Minneapolis
City of Lakes

Minneapolis
Park & Recreation Board

2024 NPDES Annual Report

July 30, 2025 (amended)

Acronym Reference

Acronym	Definition
BMP	Best Management Practice
IDDE	Illicit Discharge Detection and Elimination
MCM	Minimum Control Measure
MPRB	Minneapolis Park and Recreation Board
MPCA	Minnesota Pollution Control Agency
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
SDS	State Disposal System
SMP	Stormwater Management Practice
SWMP	Stormwater Management Program
TMDL	Total Maximum Daily Load
WLA	Waste Load Allocation

Executive Summary

This report provides an overview of the City of Minneapolis and the Minneapolis Park and Recreation Board's (MPRB) efforts to meet federal and state requirements under the Municipal Separate Storm Sewer System (MS4) Phase I Permit. The City and MPRB continue to implement a comprehensive Stormwater Management Program (SWMP) aligned with the National Pollutant Discharge Elimination System (NPDES)/State Disposal System (SDS) Permit No. MN0061018.

Key 2024 accomplishments include:

- 174 stormwater-related public outreach and education events
- 519 new Adopt-a-Drain participants.
- 1,935 construction erosion inspections
- 45,000 lbs. collected through Adopt-a-Drain program
- 381 green infrastructure inspections and maintenance activities
- 15 stormwater treatment BMPs integrated into private redevelopment
- 32 sessions of naturalist-led free canoeing
- 478 4^{th}-8^{th} graders educated on the impact of human activity on aquatic systems
- 145,081,601 gallons of stormwater monitored at 6 sites
- 123 stormwater samples collected from 42 stormwater events

Introduction

Stormwater Management Program

The City and MPRB have developed a comprehensive Stormwater Management Plan (SWMP) that recognizes the multi-departmental nature of stormwater responsibilities. The SWMP is implemented through a collaborative framework involving various City and MPRB departments, each contributing through ordinances, regulatory inspections, public education, water quality monitoring, routine maintenance, and capital improvement projects. This integrated approach ensures compliance with the MS4 permit and supports measurable improvements in water quality.

Annual Report

The City and the MPRB prepare annual reports that are made available for public review and comment. The annual reports provide an overall description and evaluation of the activities, accomplishments, progress towards goals, special studies, financial information, and other assessments for each stormwater management practice. Current and past reports can be found on both the City's and MPRB's websites under *Minneapolis MS4 Permit Annual Report* and *MPRB Water Resources Reports*. Future reports will also be posted there as they become available.

The annual report is organized by Minimum Control Measure (MCM) to align with Stormwater Management Plan.

MCM 1: Public Education and Outreach

(MS4 Permit Reference: 16.1 – 16.8, 18.26-18.28 18.39, 19.13-19.17,20.18, 20.21, 21.7,21.17, 30.3)

Program Overview

A successful stormwater management program involves participation and good management from everyone in the city, including residents, business owners, park visitors, facility managers, contractors, developers, City and MPRB staff, and all others who live, work, and recreate in Minneapolis. A long-term component of the City's and MPRB's stormwater program is public education that serves to provide new or updated information on the importance of water quality, the impacts of stormwater runoff, the sources of pollutants in stormwater runoff, and the activities that the public should adopt to fulfill their collective responsibilities towards improved water quality. The SMPs contained in this minimum control measure work to maintain and improve the ongoing stormwater education efforts.

Program Goals

The goals of these stormwater education activities are to increase the awareness of local water quality, sources of pollutants, and important practices that must be adopted to improve overall water quality. Behavior change around water quality protection is the desired program results. These goals are accomplished through the hosting of education events, distribution of education materials, regular updates of web-based information, staff training, and other activities.

Minimum Control Measure 1 SMP Sheets

SMP 1.1 – Stormwater Public Education

SMP 1.2 – Stormwater Education and Training for Staff

Annual Reporting Summary

SMP 1.1 – Stormwater Public Education

Website traffic January 1-December 31, 2024:

Stormwater Education Webpage	Number of site visits
Stormwater page	367 visits
Beach page	25,971 visits
Creeks and Rivers page	1,252 visits
Water Resources FAQ page	551 visits
MPRB Water Quality Beach GIS Map	82,351 visits
Salt mini-course	896 visits
Salt best practices	721 visits
Salt impacts	253 visits
Salt reduction measures	192 visits
Salt stewardship pledge	168 visits
Salt mini-course videos	159 visits
Follow the Rain	2,055 visits

Event	Date	Number of contacts (Estimated)	Type of Engagement
Community Connections Conference	2/17/2024	200	Tabling
Downtown Improvement District Learning Tuesday	3/12/2024	10	Tabling
Waite Park Annual Neighborhood Meeting	3/14/2024	20	Tabling
Hale Page Diamond Lake Earth Day	4/20/2024	15	Tabling
Eastside Food Co-Op Earth Day	4/21/2024	na	Provided materials
Downtown Minneapolis Neighborhood Association Neighborhood Day	5/11/2024	10	Tabling
East Harriet Neighborhood Annual Meeting	5/11/2024	20	Presentation
Doors Open Minneapolis	5/18/2024	800	Tabling
Grand Avenue Neighborhood Pollinator Planting	6/1/2024	70	Tabling, presentation
Kenny Neighborhood Green Fair	6/20/2024	20	Tabling
Lake of the Isles Trash Boom Installation	6/26/2024	30	Tabling, presentation
Kingfield Garden Tour	7/11/2024	na*	Tabling
St. Anthony West Annual Picnic	7/11/2024	na	Provided materials
Fulton Fall Festival	9/14/2024	na	Provided materials
Linden Hills Fall Festival	9/21/2024	na	Provided materials
East Harriet Fall Festival	9/22/2024	na	Provided materials
Clara Barton School clean water presentation	11/18/2024	150	Presentation

**na = we provided materials to the event organizers to share at the event, but we did not attend the event*

City educational materials distributed:

- Community Programs & Resources brochure
    - Contains information on Adopt-a-Drain, Adopt-a-Rain Garden, Storm Drain Stenciling, and Salt Mini-Course (total of 204 welcome packets mailed)
- Adopt-a-Drain, Adopt-a-Rain Garden, and Storm Drain Stenciling brochures (total of about 100 brochures handed out)
- Salt- A permanent pollutant postcard
- Stop Oversalting and Salt Steward stickers

    - For Salt mini-Course participants (32 finished the minicourse with 15 requesting to receive the stickers)
- Adopt-a-Drain and Storm Drain Stenciling door hanger (for a total of 293)

City education and outreach activities:

- Salt Mini-Course: 31 completions, 28 Unique finishers, 15 stickers sent
- Storm Drain Stenciling: 18 Stenciling events, 93 Volunteers, 236 Storm drains stenciled, 293 door hangers distributed, 70 bags of trash collected
- 2024 Minneapolis Adopt a Drain:
    - 519 new participants who adopted 1005 drains
    - Total of 3,702 participants adopting 7,541 Drains
    - 2,300 hours volunteering and collecting over 45,000 lbs. of debris.
    - Participants represented 489 individuals (94%), 12 business, 11 schools/classrooms, and 7 community organizations.
    - Personal referral (family, friends, or neighbor) was the most effective in recruiting new participants.

Referral Type	Number of referrals	Percentage
Other	201	38.7%
Friend, family or neighbor	140	27.0%
My city or watershed district	48	9.2%
Yard sign	30	5.8%
Family's teacher or school	21	4.0%
Social media (Facebook, Next Door)	20	3.9%
News outlet	17	3.3%
Door hanger or flyer	11	2.1%

Park Board education and outreach activities:

- In-Person Education and Engagement:
    - 350+ hours of in-person environmental programming, 4,000 people reached Portable activities: mini-golf, bean bag toss, and watershed floor map
    - 32 free canoe drop-in sessions
    - 27 hours of fieldtrips for 765 students (grades 4-8)
    - 130 total events spread throughout Minneapolis at 78 sites where engagement occurred, some sites had multiple activities on multiple dates
- Salt Awareness
    - Winter salt displays at 9 hardware stores
- Minnehaha Park Exhibit: Mobile water quality display

    - Lake Nokomis Water Quality Trail: 5 buoys with standup paddleboard yoga poses and water quality educational messaging
- Aquatic Invasive Species Outreach:
    - At boat launches: Bde Maka Ska, Lake Harriet, and Lake Nokomis
    - 17,869 park visitors engaged
    - Tabled at 4 free sailing events hosted by Minneapolis Sailing Center, engaged with 260 patrons
    - Adjacent to booths were informational boards. Annually, over 7 million people visit the Chain of Lakes and more than 2 million visit Lake Nokomis (Metropolitan Council, 2024)
- Water Quality Education Campaigns
    - Canines for Clean Water: Three Thursday summer events, engaged an average of 100 participants at each event. Participants were invited to sign the Canines for Clean Water Pledge
    - Don't Feed the Ducks Campaign: Large yellow duck placed along Lake Harriet, 175 hours of programming, 1,2000 people reached at 6 locations focusing specifically on waterfowl education. Redesigned signage.
- Earth Day Watershed Cleanup
    - 1,500 volunteers at 44 locations
    - 6,280 pounds of trash collected
- Mississippi River Green Team
    - Conservation-based teen crew engaged in daily hands-on environmental work throughout summer consisting of 18 youth and 2 supervisors
    - Field work: invasive species removal, weed wrenching, planting, watering, and mulching
    - Crew were scheduled for weekly career exposure days
    - Participated in storm drain stenciling, studying macroinvertebrates and their connection to water quality, and clearing vegetation from a turtle nesting site
    - Completed several educational experiences including Spark'd Studio Photography project, MPRB Bioblitzs in several parks, Stormwater 101 lesson, and history instruction about human impact and dependency on the Mississippi River.

