from the Stillwater IESF facility still has phosphate removal capacity.
2. Some areas of the filter surface appear to have less capacity to adsorb phosphate than other areas. Also, the surface media has diminished phosphate sorption capacity than the bottom media. These results are expected for a vertical-flow filtration system.

3. There is a small potential for the surface media to release the already-captured phosphate; however, the amount of phosphate released from the media is not expected to result in significant increases in phosphate concentration in the water flowing through the filter.

The actual performance of the filter is currently difficult to determine, because research is underway to estimate the relationship between media studies and filter performance at retaining phosphate.

Acknowledgements

This project was completed through a contract between the St. Anthony Falls Laboratory (SAFL) and EOR, under the supervision of Ryan Fleming.

References

APHA, AWWA, WPCF (1995). *Standard Methods for the Examination of Water and Wastewater*, 19th Ed., American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF, former Water Pollution Control Federation or WPCF), Washington, D.C.

Erickson, A.J., Gulliver, J.S., and Weiss, P.T. (2012). "Capturing Dissolved Phosphorus with Iron Enhanced Sand Filtration." *Water Research*, 46(9), 6601–6608.

Maestre, A., and Pitt, R. (2005). The National Stormwater Quality Database, Version 1.1: A Compilation and Analysis of NPDES Stormwater Monitoring Information. University of Alabama, Tuscaloosa, AL, and Center for Watershed Protection, Ellicott City, MD.

Project Name |	Brown's Creek Park Rock Crib	**Date** |	5/2/24
To / Contact info |	BCWD Board of Managers		
Cc / Contact info |	Karen Kill, District Administrator		
From / Contact info |	Kajol Annaduzzaman, PhD.; Alec Olson; Camilla Correll, PE		
Regarding |	Rock Crib Performance Evaluation		

Introduction

This memo provides an overview of the operational performance of the Rock Crib structure within the Brown's Creek Park Stormwater Project, completed in Spring 2017. Situated south of McKusick Road and west of Neal Avenue North in Stillwater, MN, the project was a collaborative effort involving the City of Stillwater, Washington County, Brown's Creek Watershed District, Middle St. Croix Watershed Management Organization, Emmons & Olivier Resources, and Prinsco (Manufacturer) (refer to **Figure 1** for the location map).

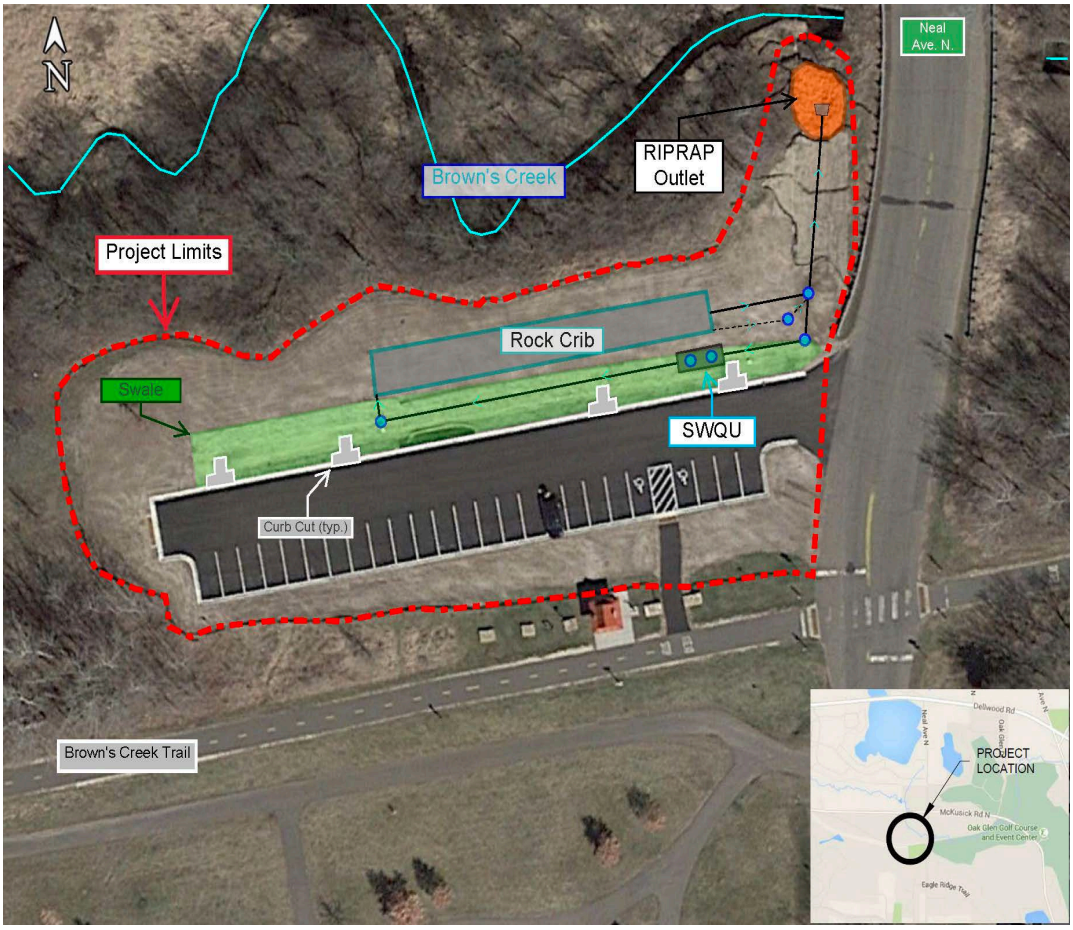


Figure 1. Location map for Brown's Creek Park Stormwater Project.

The primary objective of the project was to mitigate thermal and sediment loading from the parking lot area and Neal Avenue, preventing untreated drainage into Brown's Creek. The development of plans and specifications for the Brown's Creek Park Parking Lot BMPs involved the installation of a rock crib and

bioretention basin, as well as the construction of a new parking lot. This initiative aimed to reduce thermal loading to Brown's Creek and enhance water quality by addressing runoff from the impervious parking lot paving.

The targeted outcomes included the reduction of Total Suspended Solids (TSS) from 155 to 34 lbs/year, Total Phosphorous (TP) from 0.60 to 0.20 lbs/year, and Thermal Loading from 23.45 to 18.3°C. Additionally, the BMPs were strategically designed to accommodate future improvements to Neal Avenue, incorporating connections for storm sewer integration from existing roads. The successful connection of the Neal Avenue storm sewer to the rock crib occurred in 2020, specifically between August 25 and September 14, broadening the system's functionality beyond the parking lot.

It's crucial to note that the rock crib functioned solely for the parking lot before the 2020 sewer connections. The subsequent sections of this memo will delve into the performance evaluation of the rock crib, focusing on pre-Neal Avenue storm sewer connection (before August 2020) and post-Neal Avenue storm sewer connection (after August 2020). The assessment will include key parameters such as inlet and effluent water quality and temperature during these phases. This comprehensive analysis aims to provide valuable insights into the efficacy and adaptability of the rock crib structure in fulfilling its stormwater management objectives.

Project summary

The stormwater management system within this project meticulously follows a designated drainage path, commencing at a paved driveway equipped with curb & gutter, catch basins, and curb cuts. This purposeful design directs site drainage seamlessly through a bio swale, culminating in a Prinsco underground stormwater quality unit (SWQU) (see **Figure 2**). The 5-foot diameter by 20-foot-long underground storage tank stands as a strategic element, engineered to adeptly capture various debris, including trash, sediment, oils, and suspended solids.

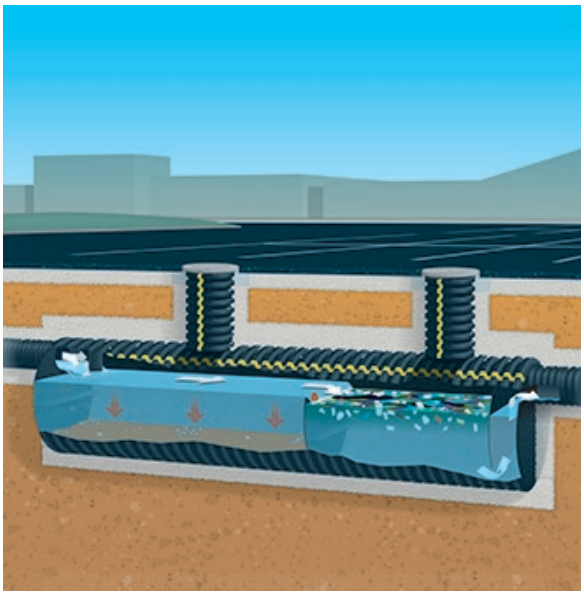


Figure 2. Prinsco Underground SWQU.

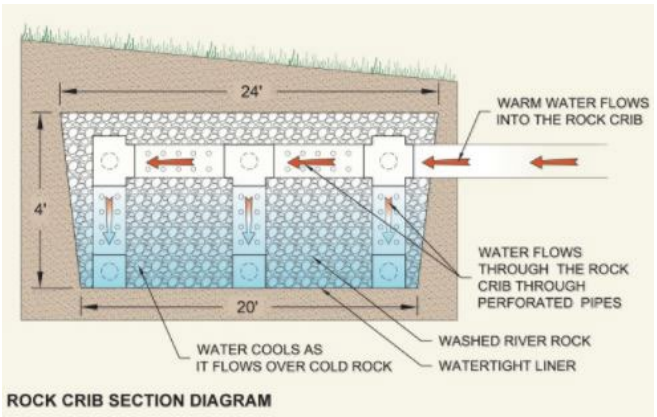


Figure 3. Rock Crib Design.