Based on the findings of the annual evaluation, we developed a detailed inventory of our educational activities to better understand the scope and distribution of our outreach efforts. This process allowed us to identify programmatic gaps and informed the creation of an educational activity map, providing geolocation data to ensure a more equitable delivery of services across the community. Additionally, we transformed the inventory into a SmartSheet platform to improve data management and streamline team coordination, including assignments and sign-ups for upcoming events.

SMP 1.2 Stormwater Education and Training for Staff

MPRB:

- Inspection and Maintenance of Permanent Stormwater Treatment Practices

    - 2 staff completed in 2024
        - Carolyn Eckstein, Water Quality Specialist, April 22-23, 2024
        - Kaitlynn Chamberlin, Water Quality Specialist, April 22-23, 2024
- Illicit Discharge Training
    - 295 staff completed in 2024
- MPCA Smart Salt Training/Winter Maintenance
    - 8 staff certified in 2024

City:

- Chloride reduction:
    - A targeted training program on winter road salt management was delivered to enhance staff knowledge and operational practices. An initial two-hour training session was held on September 23, 2024, as part of the SPOT program at the State Fairgrounds, with 60 staff members in attendance.
    - This was followed by three additional one-hour sessions on September 23, September 30, and October 7, reaching another 60 staff members.
    - In addition, two Smart Salting Certification trainings were conducted on October 17, resulting in 50 staff members becoming certified.
- Erosion and Sediment Control Training:
    - 4 staff completed training in 2024
        - Dominic Fields, Health Department, Environmental Inspector
            - 1/11/2024, Construction Installer (EI1001 / RI1501)
            - 2/7/2024, Construction Manager (EM2001 / RM2501)
            - 1/18/2024, SWPPP Design (ED3001 / RD3501)
            - 4/30/2024, Regulatory Enforcement (MS4001)
        - Kate Gabriel, Health Department, Environmental Inspector
            - 4/1/2024, Construction Manager (EM2001 / RM2501)
            - 4/30/2024, Regulatory Enforcement (MS4001)
        - Zach Kolsum, Health Department, Environmental Inspector
            - 4/30/2024, Regulatory Enforcement (MS4001)
        - Elan Quezada, Health Department, Environmental Inspector
            - 1/11/2024, Construction Installer (EI1001 / RI1501)
            - 2/7/2024, Construction Manager (EM2001 / RM2501)
            - 4/30/2024, Regulatory Enforcement (MS4001)
- Illicit Discharge Training
    - Environmental Inspectors
        - 40-hour HAZWOPER
        - 8-Hour HAZAMAT Refresher
        - In-house SOP Review

MCM 2: Public Participation and Involvement

(MS4 Permit Reference: 17.1-17.12, 30.4)

Program Overview

The City of Minneapolis' (City) and Minneapolis Park and Recreation Board's (MPRB) Stormwater Management Program (SWMP) taps into numerous public participation and public involvement activities to solicit input on specific stormwater-related activities and decisions that affect the residents and businesses of the city. As with Minimum Control Measure 1– Public Education and Outreach, this Stormwater Management Practice (SMP) embeds participation and involvement activities into the workplan of specific stormwater control practices whenever opportunities are closely linked to other activities contained in other programs.

Program Goals

The City and MPRB will give the public an opportunity to play an active role in the development and implementation of the SWMP.

Minimum Control Measure 2 SMP Sheets

SMP 2.1 – Stormwater Public Participation Activities

Annual Reporting Summary:

SMP 2.1 Stormwater Public Participation Activities

At our 2025 NPDES public meeting on Thursday, May 8th at 1:30 pm during the City's Climate & Infrastructure Meeting at the Public Service Center, the Resilient Cities & Communities representative commended the City of Minneapolis and MPRB for our strong stormwater program and the collaborative efforts with local volunteers and resource organizations.

Their recommendations focused on

- improving two-way communication with grassroots advocates,
- organizing sub-watershed teams to support local efforts like Adopt-a-Drain and shoreline restoration, and
- co-hosting educational forums on key water quality topics.

They also encouraged long-term advocacy to expand stormwater efforts to include emerging pollutants like microplastics and litter.

A copy of the Council Resolution is included in Appendix A.

MCM 3: Illicit Discharge Detection and Elimination

(MS4 Permit References: 18.1 -18.40, 23.1 – 23.8, 30.5 – 30.6, 30.22)

Program Overview

The stormwater management objective of these programs is to regulate the illicit discharge of pollutants to the MS4, in accordance with the MS4 Permit to discharge stormwater to surface waters including lakes, creeks, wetlands, and the Mississippi River. This is defined and regulated under Chapter 54.140. – Prohibited discharges to storm sewer system.

Program Goals

This program serves to minimize the adverse effects caused by unauthorized (illicit) discharges of materials to receiving waters via the stormwater drainage system. Illicit discharges may be random, frequent, infrequent, accidental, or other, and may be introduced and occur anywhere along the stormwater drainage pathways including, but not limited to, pavements, gutters, catch basins, maintenance holes, or permitted connections to the storm drain.

Minimum Control Measure 3 SMP Sheets

SMP 3.1 – Illicit Discharge Detection and Elimination Program

SMP 3.2 – Facilities Regulatory Oversight Program

SMP 3.3 – Lake Hiawatha Trash Reduction Program

Annual Reporting Summary:

SMP 3.1 – Illicit Discharge Detection and Elimination Program

Regulatory Mechanism

- Covered under 54.140, which was last updated in 2021.

Storm Sewer System Inventory and Map

- The City maintains a comprehensive, continuously updated electronic inventory and map of the storm sewer system, with data refreshed daily. This system includes all required elements, such as receiving waters, structural stormwater BMPs (with subwatershed areas and capacities), land use types, pipes, ditches, swales, and permittee-owned facilities. It also identifies outfalls with detailed attributes and stormwater inflows from other MS4s. The inventory is integrated with the City's asset management system and supports real-time mapping to ensure accessible and current system information for planning, operations, and reporting.

Illicit Discharge Activity Summary

- MPRB Activity: 20 IDDE cases, 20 inspections
- City Activity:

Category	Count
Service Requests (land or water pollution)	332
└ Duplicate	4
└ Founded	39
└ Invalid	15
└ Notified	40
└ No Violation	27
└ Resolved	207
Cases from Service Requests	63
Inspections Conducted (All Cases)	115
Enforcement Actions	46
└ Advisory	13
└ OTC (Order to Correct)	18
└ Tier 1 Citation ($200)	5
└ Tier 2 Citation ($400)	2
└ Immediate Citation ($1,000)	8

Staff Training Activities

Department	Training Description
Health Department	• 40-hour HAZWOPER • 8-Hour HAZAMAT Refresher • In-house SOP Review
MPRB	• IDDE Training provided to 295 staff

SMP 3.2 – Facilities Regulatory Oversight Program

Facility Inventory: Nothing to report

Facility Inspections: Nothing to report

SMP 3.3 – Lake Hiawatha Trash Reduction Program

Trash Boom Implementation

- Installation Date: April 10, 2024
- Removal Date: October 23, 2024
- The trash boom was removed on October 23rd due to signs of impending ice. After the challenging iced-in conditions we experienced in 2023, when we waited until November to remove the device, we took a more cautious approach this year to avoid the boom freezing in place. We will update MPCA in the future of our intentions to remove the device earlier than November 1.

Inspections of Trash Boom

- The technicians document the site conditions each time they visit the device.
- There were no structural changes to the device over the course of the project period. The technicians noted that it was in good working condition at each visit.
- The technician observations do not indicate any signs of litter bypassing the device during their site observations.
- The technicians conduct shoreline cleanups of the perimeter of the lake and did find litter accumulated in various areas. The litter seems to be primarily associated with areas of public access (fishing spots, the dock, the beach) rather than the area by the outfall.
- Most of the device cleanout notes regarding litter accumulation indicate that, during high water events, the majority of litter collects against the banks near the anchor points/tie-ins. This would indicate that it is staying inside the system but moving from the apex of the boom back to the shoreline edges. If there was any escape, it would have likely been near the anchors at extremely high water when that area was submerged.

Trash Boom System and Outfall Inspection Dates and Findings

Date	Findings
4/24/24	Operational, no issues
5/24/24	Operational, no issues
6/24/24	Operational, no issues
7/24/24	Operational, no issues
8/24/24	Operational, no issues
9/24/24	Operational, no issues
10/24/24	Operational, no issues

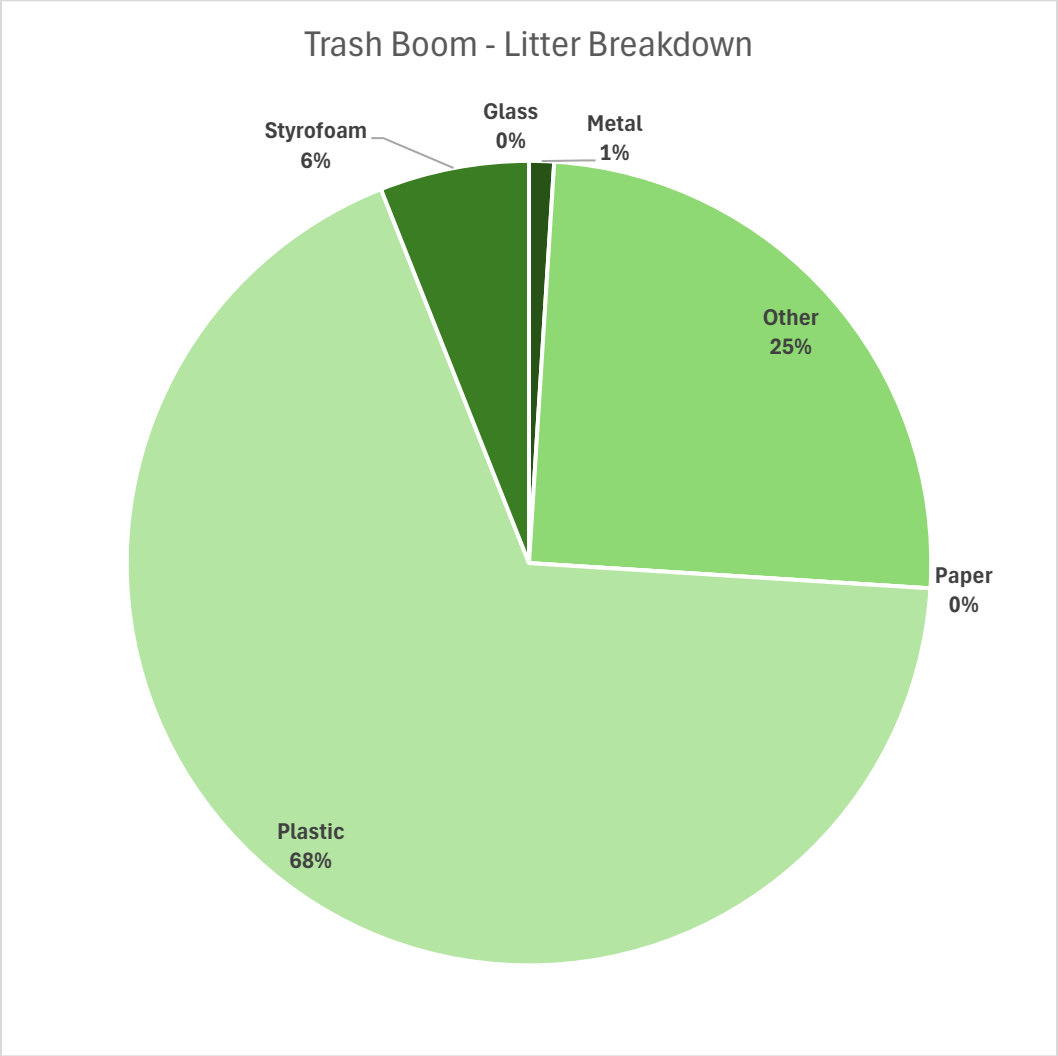
Maintenance Activities and Trash Collection

- Maintenance involved manual removal of litter and vegetation using grabbers, skimmers, and by hand. Items were sorted and analyzed shoreside.

Boom Maintenance and Removal Quantities

Month	Recycling (Lbs.)	Trash (Lbs.)	Debris (Lbs.)
April	1.36	8.80	0
May	2.14	23.63	0
June	0.50	21.81	0
July	3.28	13.38	0
August	2.94	26.28	0
September	0.50	4.80	0
October	3.48	14.58	0
Totals:	**14.20**	**113.28**	**0**

- In addition to the general weights of material captured within the boom system, information about the type of items removed. This information is recorded using a modified version of the EPA's Escaped Trash Assessment Protocol (ETAP). The pie chart below documents the litter profile by category. It should be noted that the percentages are based on the per item count, not on weight or volume.



Shoreline Cleanup Events

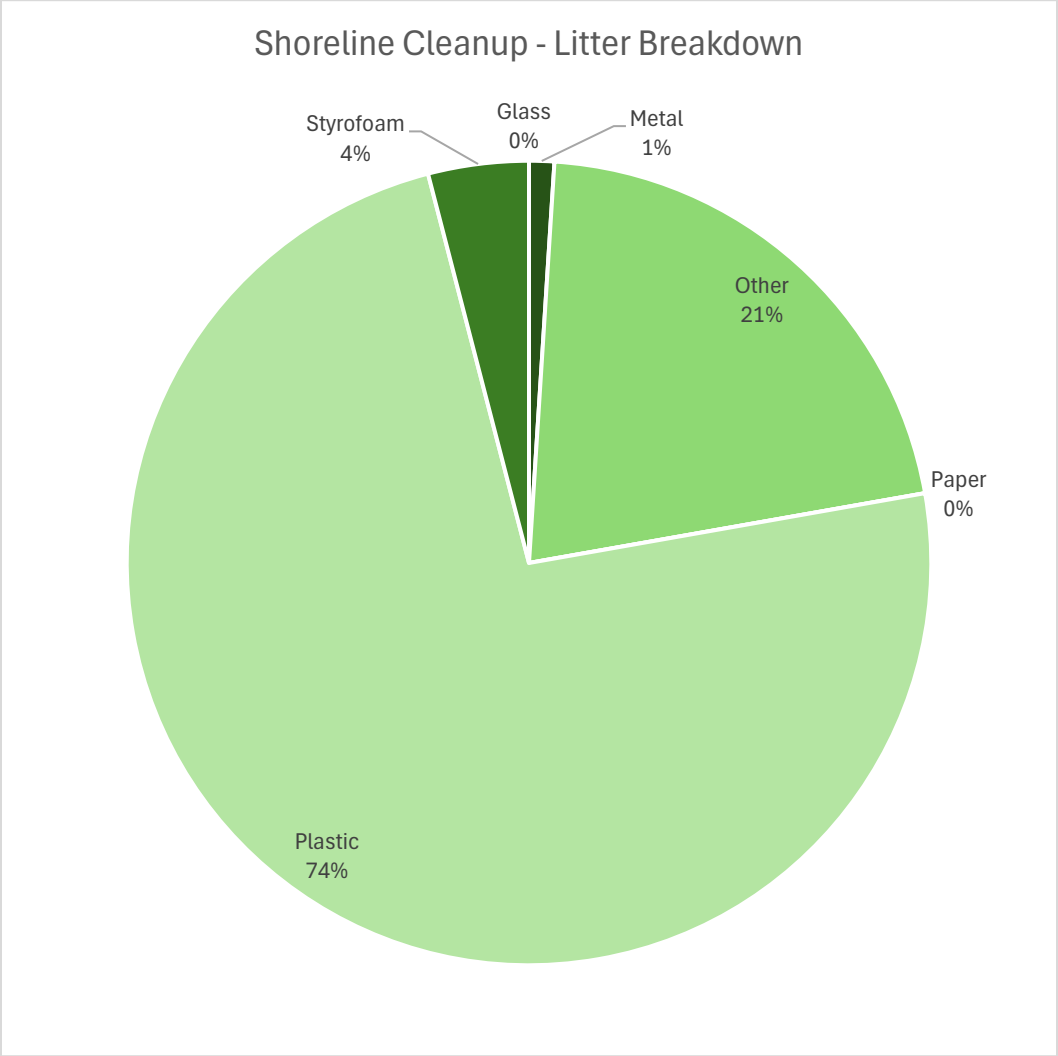
- Clean-up events targeted at priority areas which are publicly accessible around the lakeshore.