Subsequently, the orchestrated flow of stormwater continues through a rock crib (**Figure 3**), strategically designed to address thermal loadings. This ensemble of constructed features ensures that cleaner and cooler stormwater is being discharged into Brown's Creek. To preempt overflow scenarios, a well-integrated bypass system redirects excess water directly to Brown's Creek via an underground pipe. The thermal reduction is achieved by enabling stormwater to traverse a series of perforated pipes surrounded by 1.5" – 3.0" river rock.

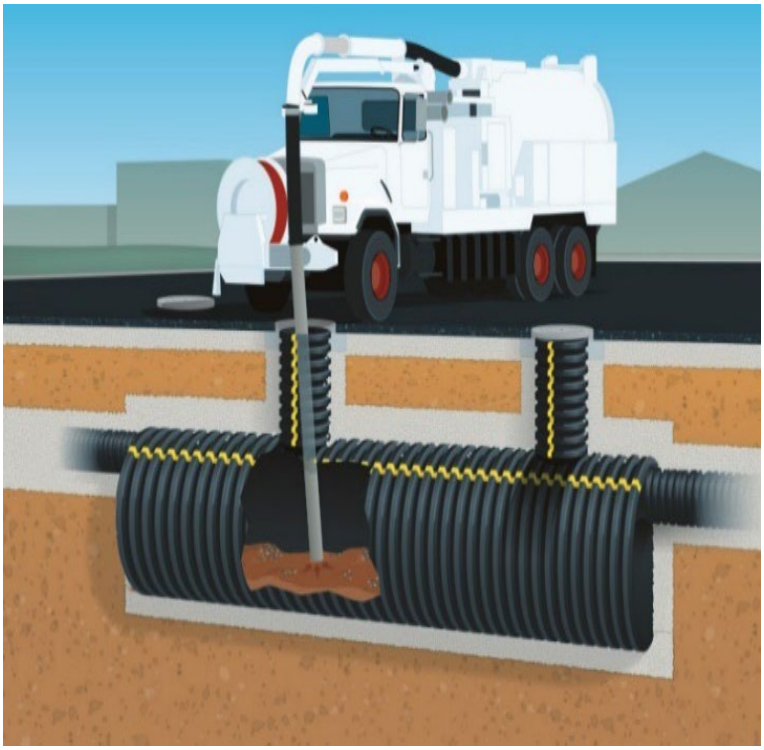


Figure 4. Maintenance of SWQU

In terms of accessibility for maintenance purposes, a thoughtful layout facilitates easy entry from the adjacent parking lot. Manhole risers on the SWQU play a crucial role in aiding the removal of debris and sediment, while PVC cleanouts strategically positioned on both sides of the SWQU and the western edge of the Rock Crib assist in systematic flushing. Maintenance equipment, weighing approximately 10 to 15 tons dry, with a gross weight nearing 30-tons, can be seamlessly operated without intruding into the vegetated area. This strategic placement owes itself to the proximity of the SWQU and Rock Crib to the parking lot edge, exemplifying a well-thought-out approach to system accessibility and upkeep (**Figure 4**).

Methods

To evaluate the performance of the BCWD Rock Crib, data collection followed the parameters outlined in the BC Park Rock Crib Standard Operating Procedures Manual (BC Park Rock Crib_SOPM). However, post-construction data focused solely on temperature monitoring at five specific locations: Rock Crib Inlet, Underdrain, High Drain, Main Outlet, and Overflow Inlet Pipe (refer to **Figure 5**). Notably, Total Suspended Solids (TSS) and Total Phosphorus (TP) monitoring were omitted, as per discussions with the Washington Conservation District on February 26, 2024. Monitoring of the volume input to the Rock Crib was conducted effectively, alongside recording stage, velocity, and flow rate data for the outlet during the specified timeframe, although these details are not elaborated in this memo.

Given the available data, this memo exclusively focuses on evaluating temperature reduction from source water to discharge at the Creek. The temperature monitoring sensors were strategically located within the rock crib system, facilitating comprehensive data collection. The installation of rock cribs adhered to established procedures, ensuring proper alignment and stability. This section outlines the methods employed for rock crib installation and temperature monitoring, while acknowledging the absence of TSS

and TP data. It also clarifies that sediment removal data was not collected as it was not deemed necessary for the scope of the study.

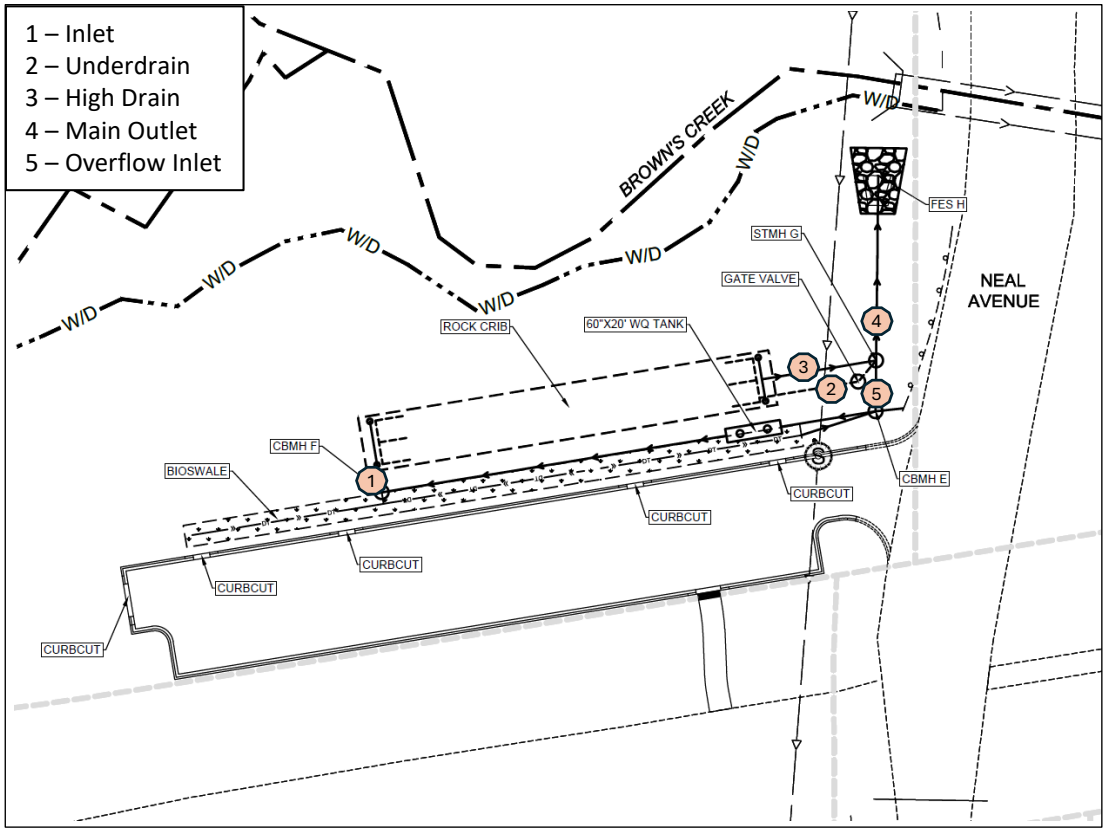


Figure 5: Location of temperature monitoring sensor within the rock crib system.

Results

The temperature variations in Rock Crib outlet compared to its inlet are depicted in **Figure 6**, focusing on two distinct operational periods: pre-summer 2020 (pre-2020) and post-summer 2020 (inclusive). This delineation captures the system's operation from its installation in 2017, initially addressing only the parking lot, up to the point when Neal Avenue's stormwater began discharging to the Creek via the rock crib system in summer 2020 (which is referred to as “inclusive” in the legend).

The study reveals that the rock crib exerts its most significant cooling influence on runoff, notably reducing temperatures by approximately 3°C, particularly during peak air temperatures in June and July. This cooling effect persists year-round, maintaining temperatures close to the targeted 18.3°C, except for a deviation in October, which is likely due to higher ground temperatures which serves to warm the cooler stormwater runoff as it travels through the rock crib. Notably, before 2020, the rock crib consistently produced cooler water compared to post-2020 conditions. The increase in outlet temperature post-2020 is attributed to elevated flow rates from Neal Avenue stormwater and higher inlet water temperature (**Figure 7**). However, the effectiveness of the rock crib remains steady in both pre- and post-2020 scenarios. Although the volume increase from Neal Avenue connections reduced residence time with the rock, diminishing its efficacy, it generally maintains consistency. Noteworthy is the slight deviation in the initial weeks of September post-2020, correlating with significantly higher flow rates. These findings

underscore the rock crib's enduring importance despite operational variations, suggesting the need for adaptive strategies to optimize its performance under changing conditions.