Shoreline Clean Up Dates and Quantities

Date	Recycling (Lbs.)	Trash (Lbs.)	Debris (Lbs.)
4/10/2024	1.52	21.16	22
4/12/2024	1.01	12.03	0
5/16/2024	0	3.08	0
6/4/2024	1	21	0
6/11/2024	0	2.13	0

6/13/2024	0	10.2	0
7/24/2024	0.45	6.15	0
8/13/2024	0.5	8.22	0
8/30/2024	0.28	3.17	0
9/5/2024	0.54	6.94	0
9/10/2024	0	3.39	0
9/25/2024	0	2.73	0
10/1/2024	1.07	4.73	0
10/5/2024	0.48	5.84	0
10/17/2024	0.39	6.48	0
10/21/2024	0.34	19.93	0
10/23/2024	1.00	10.55	0
Shoreline Clean Up Total	**8.58**	**147.73**	**22**

- In addition to the general weights of material captured within the boom system, information about the type of items removed. This information is recorded using a modified version of the EPA's Escaped Trash Assessment Protocol (ETAP). The pie chart below documents the litter profile by category. It should be noted that the percentages are based on the per item count, not on weight or volume.



Trash Reduction Plan

- Cumulative Estimate from Upgradient BMPs:
    - There is currently no methodology or guidance provided by the MPCA or within the MPCA Minnesota Stormwater Manual on how to quantity trash reduction of BMPs. As a result, the city is working to develop a methodology.
    - We estimate that little to no trash was removed from structural stormwater BMPs located upgradient of Lake Hiawatha. Per the Trash Reduction Plan these BMPs were installed to remove TP and TSS and therefore have limited trash capture potential. The City is investigating the feasibility of modifying its BMP cleanout procedures to include quantifying trash capture.
- Modifications: No modifications were made.

MCM 4: Construction Site Stormwater Runoff Control

(MS4 Permit References: 19.1 – 19.20, 30.7)

Program Overview

The stormwater management objective of these programs is to prevent or minimize discharge of sediment or pollutants from public or private construction activities to the MS4.

Program Goals

The goal of this category is to ensure that the City's and MPRB's erosion and sediment control practices and requirements continue to be effective tools in minimization of the discharge of sediment and pollutants from construction sites and that these practices and requirements continue to evolve and improve.

Minimum Control Measure 4 SMP Sheets

SMP 4.1 – Erosion and Sediment Control for Private Construction Projects

SMP 4.2 – Erosion and Sediment Control for Public Construction Projects

Annual Reporting Summary:

SMP 4.1 – Erosion and Sediment Control for Private Construction Projects

Regulatory Mechanism:

- Regulated under Chapter 52, last updated in 2024.

Construction Site Plan Reviews

- 46 site plans reviewed and approved.

Construction Stormwater Complaints

Construction stormwater complaints received	17
└Duplicate	0
└Cases Created	1
└Notified	1
└Number of Violations found	3
└Resolved	12

Construction Site Inspections

- 1935 erosion and sediment control inspections completed for 441 erosion control permits in 2024

Pass	1442
Fail	268
Final Inspection, permit closed)	147
No work	74
NA (duplicate/error)	4

Violations and Enforcement Actions

Number of fails	265
OTCs	141
Number of citations	124
Tier 1 ($200)	69
Tier 2 ($400)	30
Tier 3 ($800)	16
Tier 4 ($1600)	7
Tier 5 ($2000)	1
Tier 6 ($2000)	1

SMP 4.2 – Erosion and Sediment Control for Public Construction Projects

Public Project Inspections

Project Name	Project Owner	Number of Inspections in 2024
Upper Harbor Park (active)	MPRB	34
Nokomis and Hiawatha Regional Parks Trail Improvements (active)	MPRB	17
Bethune Park Phase 1 Improvements (active)	MPRB	24
Ole Olson Park Improvements (active)	MPRB	18
Nokomis Ave Outfall Project	Surface Water and Sewers	42
Jordan Flood Mitigation Project (27 Ave N)	Surface Water and Sewers	50
Hennepin Ave S	Surface Water and Sewers	23
2nd St	Surface Water and Sewers	6
1st Ave	Traffic Maintenance and Repair	50

Upper Harbor Terminal (Lower Dowling)	Transportation Engineering and Design	17
Upper Dowling	Transportation Engineering and Design	5
37th Ave NE	Transportation Engineering and Design	17
Green Central	Transportation Engineering and Design	12
35W and Johnson	Transportation Engineering and Design	13
Hennepin Ave	Transportation Engineering and Design	34

MCM 5: Post-Construction Stormwater Management

(MS4 Permit References: 20.1-20.22, 30.8)

Program Overview

Redevelopment of existing properties and roadways, especially those created before regulation under the Clean Water Act (CWA), offer the opportunity to employ stormwater practices that reduce the negative environmental impacts of urbanization on the lakes, creeks, and the Mississippi River in the City of Minneapolis (City). The stormwater management objective of these SMPs is to reduce the discharge of pollutants and stormwater runoff from public and private development and redevelopment sites and from reconstructed streets, as compared to conditions before the project construction.

Program Goals

The overall goal of these SMPs is to ensure that the City's regulatory structure and procedures are up to date, to ensure that development and redevelopment projects and public roadway projects incorporate stormwater management and that violations to the City's regulations are mitigated. Specifically, both co-permittees will revise their program as needed and will enforce it to minimize pollution from post- construction. The co-permittees will also create maintenance and operation plans.

Minimum Control Measure 5 SMP Sheets

SMP 5.1 – Private Development and Redevelopment Projects

SMP 5.2 – Linear Projects

Annual Reporting Summary:

SMP 5.1 –Private Development and Redevelopment Projects

Regulatory Mechanism

- Regulated under Chapter 54, last updated March 12, 2021

Number of plan reviews

Number of private plan reviews	**199**
Total BMPs Proposed	21
└ surface infiltration BMPs	15
└ subsurface infiltration BMP	1
└ subsurface filtration BMP	1
└ subsurface detention BMPs	2
└ manufactured treatment device BMPs	2

SMP 5.2 – Linear Projects

Number of plan reviews.

- 3 plans approved in 2024 that were subject to Chapter 54

Number and type of structural stormwater management practices installed in 2024.

Project Name	Chapter 54	Number of stormwater facilities
1st Ave S (Franklin Ave to Lake St)	Yes	60
Hennepin (Lake to Douglas), Phase 1	Yes	49
Hennepin-Dunwoody (Cedar Lake Trail to 12th)	Yes	6
Johnson St NE at Quarry	Yes	2

MCM 6: Pollution Prevention and Good Housekeeping for Municipal Operations

(MS4 Permit References: 21.1-21.19, 30.9 – 30.14)

Program Overview

The City and the MPRB collaborate to oversee the maintenance, planning, design, and operation of the city's sanitary sewer and drainage systems, ensuring efficient management and regulatory compliance for community benefit. Together, they ensure that public works systems maintain structural integrity, prevent impacts to health, safety, property, infrastructure, the environment, and provide sufficient hydraulic capacity to prevent flooding and property damage while minimizing pollutant discharge. This is achieved through a series of practices to insure proper operation and maintenance of stormwater management practices, public streets, bridges, alleys, parks, golf courses, municipal properties, parking lots, and municipal equipment yards.

Program Goals

The overall goal of these SMPs is to follow operation, inspection, and maintenance practices in a manner that prevents or reduces the discharge of pollutants from the City and the MPRB MS4 system, streets and alleys, facilities, parks, and golf courses.

Minimum Control Measure 6 SMP Sheets

SMP 6.1 – Operations and Maintenance

SMP 6.2 – Street Sweeping and Cleaning Program

SMP 6.3 – Facilities Management

SMP 6.4 – Chloride Management SMP 6.5 – Retrofit Plan

SMP 6.6 – Localized Flood Mitigation Capital Projects

Annual Reporting Summary:

SMP 6.1 – Operations and Maintenance

Outfall Inspections and Repairs

- Total Inspections Completed: 52
- Outfall Repair Projects Completed: 3

Structural Stormwater BMPs – Inspection and Maintenance Results

- Grit chambers, 133 inspections and maintenance activities, 470 cubic yards of material removed, no repairs needed
- Green Infrastructure Inspections, 381 inspections, 182 basins maintained

MS4 Component List

- City of Minneapolis Sewer division removed 158 cubic yards of material from our Storm pumping stations.
- Cleaned an estimated 1200' of large diameter pipe, with estimated 15 cubic yards of debris removed.
- 166 sumps maintained. 42 cubic yards material removed.
- 123 catch basin repairs. 185 catch basins have been identified for future repair.

SMP 6.2 – Street Sweeping and Cleaning Program

Operation Period	Material Removed	Quantity
Spring/Summer	Sand, debris, litter	9,196 tons
Fall Citywide	Leaves	6,030 tons

SMP 6.3 – Facilities Management

- Site specific plans are being developed for each facility which include site maps, operations specific Best Management Practices, and inspection and reporting requirements.
- These facility plans will be used to facilitate regular site inspections that will document and correct potential sources of pollution or illicit discharge to the storm sewer system from City or MPRB-owned properties. Inspection frequency will be evaluated based on site specific needs such as continuing or ongoing issues, seasonal site usage, or change in property use. Implementation of the facility management plans will be prioritized based on the highest pollutant potential.

SMP 6.4 – Chloride Management

Staff Training

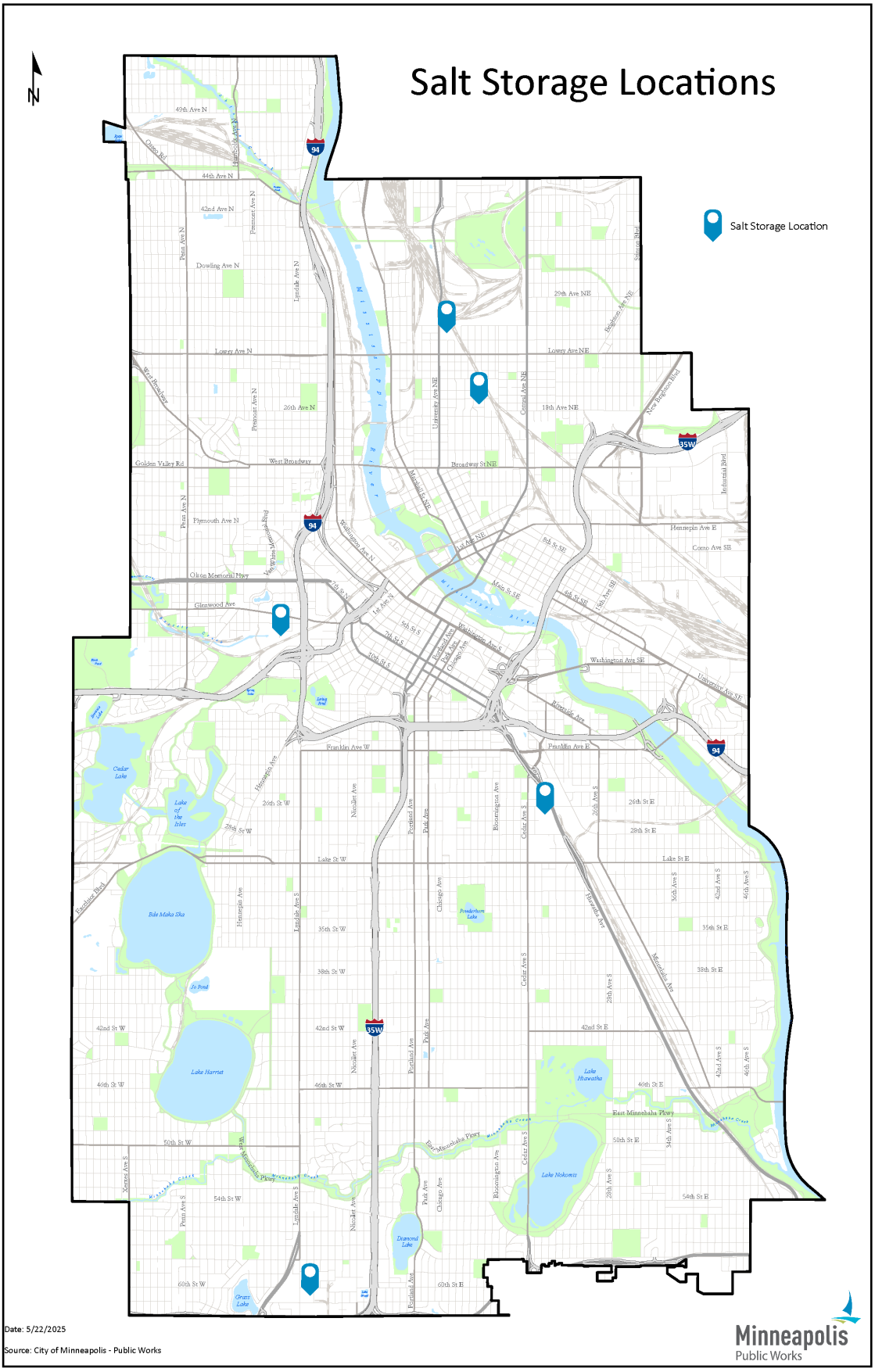
- Total Certified Staff: 39
- Certification Type: Smart Salting
- Agencies Represented: City of Minneapolis and MPRB

Deicing Material Application (Winter 2023-2024)

Material	Quantity Applied (tons)
Road Salt	7,870
Sand	4,924

Storage Facilities for Winter Materials

- The city has 5 storage facilities. See figure below. All are covered with best management practices implemented and inspected weekly during winter operational period.


Salt Storage Locations
N
Salt Storage Location
Date: 5/22/2025
Source: City of Minneapolis - Public Works
Minneapolis
Public Works

SMP 6.5 – Retrofit Plan

- Annual Reporting Requirement: None

SMP 6.6 – Localized Flood Mitigation Projects

Project Summary

- Projects Completed in 2024: None
- In Progress: Several projects currently in the planning, design, and construction phases.
- Link: 2026-31 Capital Budget Requests

MCM 7: Stormwater Discharge Monitoring and Analysis

(MS4 Permit References: 24.1 - 24.5, 30.23 – 30.27)

The goal of stormwater runoff monitoring and analysis is to quantify stormwater volumes and pollutant loads from the MS4, evaluate the efficiency of stormwater practices for the purpose of adaptive management, and to comply with stormwater management programs.

Program Overview

Monitoring results are used to track long-term improvements in stormwater quality, to assess the effectiveness of structural stormwater management practices, and to influence future stormwater management practice design and operations and maintenance decisions. The MPRB leads the field water quality monitoring of stormwater, creeks, and lakes, as detailed in the joint workplan and according to the MS4 permit.

Minimum Control Measure 7 SMP Sheets

SMP 7.1 – Stormwater Runoff Monitoring and Analysis

Annual Reporting Summary:

SMP 7.1 – Stormwater Runoff Monitoring and Analysis

- See Appendix B, C, D, and E for Stormwater Monitoring data.
- Additional information on water quality monitoring can be found in the Annual Water Resources Report.
- No proposed modifications to substitute sources of monitoring and analysis data.
- No significant operational differences in monitoring and monitoring protocols.

MCM 8: Progress Toward Waste Load Allocations for Approved Total Maximum Daily Loads

(MS4 Permit Reference: 9.1-9.5, 26.1-26.11)

Program Overview

Total maximum daily loads (TMDL) are one of the many tools Congress authorized in the Clean Water Act (CWA) to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." which will lead to waters that are fishable and swimmable. A successful TMDL study includes significant stakeholder involvement, characterizes the watershed to identify the waterbody, watershed and impairment conditions, requires sound data, emphasizes the importance of locally led decisions on where and how to spend local money to address water quality issues, and provides equitable allocations for known sources.

A TMDL study determines the level of pollution the impaired waterbody could assimilate if it were meeting State water quality standards, models the mass of pollutants associated with various pollutant sources including stormwater runoff, and develops an equation with allocations for regulated sources (waste load allocations or WLAs), unregulated sources, future growth if applicable, and a margin of safety to account for uncertainty. The MS4 WLA is a numerical maximum pollutant discharge goal for pollutants in stormwater runoff from each MS4 (individual WLA) or all the MS4s in the study (categorial WLA).

Program Goals

The goal of the TMDL program is to improve water quality. In order to accomplish this goal and understand what work is still needed, the permittees must develop and maintain a tracking system to assess and report on the progress towards compliance with TMDL established maximum pollutant discharges. Additionally, this program aims to work closely with the MPCA, neighboring cities, and other water resource partners during the study and implementation phases of each TMDL study which is being conducted for a waterbody that receives stormwater runoff from the Minneapolis/MPRB MS4 system.

TMDLs are established on a watershed basis to assign pollutant reductions to all regulated MS4s that drain to a waterbody rather than making the water quality only the responsibility of the municipality containing the impaired water resources. The City and MPRB can work to solve pollutant problems within their regulated areas but have no control over flows received from upstream entities.

Minimum Control Measure 8 SMP Sheets

SMP 8.1 – Total Maximum Daily Load (TMDL) Program

Annual Reporting Summary

- No TMDL annual reporting requirements in 2024 per the MPCA.

MCM 9: Coordination and Cooperation with Other Entities

(MS4 Permit Reference: 7.1-7.5 17.6 c, 20.9 30.2,30.8c)

Program Overview

The City and MPRB interact with numerous agencies involved in surface water systems or stormwater management. The SMPs contained in this category serve to facilitate communications and develop cooperative agreements such that water quality efforts and MS4 permit responsibilities are defined and documented.