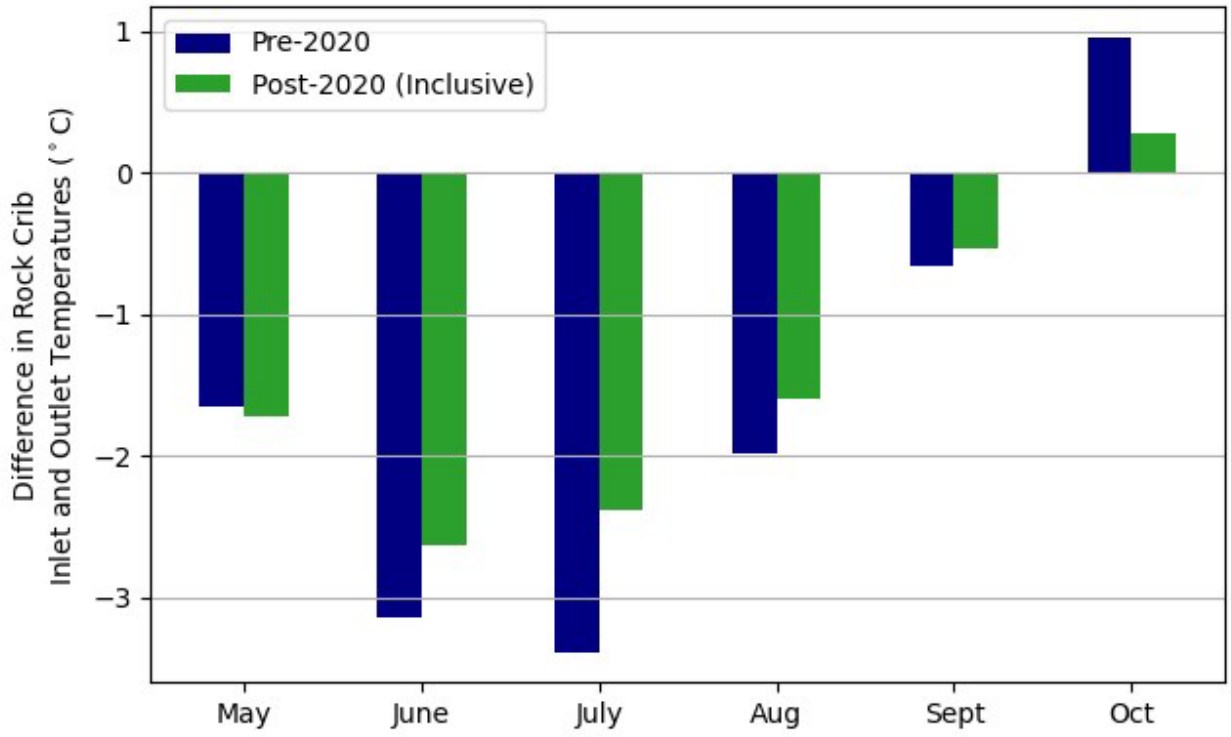


Figure 6: Temperature variation in the rock crib discharge water over pre-and post-2020.

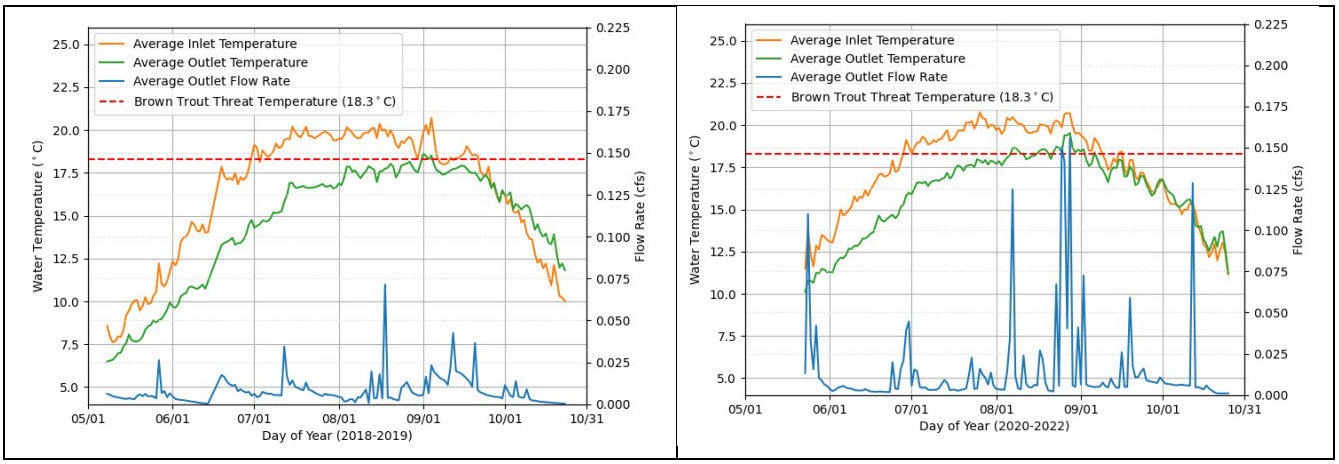


Figure 7: Temperature and flow rate in the rock crib system over pre-2020 (left) and post-2020 (right).

Despite the lower temperature at the rock crib outlet, the higher temperature observed in the discharged water is primarily attributed to the mixing of warmer inlet overflow and high drain temperatures (as illustrated in **Figure 8**).

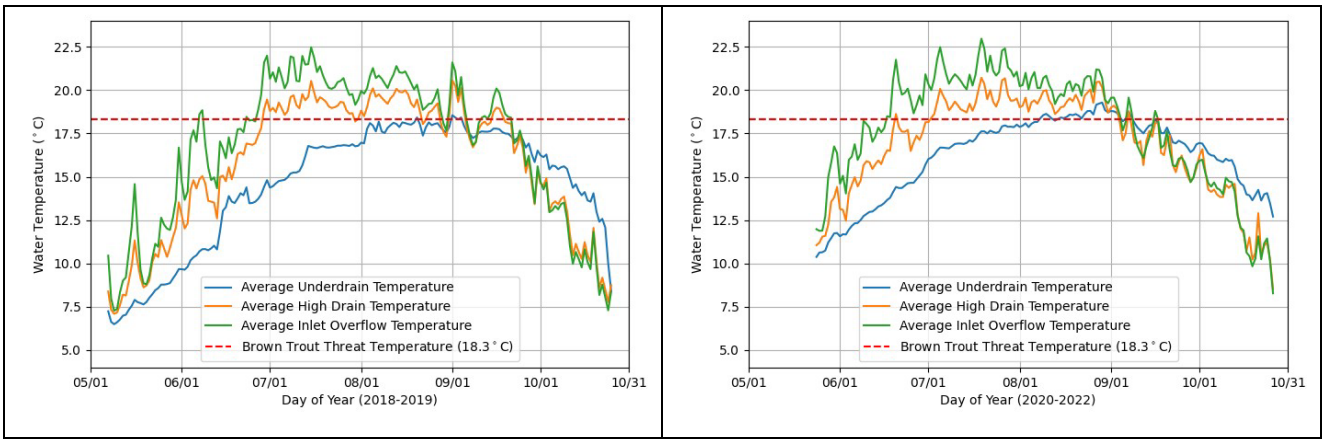


Figure 8: Temperature variation in the underdrain, high drain, and inlet overflow in the rock crib system over pre-2020 (left) and post-2020 (right).

Although the Rock Crib shows lower inlet and outlet temperatures, downstream creek temperatures remain high due to elevated atmospheric temperatures until mid-July, for both pre- and post-2020 conditions (in **Figure 9**). Subsequently, as atmospheric temperatures decrease post-mid-July, high stormwater temperatures from ground runoff elevate inlet temperatures. However, following this, outlet temperatures also rise but are notably reduced from the inlet temperature. This increase in inlet and outlet temperatures is primarily attributed to the elevation of ground temperature over the high atmospheric temperature season (before mid-July), maintaining high ground temperature until reaching its peak at the end of August. The ground temperature decreases after the end of August, coinciding with the decline in atmospheric temperatures post-mid-July.

As a result, it can be deduced that approximately 1.5 months are needed for the elevated temperature to dissipate, allowing inlet temperatures to align with the guideline temperature for the outlet. Hence, it can be inferred that approximately 1.5 months are required for the elevated temperature to dissipate, allowing inlet temperatures to align with the guideline temperature for the outlet.

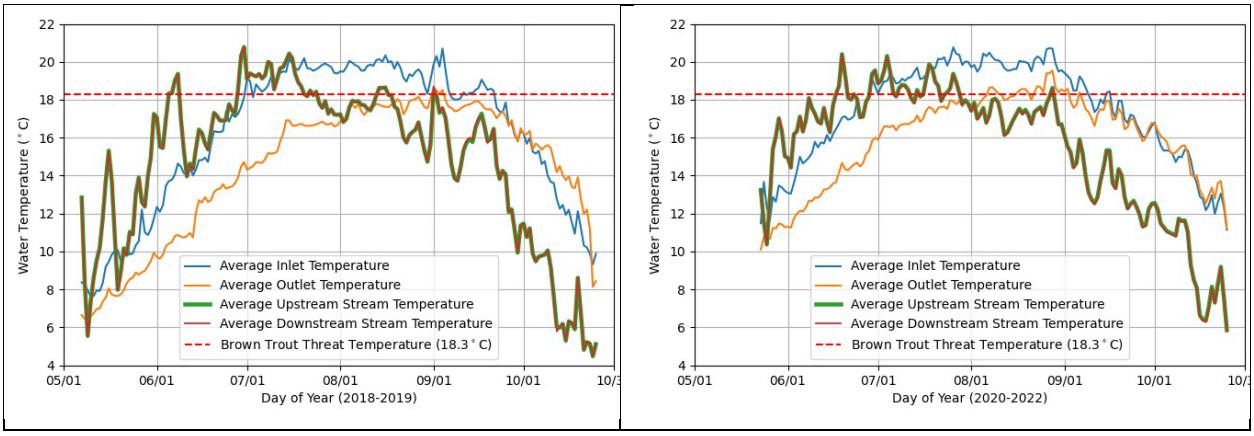


Figure 9: Temperature variation in the downstream, inlet and outlet for the rock crib system over pre-2020 (left) and post-2020 (right) condition.