Federal level:

- Environmental Protection Agency (EPA)
- Army Corps of Engineers

State level:

- Minnesota Pollution Control Agency (MPCA),
- Minnesota Department of Transportation (MnDOT),
- Minnesota Department of Health (DOH),
- Minnesota Department of Natural Resources (DNR)

Regional level:

- Metropolitan Council,
- Mississippi Watershed Management Organization (MWMO),
- Minnehaha Creek Watershed District (MCWD),
- Bassett Creek Watershed Management Commission (BCWMC),
- Shingle Creek Watershed Management Commission (SCWMC)

Local level:

- Hennepin County,
- neighboring cities,
- University of Minnesota (U of M)

Program Goals

The goal of these SMPs is to work cooperatively with all water resource agencies towards improvements in water resource management. Specifically, this category of SMPs aims to establish new, or to re- establish previous cooperative agreements with the City's primary partners, including the Minneapolis Park and Recreation Board and the Metropolitan Council, to ensure that all required activities are properly defined and managed.

Minimum Control Measure 9 SMP Sheets

SMP 9.1 – City of Minneapolis and Minneapolis Park and Recreation Board Responsibilities

SMP 9.2 – City of Minneapolis and Metropolitan Council Responsibilities

SMP 9.3 – Coordination and Cooperation with Other Entities

Annual Reporting Summary:

SMP 9.1: City of Minneapolis and Minneapolis Park and Recreation Board Responsibilities

- No annual reporting requirements.

SMP 9.2 City of Minneapolis and Metropolitan Council Responsibilities

- Nothing to report.

SMP 9.3 Coordination and Cooperation with Other Entities

- The City of Minneapolis has an official arrangement, through joint power agreements, with the BCWMC and SCWMC to provide financial contributions to the watersheds through an annual assessment. This assessment provides funding for the commissions' administrative operations and their public education programs.
- SCWMC and BCWMC, along with other west-metro watershed management organizations, are a part of a cooperative education organization known as the West Metro Water Alliance (WMWA).
- 2024 water education activities for
    - BCWMC
    - SCWMC
    - WMWA

MCM 10: Program Assessment, Modification, and Annual Reporting

(MS4 Permit Reference: 28.1-28.6, 29.1-29.6, 30.1-30.29)

Program Overview

The City and MPRB continue to develop, implement, and enforce a SWMP designed to reduce the discharge of pollutants from the MS4 to the Maximum Extent Practicable (MEP), to protect water quality and to satisfy the appropriate water quality requirements of the Clean Water Act and the conditions of this permit. The SWMP must utilize an adaptive management strategy by which monitors, analyzes, and adjusts the SWMP to achieve pollutant reductions to the MEP.

The City and the Minneapolis Park and Recreation Board (MPRB), as co- permittees, have annual and ongoing responsibilities for SWMP assessment, SWMP modifications, recordkeeping, and annual reporting to the MPCA.

Program Goals

The goals of completing SWMP assessments and updating the program are to ensure permit compliance and to ensure that less effective BMPs identified in the SWMP are replaced with more effective practices. The annual assessment is used to provide information for improving performance of the MS4, reduce pollutant loadings, and to support improvements to associated planning and design, construction, operation, and maintenance of the MS4. Annual reporting is used to understand and communicate the status of compliance with the permit terms and conditions.

Minimum Control Measure 10 SMP Sheets

SMP 10.1 – Stormwater Management Program Assessment, Modifications, and Annual Reporting

Annual Reporting Summary:

SMP 10.1 Stormwater Management Program Assessment, Modifications, and Annual Reporting

We collaboratively updated our Stormwater Management Program document with MPRB and other partners and successfully revised it, updated it, and submitted it to the MPCA in November 2024.

MCM 11: Sanitary Sewer Reporting Requirements

(MS4 Permit Reference: 22.1 – 22.17, 30.15-30.21)

Program Overview

In 2019, Minneapolis transitioned from a Combined Sewer Overflow (CSO) permit to an Integrated MS4 permit. This transition is possible because of the success of the efforts of the City of Minneapolis and MCES to reduce the risk of releases of untreated wastewater through storm drain separation, improvements to hydraulic performance and programs to reduce Inflow & Infiltration (I & I)

There are seven (7) control structures on the Metropolitan Council interceptor system that are capable of releasing sanitary sewage to either the Mississippi River or the stormwater drainage system during an extreme rain event. Improvements made to the Minneapolis sanitary sewer system, through the removal of inflow and infiltration sources, has dramatically reduced the number and volume of releases as compared to historic records. In fact, there have been no releases of raw sewage caused by a rain event since 2006. However, these structures must remain in place as a safeguard to prevent the future release of raw sewage into basements or onto streets should an extreme event occur.

The Minnesota Pollution Control Agency (MPCA) has written specific conditions into the Minneapolis / Minneapolis Park and Recreation Board NPDES Municipal Stormwater Permit that the City must follow to allow for these control structures to remain in operation. This Minimum Control Measure and SMP sets up program requirements around monitoring and reporting to meet the obligations of the permit. Some of these program requirements are met by the Metropolitan Council Environmental Services (MCES) through a cooperative agreement with the City.

Program Goals

Manage the sanitary sewer infrastructure in a manner that:

- Maximizes public investment.
- Minimizes risk to human health.
- Minimizes risk to the environment.
- Prevents the loss of life and personal injury.
- Prevents property damage.
- Prevent releases of untreated sewage from the Minneapolis sanitary sewer system.

Minimum Control Measure 11 SMP Sheets

SMP No. 11.1 – Integrated Infrastructure Management Program

Annual Reporting Summary:

SMP 11.1 Integrated Infrastructure Management Program

Partnership activities with MCES

- Cooperative agreement with MCES was executed on March 27, 2018. The agreement provides an inventory of control structures (historic regulators) and clarifies the commitments of each party to invest in, operate and maintain, and reduce inflow and infiltration in each system.

- Joint Capacity Study

  Metropolitan Council and the City of Minneapolis share a commitment to minimize the risk of overflows. A 5-year joint study of the regional wastewater system within Minneapolis was initiated in 2018. The purpose of the study is to develop a work plan to address hydraulic capacity and provide for continued system reliability and reduced risk of system overflow. The goals of the study include the following:

  - Identify areas within the City with high rates of I&I
  - Identify areas of the MCES system with highest risk of sanitary sewer overflow
  - Identify areas where hydraulic capacity is limited in the MCES system
  - Identify projects that could lower risks of sewer overflow and increase needed capacity, including consideration of regulator closures
  - Reduce I&I contribution to wastewater flows to recover interceptor capacity
  - Maximize conveyance and storage capacity in the existing interceptor system
  - Identify areas of the City where insufficient storm sewer capacity affects MCES system capacity and reliability
  - Develop feasible alternatives to reduce risk of sewer overflows, including evaluation of cost-effectiveness, for capital projects that address the hydraulic capacity, risk of sewer overflow, and sources of I&I identified in the study

Efforts to minimize inflow and infiltration

Inflow from the public sewer system is addressed through projects included in the City's Capital Improvement Program. The Capital Improvement Program Includes:

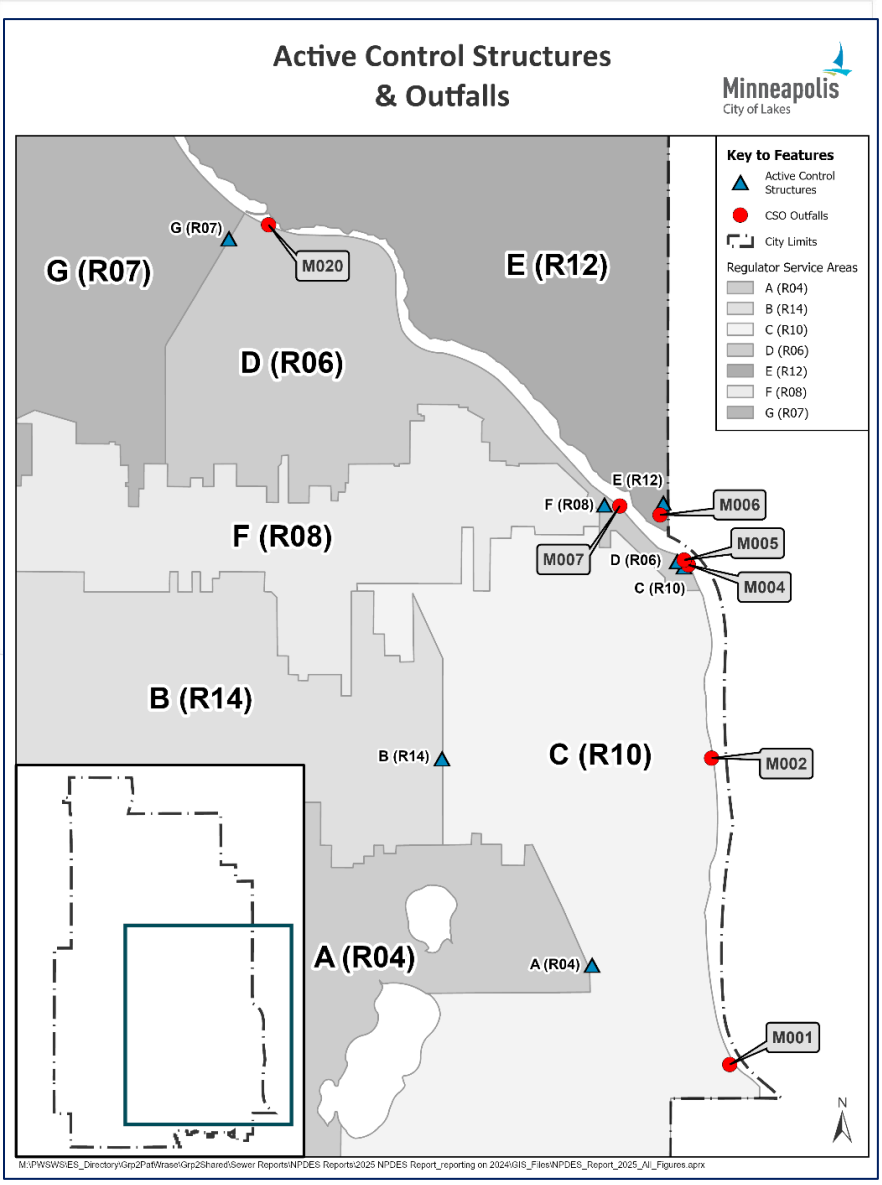
- Combined Sewer Overflow Program – projects to reduce inflow by separating storm drains from the sanitary sewer system
- Inflow & Infiltration Removal Program – rehabilitation and repair projects aimed at reducing inflow of stormwater and infiltration of groundwater into the sanitary sewer system
- Sanitary Tunnel & Sewer Rehab Program – projects to repair and rehabilitate sanitary sewers, lift stations, tunnels and access structures