Recommendations

Enhanced Monitoring: Implement a more comprehensive monitoring system to continuously track both inlet and outlet temperatures, as well as atmospheric and ground temperatures, to better understand the system's behavior over time. Furthermore, it is important to monitor the water quality parameters (i.e., TSS and TP) to maintain the creek water quality, which can directly affect the aquatic environment.

Optimized Stormwater Management: Develop strategies to mitigate the impact of high stormwater temperatures caused by ground runoff, possibly through improved/increased drainage systems or vegetation area around the rock crib to dissipate the inlet temperature for rock crib.

Consider Expansion: Evaluate the feasibility of expanding the rock crib system to other relevant parking lots or similar condition within the area to further enhance its overall effectiveness in reducing thermal, TSS, and TP loading and improving water quality in the creek.

Regular Maintenance: Continue to conduct regular inspections and maintenance of the rock crib system to ensure its proper functioning, including sediment removal and cleaning of inlet and outlet structures to prevent blockages and maintain optimal flow.

Adaptive Management: Continuously assess the performance of the rock crib system and adapt management practices accordingly to address any emerging issues or challenges, ensuring its effectiveness in mitigating thermal loading to the downstream creek.

Public Awareness: Enhance awareness regarding how the built environment impacts natural resources, the significance of stormwater management and the role played by the rock crib system in mitigating thermal loading. Encourage community engagement and support for continuous maintenance and improvement endeavors. This can be achieved through dissemination of information via the district web portal and/or utilization of existing signage at the site.

Concluding Remarks

In conclusion, the analysis of the rock crib's performance underscores its pivotal role in mitigating thermal loading and improving water quality downstream. Regardless of challenges such as elevated stormwater temperatures and seasonal variations, the rock crib consistently demonstrates its effectiveness in cooling runoff, particularly during peak air temperatures. Recommendations for enhanced monitoring, optimized stormwater management, regular maintenance, and adaptive management are crucial for sustaining its efficiency. Moving forward, a holistic approach encompassing expansion, public awareness, and continuous improvement efforts will further fortify the rock crib's contribution to preserving the environmental integrity of the downstream creek, ensuring a sustainable and resilient stormwater management system.

Project Name |	Brown's Creek Drone Assessment	**Date** |	04/25/2024
To / Contact info |	BCWD Board of Managers		
Cc / Contact info |	Karen Kill, District Administrator		
From / Contact info |	Mike Majeski & Chris Long		
Regarding |	Drone Flight Upstream of Manning Avenue and Downstream of Stonebridge Trail		

Background

The 2017-2026 Watershed Management Plan includes an implementation activity to conduct routine drone flights every other year along the Brown's Creek corridor to monitor beaver dams and other channel obstructions in the system. The drone flights are useful for identifying areas of bank erosion and channel obstructions and allow the District to efficiently locate obstructions and other stream-related issues along the channel in remote reaches and wetland areas that are difficult to traverse on foot, especially the wetland-dominated reaches upstream of Manning Avenue and the Brown's Creek gorge.

Drone Assessments

A drone flight was conducted on April 4, 2024 from Manning Avenue upstream to the headwaters north of 110th Street, and also from Stonebridge Trail to the St. Croix River. Beaver dams and other obstructions were photographed using the drone, and the images were cross-referenced using Google Earth. Obstructions that appeared to be impeding streamflow were photographed and analyzed. Minor channel obstructions were observed from the drone including one active and two inactive beaver dams at the same locations identified in 2018 and 2022. No significant channel obstructions or signs of bank erosion were observed, but numerous down trees were observed in the gorge. The down trees are mostly "bridged" over the channel and are not obstructing flow at this time, and many of the down trees are providing overhead cover and instream habitat for fish and macroinvertebrates. However, the down trees will be monitored to determine if full channel obstructions begin to form which could cause flow deflection into the adjacent banks and subsequent bank erosion.

Select images taken from the drone flight are included in Appendix A and are presented in sequential order beginning at the headwaters of Brown's Creek and progressing downstream. The complete drone flight video is available at the BCWD office.

Appendix A

Select Images from the Drone Flight Upstream of Manning Avenue and Downstream of Stonebridge Trail

Image of the headwaters of Brown's Creek and the beginning of perennial flow

Landowner shrub cutting and piling near Brown's Creek in the headwaters reach north of 110th St

Driveway crossing and small foot bridge over Brown's Creek just upstream of 110th St

Twin culverts under a trail crossing downstream of 110th St

Location of previous large beaver dam (red line) that spanned the entire floodplain downstream of the Gateway Trail in 2018

Wood bridge and location of old beaver dam (yellow oval) near private parcel west of 97th St. N / downstream of the Gateway Trail

Active beaver dam located approximately 900 feet upstream of Manning Avenue

Debris jam in Mendel wetland upstream Highway 96

Example of down trees in the Brown's Creek gorge. Note the trees are spanning the creek from the top of the banks and not obstructing flow

Down tree trunk within the creek upstream of Highway 96 in the Brown's Creek gorge

Down trees between Highway 96 and Highway 95 near the St. Croix River

Resolution No. 24-__

Brown's Creek Watershed District
Board of Managers

Ordering the 62nd Street Trail Flood-Resilience Improvement Project and authorizing work in support of the project by the administrator

Manager _____ offered the following resolution and moved its adoption, seconded by Manager _____:

Whereas Brown's Creek Watershed District has an adopted watershed management plan in fulfillment of Minnesota Statutes section 103B.231, and the plan includes policies supporting flood-risk reduction strategies and climate resilience, including:

- In subsection 3.11.4 and Table 41, pertaining to BCWD's response to the impacts of climate change, BCWD commits to evaluating its role in addressing and responding to impacts of climate change, and encouraging cities to increase resilience of the stormwater-management system;
- In subsection 4.1, BCWD commits to assisting local units of government with planning and design related to resource protection needs and promoting resiliency of infrastructure to withstand changes in climate such as rainfall events of increasing intensity and volatility.

Whereas the BCWD plan also provides, in subsection 4.4.5, for incentive programs, including a program that provides cost-share funding support for water-quality retrofit projects by other local units of government, the structure of which could be applied to flood-risk mitigation projects;

Whereas the Long Lake Flood Risk Assessment, completed by the BCWD engineer in January 2021 at the direction of the BCWD Board of Managers, determined that under current and future rainfall conditions, the 100-year water level in the 62nd Street Pond in Stillwater would exceed the lowest-opening elevation of two adjacent homes and would be within 0.25 feet of the lowest-opening elevation of another six homes;

Whereas the BCWD engineer assessed the flood-risk mitigation that would be achieved by lowering the elevation of the 62nd Street Trail (the 62nd Street Trail Project), and the engineer determined that lowering the trail to an elevation 903.5 would bring several adjacent homes into compliance with the BCWD flood-freeboard standard of 2 feet, providing greater flood resilience in the area;

Whereas the 62nd Street Trail Project would be undertaken on property owned in fee by the City of Stillwater and on an easement on private property held by Stillwater;

Whereas the City of Stillwater prepared the necessary technical documents and solicited a contractor for implementation of the 62nd Street Trail Project, receiving a quote

for $19,970, and proposed that BCWD and the city pay equal shares of the construction costs;

Whereas the BCWD Board of Managers held a noticed public hearing on the 62nd Street Trail Project pursuant to Minnesota Statutes section 103B.251, subdivision 3, at the May 8, 2024, regular meeting of the managers, at which interested members of the public were provided with the opportunity to comment on the 62nd Street Trail Project, and [NO COMMENTS WERE OFFERED]; and

Whereas in consideration of the above-cited plan basis and record in the matter, along with the managers' interest in undertaking a pilot project to assess possible roles BCWD could take in the future to mitigate flood risks in the watershed while maintaining its present policy of supporting efforts of other watershed governmental entities to mitigate flooding and flood risks through establishment of policy and provision of technical assistance, the board of managers finds that the 62nd Street Trail Project will be conducive to public benefit and promote the general welfare, and represents a cost-effective contribution to the implementation of the watershed plan and the fulfillment of BCWD's powers and purposes under Minnesota Statutes chapters 103B and 103D.

Now, therefore, be it resolved that the Brown's Creek Watershed District Board of Managers hereby orders the 62nd Street Trail Project, and directs that BCWD's costs thereof be funded through a watershed-wide levy;

Be it further resolved that the BCWD Board of Managers authorizes the president to enter into an agreement for reimbursement of 50 percent of the City of Stillwater's costs of implementation of the 62nd Street Trail Project or $10,000, whichever is less, comporting in material form with the attached.

The question was on the adoption of the resolution and there were ___ yeas and __ nays as follows:

	Yea	Nay	Abstain	Absent
Eckles	☐	☐	☐	☐
Johnson	☐	☐	☐	☐
LeRoux	☐	☐	☐	☐
Sahulka	☐	☐	☐	☐
Wirth	☐	☐	☐	☐

Upon vote, the president declared the resolution adopted May 8, 2024.

* * * * * * * * * * *

I, Debra Sahulka, secretary of the Brown's Creek Watershed District, do hereby certify that I have compared the above resolution with the original thereof as the same

appears of record and on file with BCWD and find the same to be a true and correct transcription thereof.

IN TESTIMONY WHEREOF, I set my hand this _____.

_____
Debra Sahulka, Secretary

Attachment A

62nd Street Trail Project Cost-Share Agreement

Cooperative Cost-Share Agreement Between
Brown's Creek Watershed District and the City of Stillwater

This cost-share agreement is made by and between the City of Stillwater, a Minnesota municipal corporation (Stillwater), and Brown's Creek Watershed District, a special purposes governmental entity of the State of Minnesota with purposes and powers set forth at Minnesota Statutes chapters 103B and 103D (BCWD), for purposes of BCWD's contribution of technical and financial support to Stillwater for improvement of the 62nd Street Trail to mitigate flood risk to private residential properties in the city and watershed.

1. Location. Stillwater owns in fee simple two parcels of certain real property identified by Washington County property identification numbers 31.030.20.44.0004 and 31.030.20.42.0010, consisting of, respectively, 6.9 and 15.1 acres of land, more or less, and has an easement for the use for utility and nonmotorized trail purposes, over certain real property identified by Washington County property identification number 31.030.20.41.0054 located in the City of Stillwater, Washington County, Minnesota. (The two fee parcels and easement area are referred together herein as "the Project Site.")

2. Scope of Work. Stillwater will reconstruct and lower the elevation of the 62nd Street trail on the Project Site to reduce risk of flooding from the adjacent 62nd Street Pond and otherwise to residential properties adjacent to the Project Site, in accordance with the design and plans prepared by Stillwater and attached to and incorporated into this agreement as a term thereof as Exhibit A (the 62nd Street Trail Project). Stillwater is responsible for obtaining all required permits and approvals, including a BCWD permit if required, for the 62nd Street Trail Project and for complying with all laws, including laws requiring location of buried utilities prior to land disturbance. BCWD representatives may enter the Project Site at reasonable times to inspect the work, assess the performance of the 62nd Street Trail Project and ensure compliance with this agreement.

Stillwater will maintain a copy of the final design and plans and other records concerning the 62nd Street Trail Project for six years from the date construction of the 62nd Street Trail Project is completed. BCWD may examine, audit or copy any such records on reasonable notice to Stillwater.

3. Contractor. Stillwater has selected a contractor or contractors for the 62nd Street Trail Project and ensure construction of the 62nd Street Trail Project in conformity with Exhibit A. In contracting for construction of the 62nd Street Trail Project, Stillwater will ensure that no person is excluded from full employment rights or participation in or benefits of any program, service, or activity on the grounds of race, color, creed, religion, age, sex, disability, marital status, sexual orientation, public-assistance status or national origin, and that no person protected by applicable federal or state laws, rules or regulations against discrimination is subject to discrimination.

4. Reimbursement. BCWD, on receipt from Stillwater of receipts, invoices or other documentation reasonably requested by BCWD, along with documentation of Stillwater's payment of the costs of the 62nd Street Trail Project will reimburse Stillwater 50 percent of the cost of construction of the 62nd Street Trail Project, not to exceed a total $10,000. Stillwater is responsible for any costs beyond this reimbursement amount incurred in completing the 62nd Street Trail Project.

5. Signage. Stillwater will permit BCWD, at its cost and discretion, to place reasonable signage on Stillwater's property informing the general public about the 62nd Street Trail Project and BCWD generally.

6. Maintenance. Stillwater will maintain the 62nd Street Trail Project for at least 10 years from the date reconstruction is complete to ensure continued efficacy of the 62nd Street Trail Project as a flood-risk mitigation measure. If Stillwater does not perform maintenance obligations, BCWD will have a right to reimbursement of all amounts paid to Stillwater, unless BCWD determines that the failure to maintain the BMP was caused by reasons beyond Stillwater's control. BCWD and its representatives may enter the Project Site at reasonable times to inspect the condition of the 62nd Street Trail Project and confirm proper maintenance.

7. Timeline and Term; Survival of Obligations. This agreement is effective when executed by all parties and expires three years thereafter. Stillwater's obligations that have come into being before termination, specifically including obligations under paragraph 6, will survive expiration. BCWD retains the right to void the agreement if the 62nd Street Trail Project is not completed by June 1, 2025. After BCWD notifies Stillwater that it intends to void this agreement because of Stillwater's failure to complete, Stillwater will not be eligible to receive reimbursement for work subject to the agreement unless BCWD extends, in writing, the 62nd Street Trail Project-completion period.

8. Notices. Any written communication required under this Agreement shall be addressed to the other party as follows:

Stillwater:	BCWD:
Assistant City Engineer	Administrator
City of Stillwater	Brown's Creek Watershed District
(651) 430-8834	651-331-8316
rabdullah@ci.stillwater.mn.us	kkill@wcdmn.org

9. BCWD Role; Indemnification. BCWD's role under this agreement is solely to provide funds to support the 62nd Street Trail Project. Review of any design or installation by BCWD or its representative is solely for the purpose of establishing accountability for BCWD funds expended. Stillwater remains fully responsible for the means, method and manner of designing, constructing and operating the 62nd Street Trail Project. Neither the Stillwater nor Stillwater's contractor acts as the agent or representative of BCWD in any manner. Stillwater will hold BCWD, its officers, board members, employees and agents harmless, and will defend and indemnify BCWD, with respect to all actions, costs, damages and liabilities of any nature arising from: (a) Stillwater's negligent or otherwise wrongful act or omission, or breach of a specific contractual duty; or (b) a subcontractor's negligent or otherwise wrongful act or omission, or breach of a specific contractual duty owed by Stillwater to BCWD. No action or inaction of BCWD or Stillwater under this agreement creates a duty of care on the part of BCWD or Stillwater for the benefit of any third party.

10. Waiver and Rights. BCWD's failure to insist on the performance of any obligation under this agreement does not waive its right in the future to insist on strict performance of that or any other obligation. Notwithstanding any other term of this agreement, BCWD waives no

immunities in tort. This agreement creates no rights in and waives no immunities, defense or liability limit with respect to any third party.

Intending to be bound, the parties hereto execute and deliver this agreement.

City of Stillwater	**Brown's Creek Watershed District**
_____	_____
Ted Kozlowski, Mayor	Klayton Eckles, President
Date: _____	Date: _____
Attest	*Approved as to form and execution*
_____	_____
Beth Wolf City Clerk	BCWD counsel

Exhibit A
62nd Street Trail Project Plans and Design

Project Name |	BCWD Permit Program	**Date** |	05/01/2024
To / Contact info |	BCWD Board of Managers		
Cc / Contact info |	Karen Kill, District Administrator		
From / Contact info |	John Sarafolean, EOR		
Regarding |	April Permit Inspection Update		