Since 2002 – 201 storm drain separation projects have been identified for the Combined Sewer Overflow Program. Of the identified projects 158 are complete separating 634 acres of drainage from the sanitary sewer system. The Combined Sewer Overflow Program is a continuation of the 1980s program that separated 4600 acres of drainage from the sewer system.

Inflow from the private sewer system is addressed through the Rainleader Disconnection Program. Since 2003 –6885 of 7071 rainleader violations have been resolved.

Description of any release events from sanitary or CSO systems

- There were zero reported releases to the Mississippi River from the monitored control structures.



*Owned by Metropolitan Council

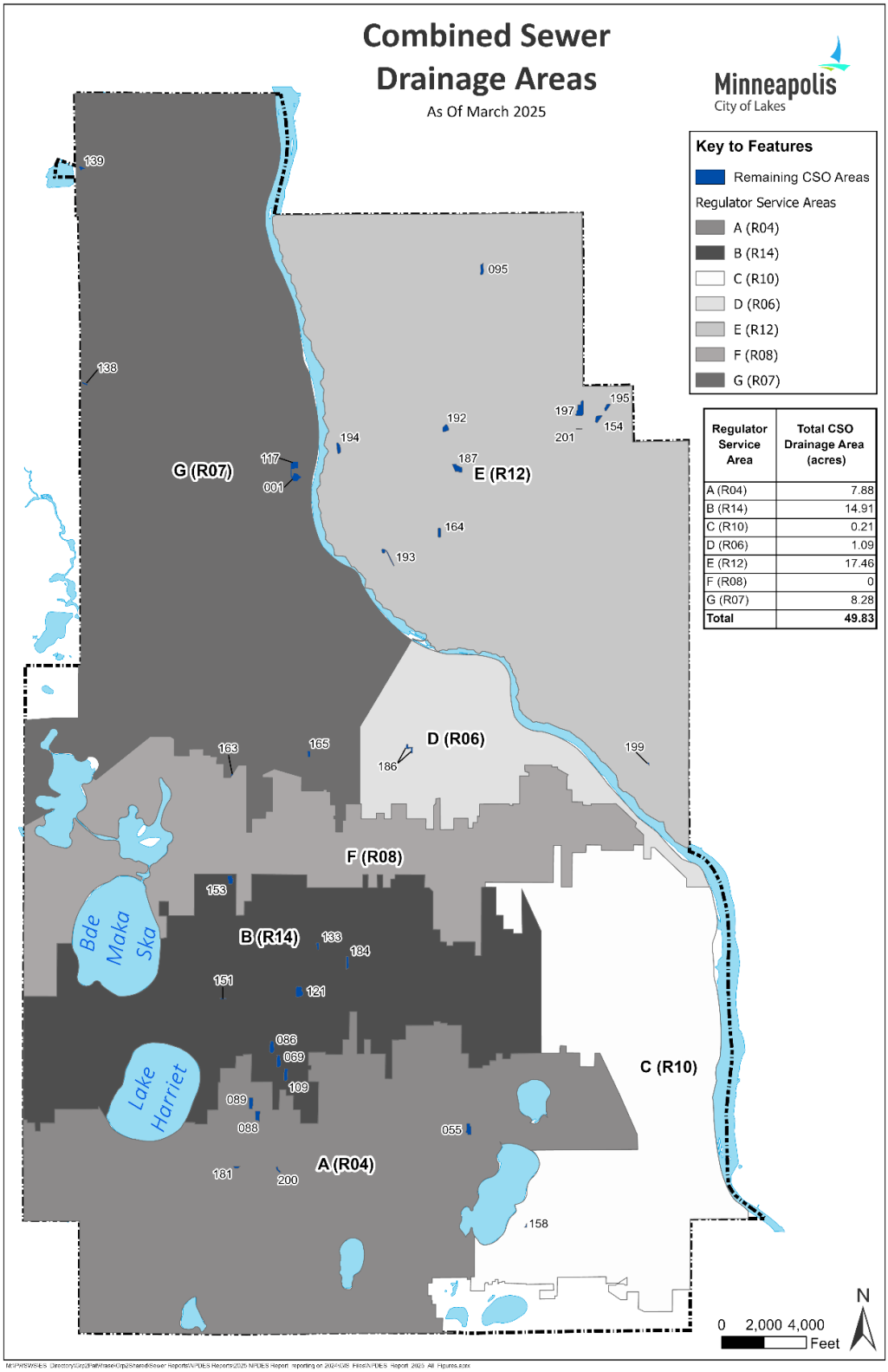
CONTROL STRUCTURE	REGULATOR (Historic CSO Permit)	NAME AND LOCATION	X COORDINATE	Y COORDINATE
A	R04	Minnehaha Pkwy and 39th Ave S	543110.6182	145799.774
B	R14	East 38th St and 26th Ave S	538476.1103	152176.1237
C	R10	Southwest Meters Diversion	545947.525	158095.0627
D	R06	Northwest Meters Diversion	545745.7152	158269.4133
E	R12	East Meters Diversion	545309.3172	160067.8323
F	R08	East 26th St and Seabury Ave	543494.3872	160010.4122
G	R07	Portland Ave S and Washington	531898.897	168232.605