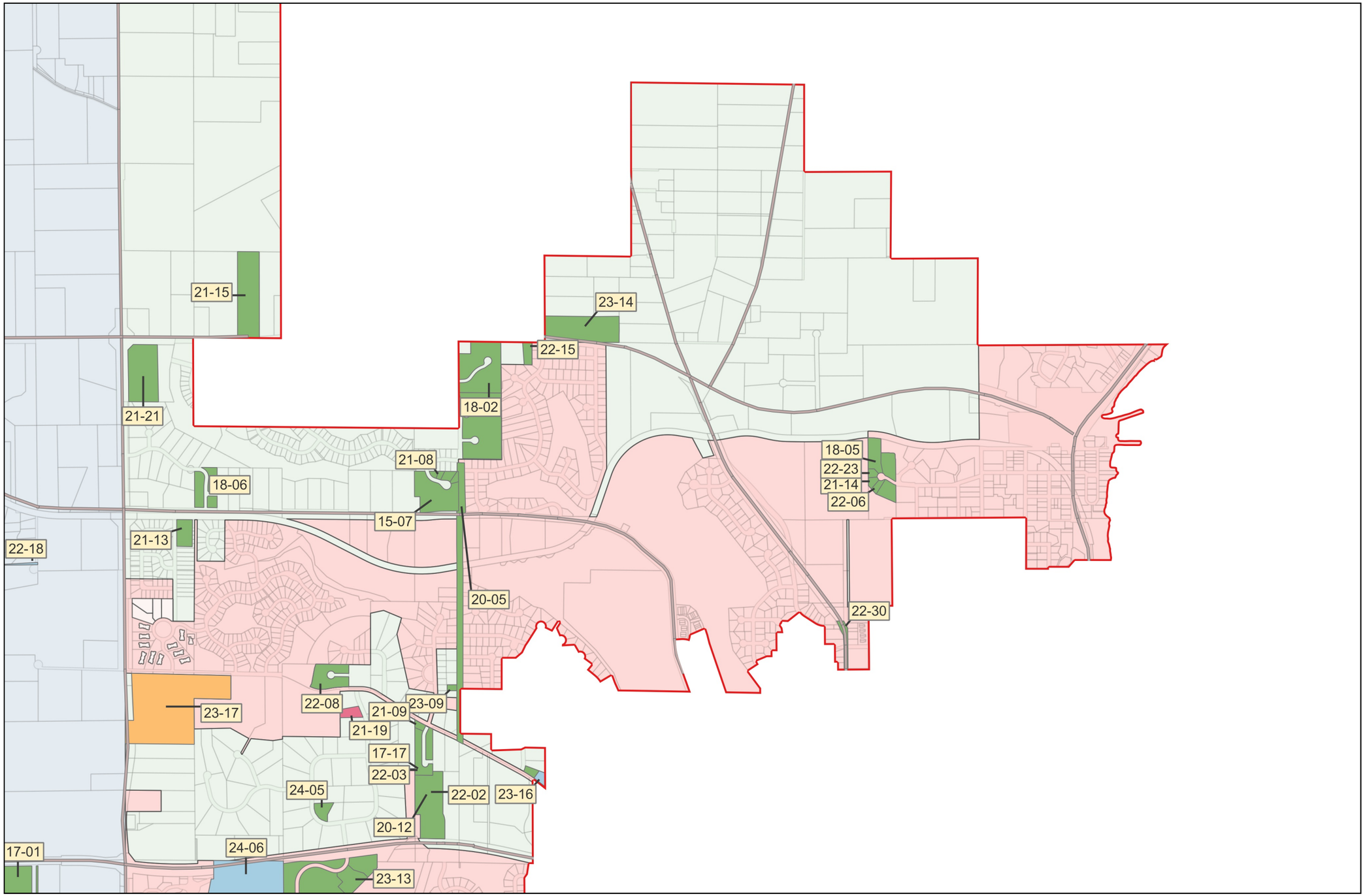
Background

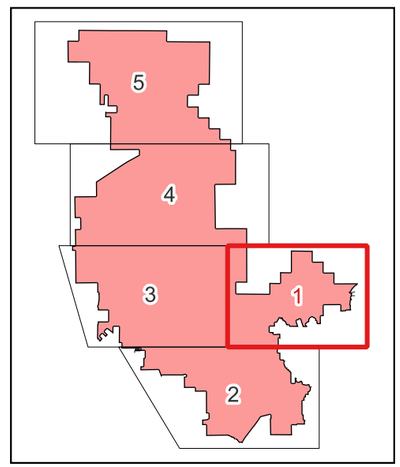
BCWD has an on-going permit review process in support of the District Rules. Developments within the District Jurisdictional Boundary are reviewed for compliance with the Rules and conditions of the permit. This memo documents inspections from 4/10/2024 through 4/30/2024.

Inspection of Existing Permits

Project Name	Permit ID	Date	Grade
White Oaks Savanna Development	17-01	4/10/2024	B
Gonyea at white Pine Ridge	22-02	4/11/2024	B
		4/30/2024	B
Greenhalo at Westridge	22-03	4/30/2024	C
WOS Lot 106 Wiechmann	22-11	4/10/2024	B
WOS Lot 109 Benjamin Mohammed	22-24	4/10/2024	B
WOS lot 113 Miller Duis	22-25	4/10/2024	C
WOS Lot 114 Tweden	23-02	4/10/2024	C
Boutwell Farm Lot 1	23-03	4/11/2024	C
WOS Lot 118 Villa Rococo	23-07	4/10/2024	B
WOS Lot 122 Freiroy	23-11	4/10/2024	C
Sandhill Shores (Lakes of Stillwater Phase 3)	23-13	4/11/2024	B
Wiskow Berm	23-14	4/30/2024	B
WOS Lot 102 Mensah	23-15	4/10/2024	B
Brock Residence	23-16	4/30/2024	A
WOS Lot 124 PennyLane	23-18	4/10/2024	C

Permit No.	Applicant/Permit Name	Status
15-07	Brown's Creek Cove	Active
16-03	The Ponds at Heifort Hills	Active
17-01	White Oaks Savanna	Active
17-04	The Lakes of Stillwater	Active
17-17	Westridge	Active
18-02	Heifort Hills Estates	Active
18-04	Boutwell Farm	Active
18-05	Heritage Ridge	Active
18-06	Nottingham Village	Active
20-05	Neal Avenue Reconstruction	Active
20-12	White Pine Ridge	Active
21-07	Brown's Creek Cove Lot 11	Active
21-08	Brown's Creek Cove Lot 14	Active
21-09	Westridge B1L1	Active
21-13	Marylane Gateway	Active
21-14	Heritage Ridge (lot 3)	Active
21-15	Schwartz Residence	Active
21-21	Millbrook West Park	Active
22-02	White Pine Ridge, remaining lots	Active
22-03	Westridge, remaining lots	Active
22-05	13290 Boutwell Rd N	Active
22-06	Heritage Ridge Lot 2	Active
22-08	Boutwell Farm, remaining lots	Active
22-14	Cahill Residence (Heritage Ridge Lots 5/6)	Active
22-15	13199 Dellwood Rd	Active
22-18	Stillwater Oaks	Review
22-23	Ferguson Residence (Heritage Ridge Lot 4)	Active
22-30	CSAH 5 Phase 2	Active
23-09	Kirn Residence	Active
23-13	Sandhill Shores (Phase III of Lakes at Stillwater)	Active
23-14	Wiskow Berm	Active
23-16	Brock Residence	Review
23-17	Sundance Stillwater	Pending
24-05	Swager Residence	Active
24-06	Rutherford Elementary	Review





Active Permit
Conditional Approval
Under Review
BCWD Political Boundary

BCWD Permit Sites
May 1st, 2024

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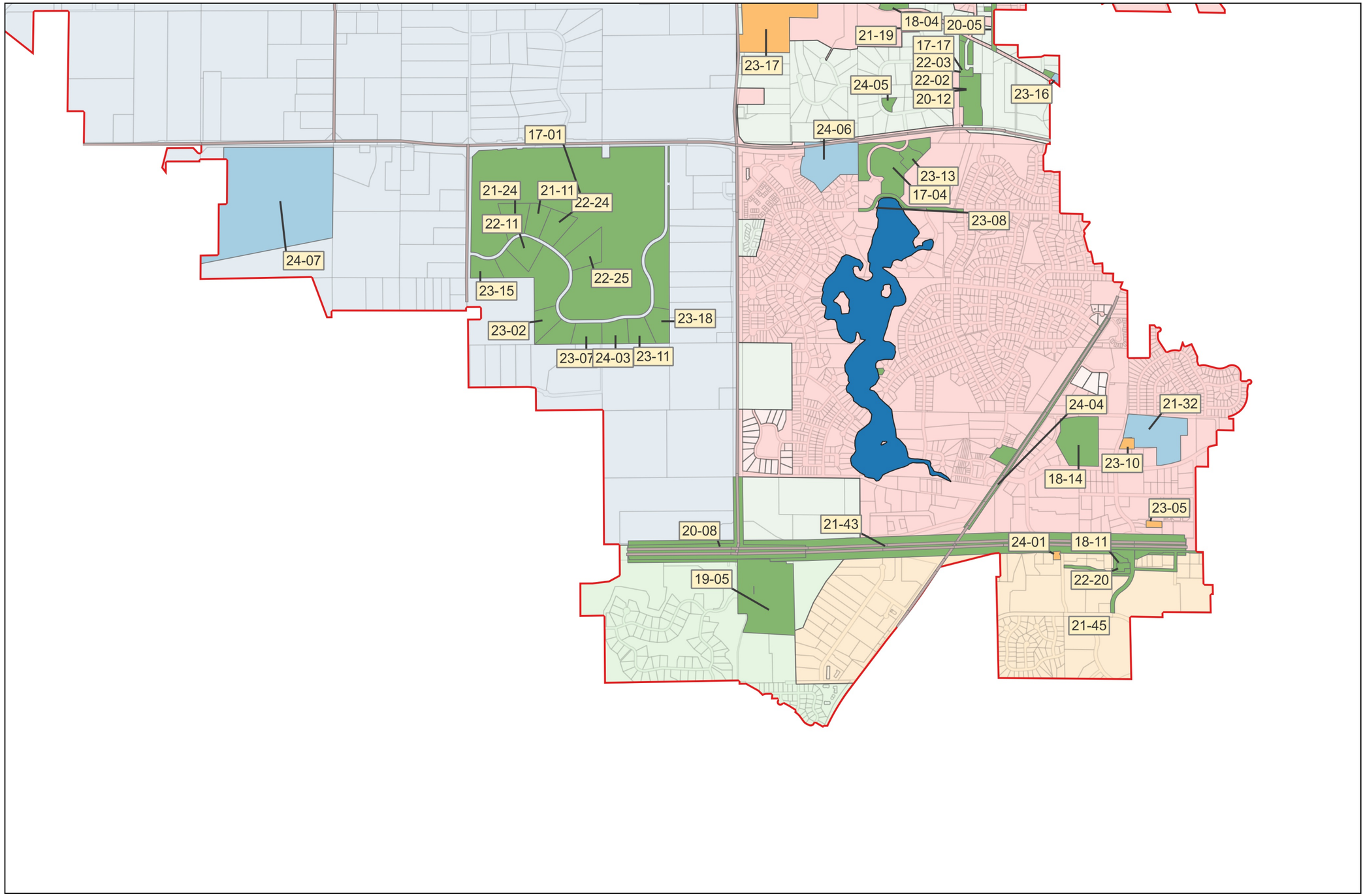
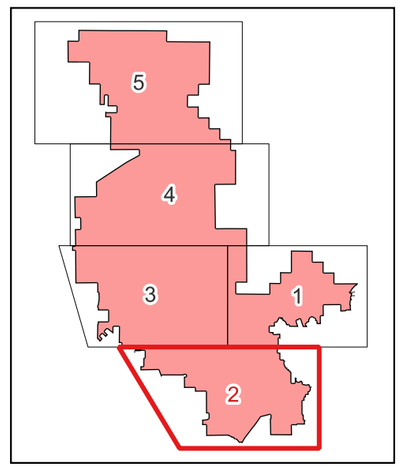


Permit No.	Applicant/Permit Name	Status
17-01	White Oaks Savanna	Active
17-04	The Lakes of Stillwater	Active
17-14	Parkwood Townhomes	Active
17-17	Westridge	Active
18-04	Boutwell Farm	Active
18-11	Ridgecrest	Active
18-14	St. Croix Valley Recreation Center Expansion	Active
19-05	Central Commons	Active
20-05	Neal Avenue Reconstruction	Active
20-08	TH36 CSAH 15 Interchange	Active
20-12	White Pine Ridge	Active
21-09	Westridge B1L1	Active
21-11	Hegarty Residence (WOS Lot 107)	Active
21-24	Nepal Residence - WOS B1L3	Active
21-32	Lakeview EMS	Review
21-43	MnDOT TH-36	Active
21-45	Norell Avenue Improvements	Active
22-02	White Pine Ridge, remaining lots	Active
22-03	Westridge, remaining lots	Active
22-05	13290 Boutwell Rd N	Active
22-08	Boutwell Farm, remaining lots	Active
22-11	Wiechmann Residence	Active
22-19	Miller Flood Protection	Active
22-20	Popeyes OPH	Active
22-24	Benjamin-Mohammed Residence (WOS Lot 109)	Active
22-25	Miller-Duis Residence (WOS Lot 113)	Active
23-02	Tweden Residence	Active
23-05	Rocket Carwash	Pending
23-07	Villa Rococo Residence	Review
23-08	72nd St Improvement	Active
23-09	Kirn Residence	Active
23-10	Curio Dance Studio	Pending
23-11	Freiroy Residence	Active
23-13	Sandhill Shores (Phase III of Lakes at Stillwater)	Active
23-15	Mensah Residence	Active
23-16	Brock Residence	Review
23-17	Sundance Stillwater	Pending
23-18	WOS Lot 124 Heck Residence	Active
24-01	Take 5 Oil Change	Pending
24-03	WOS Lot 120 Hilgert Residence	Active
24-04	CSAH 5 Resurfacing	Active
24-05	Swager Residence	Active
24-06	Rutherford Elementary	Review
24-07	Elliot Crossing/ Indian Hills	Review



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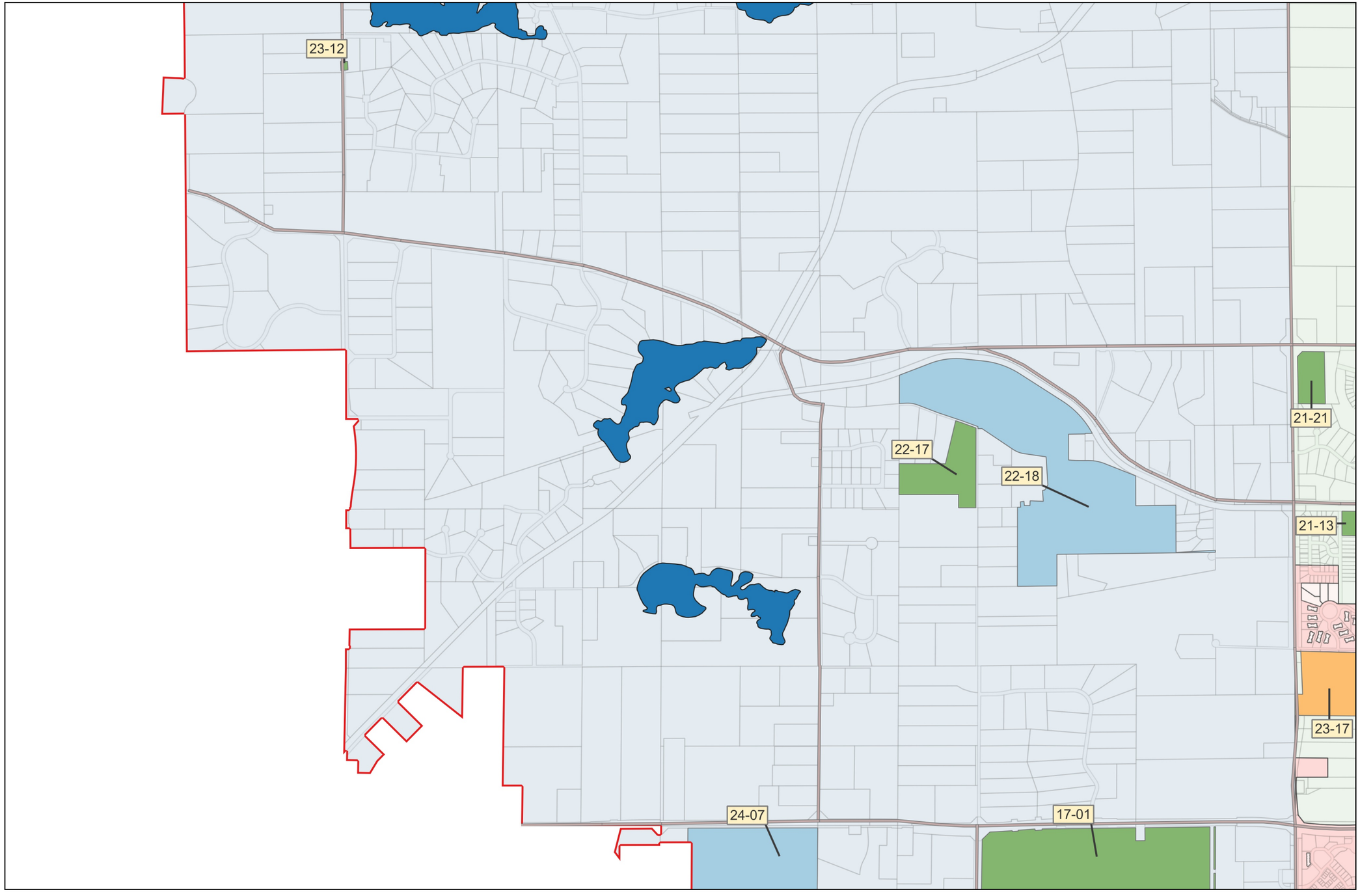
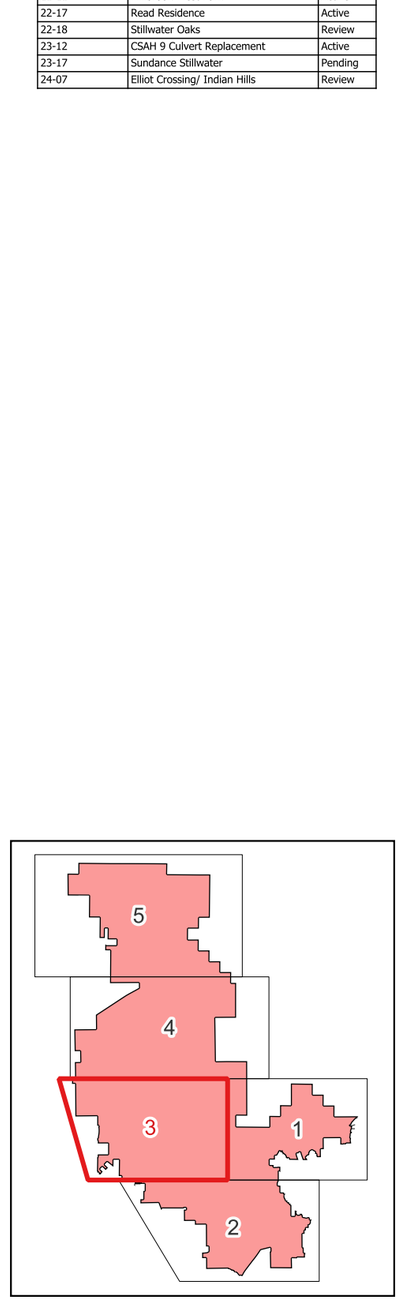
Permit No.	Applicant/Permit Name	Status
17-01	White Oaks Savanna	Active
21-13	Marylane Gateway	Active
21-21	Millbrook West Park	Active
22-17	Read Residence	Active
22-18	Stillwater Oaks	Review
23-12	CSAH 9 Culvert Replacement	Active
23-17	Sundance Stillwater	Pending
24-07	Elliot Crossing/ Indian Hills	Review





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Author: Allison
Layout: Mark
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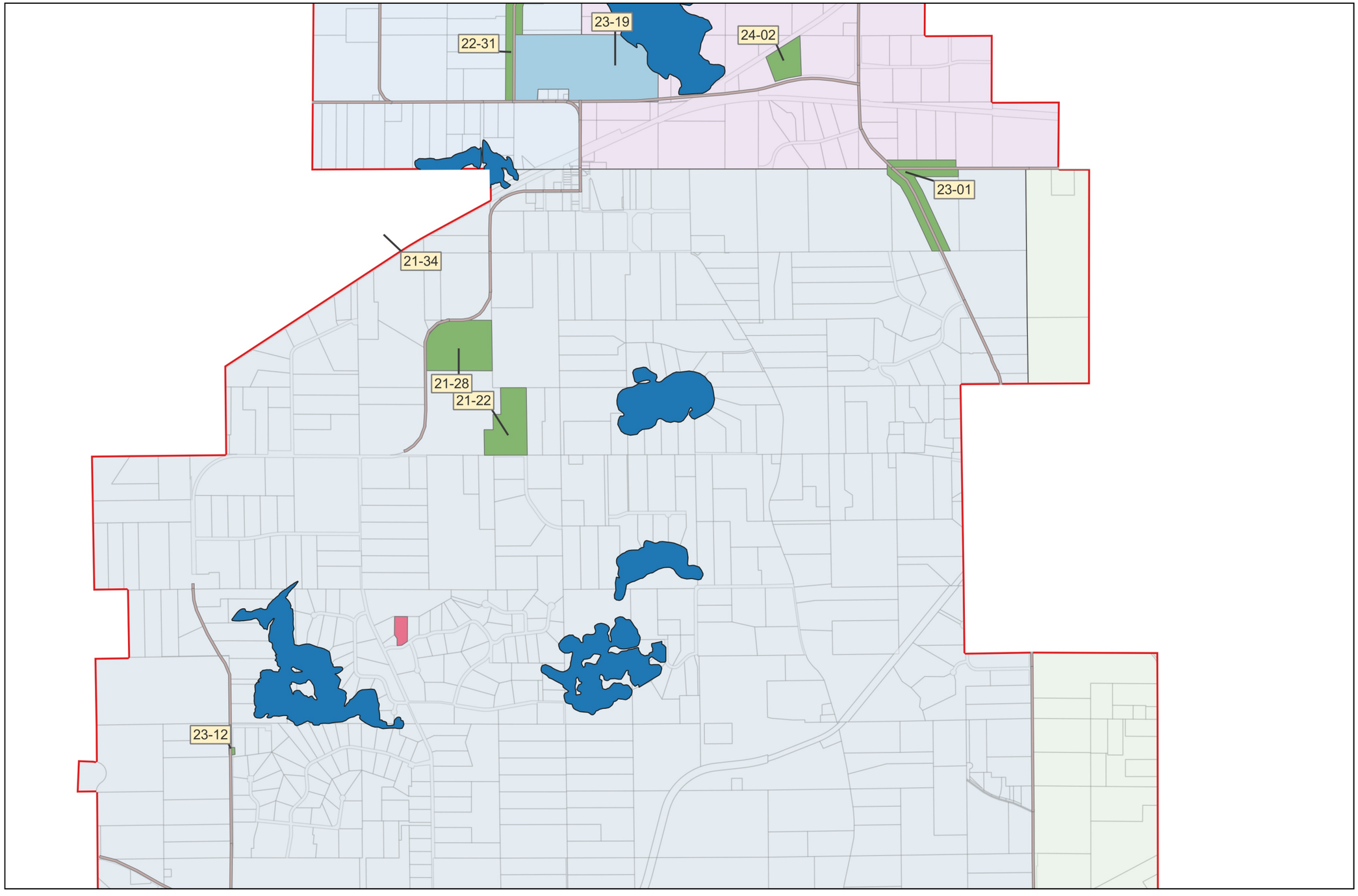
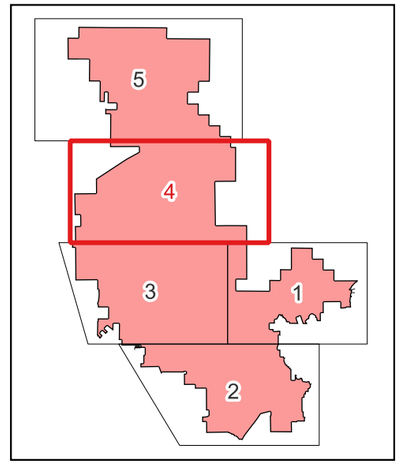
Permit No.	Applicant/Permit Name	Status
21-22	Bond Residence	Active
21-28	Guerrino Residence	Active
21-34	Fahey Residence	Active
22-31	County Road 57 Culverts	Active
23-01	County Road 61 Improvements	Active
23-12	CSAH 9 Culvert Replacement	Active
23-19	Liberty Academy Expansion	Review
24-02	Schuster Residence	Active





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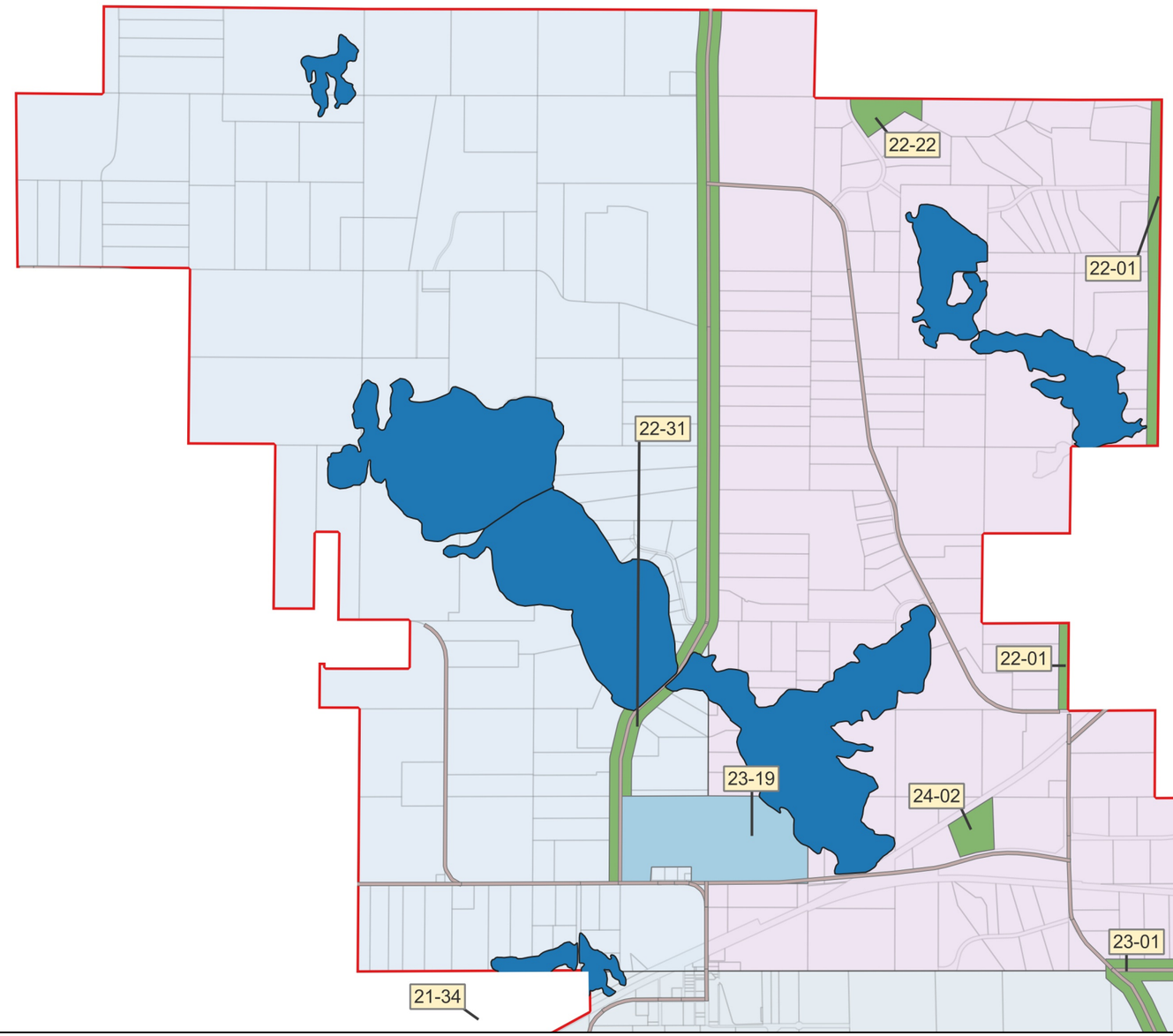
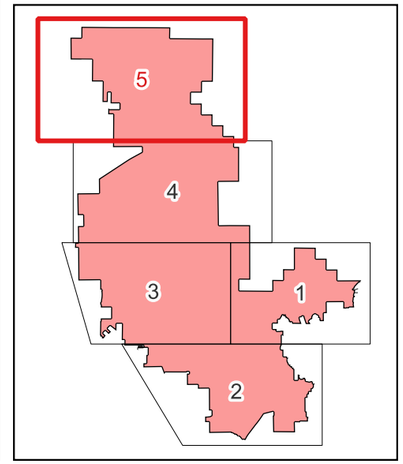
Layout: Mark
Permit Update Map

Permit No.	Applicant/Permit Name	Status
21-34	Fahey Residence	Active
22-01	CSAH 15 Culverts	Active
22-22	Fanberg Residence	Active
22-31	County Road 57 Culverts	Active
23-01	County Road 61 Improvements	Active
23-19	Liberty Academy Expansion	Review
24-02	Schuster Residence	Active





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