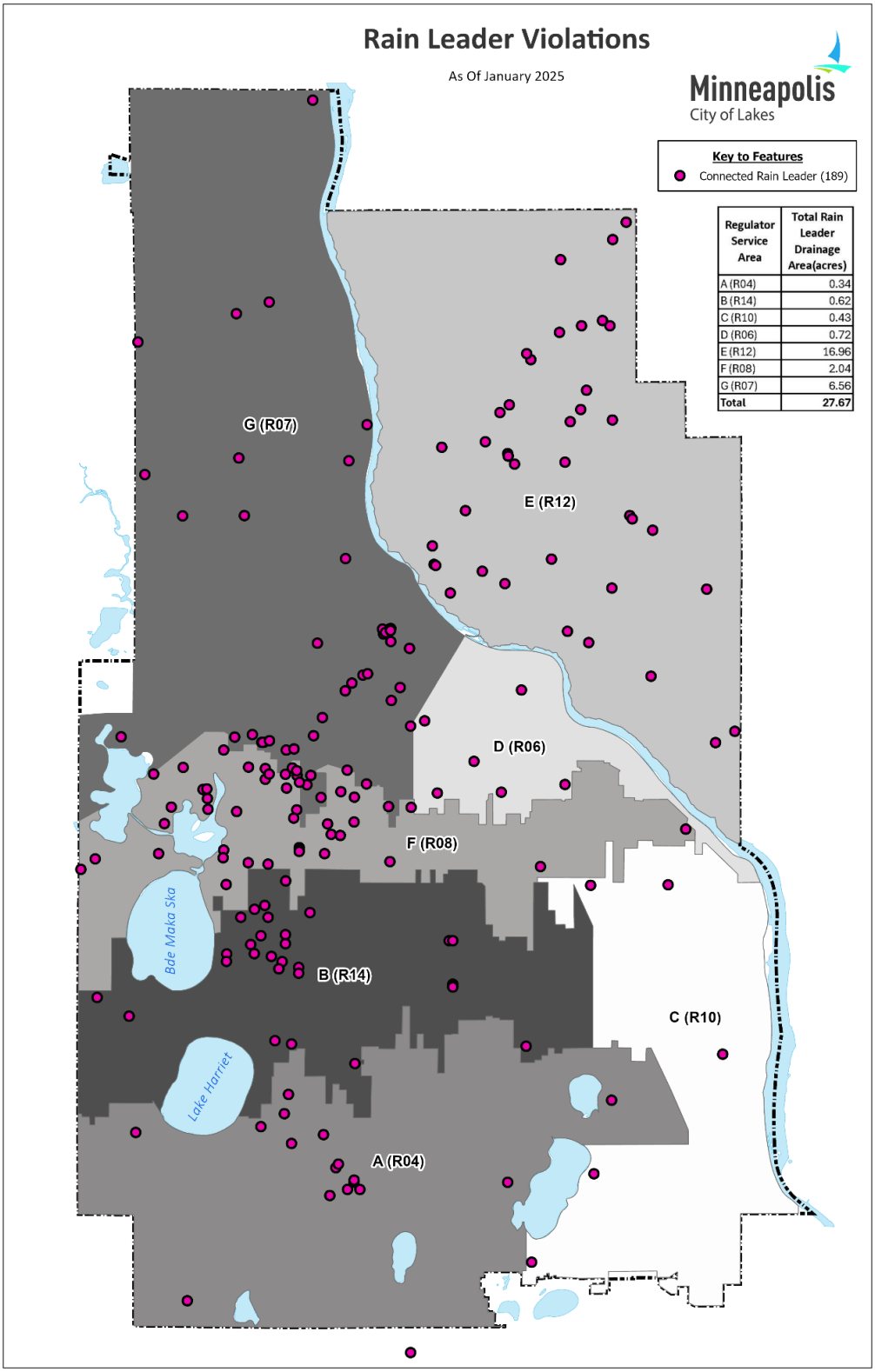
Summary of studies, investigations, and monitoring activities to identify sources of inflow and infiltration.

- Flow Monitoring: 53 sanitary sewers and 5 rain gauges were monitored in 2024. Sewer metering data was reviewed for rainfall dependent inflow and infiltration.
- Smoke Testing; 29.0 miles of sanitary sewer were smoke tested in 2024.
- Suspected Cross Connection Investigations: 2 investigations were conducted in 2024. These include suspected connections Identified from record drawings, GIS work, smoke testing and routine maintenance of the sewer system.
- Sewer Condition assessments – Televising and NASSCO condition assessments were completed for 21.8 miles of sanitary sewer.

Inventory of all identified areas of inflow to the sanitary sewer system

There are 32 connected storm drain and 189 rainleader connections to the sanitary sewer system.




Rain Leader Violations
As Of January 2025
Minneapolis
City of Lakes
Key to Features
Connected Rain Leader (189)
Regulator Service Area
Total Rain Leader Drainage Area(acres)
A (R04) 0.34
B (R14) 0.62
C (R10) 0.43
D (R06) 0.72
E (R12) 16.96
F (R08) 2.04
G (R07) 6.56
Total 27.67
G (R07)
E (R12)
D (R06)
F (R08)
Bde Maka Ska
B (R14)
C (R10)
Lake Harriet
A (R04)

The drainage areas for the storm drain connections to the sanitary sewer system and total sewershed areas are compared in the table below. The comparison shows these areas are a small fraction of the tributary areas to each control structure and associated outfall.

CONTROL STRUCTURE	RLV Area (acres)	CSO Project Area (acres)	COMBINED SEWER DRAINAGE AREA [acres]	TOTAL SEWER SHED AREA [acres]	PERCENT COMBINED SEWER AREA [%]
A (R04)	0.34	7.88	8.22	5,881.04	0.14
B (R14)	0.62	14.91	15.53	3,973.96	0.39
C (R10)	0.43	0.21	0.64	4,239.58	0.02
D (R06)	0.72	1.09	1.81	1,459.49	0.12
E (R12)	16.96	17.46	34.42	8,322.38	0.41
F (R08)	2.04	0	2.04	3,019.47	0.07
G (R07)	6.56	8.28	14.84	8,571.93	0.17
Total	**27.67**	**49.83**	**77.5**	**35,467.85**	**0.22**

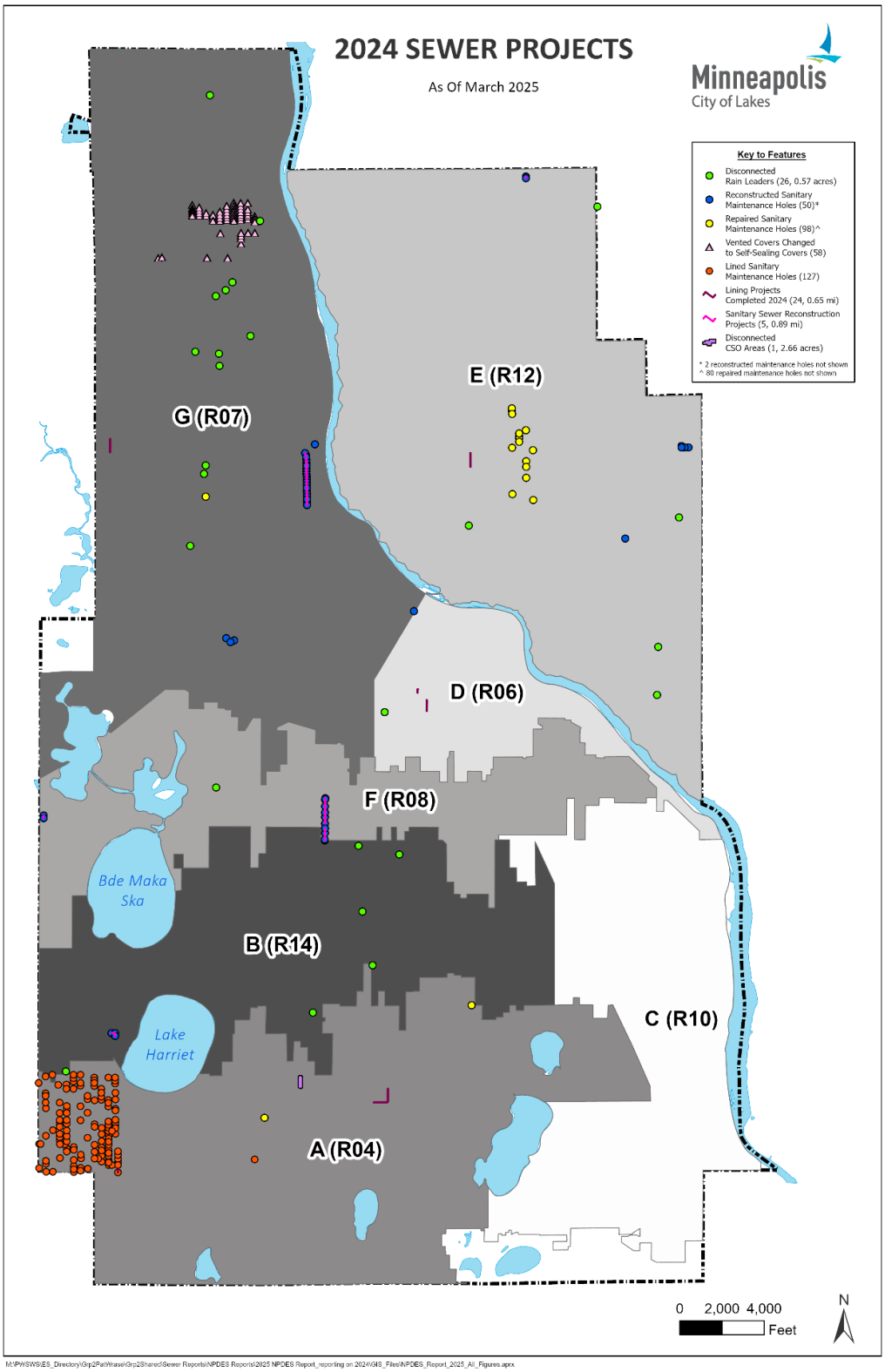
Inflow from the public sewer system is addressed through projects included in the City's Capital Improvement Program. Project work completed in 2024 is summarized in the following list and map:

- Combined Sewer Overflow Program – One storm drain separation projects was completed eliminating 2.66 acres of direct drainage.
- Rainleader Disconnection Program - Inflow from private property through roof drains, sump pumps and open standpipes are tracked by parcel In 2024, 26 rainleader disconnections were completed separating 0.57 acres of direct drainage.

PROJECT NAME	PROJECT LOCATION	DRAINAGE AREA [acres]
CSO 183	ALLEY 47TH ST W & WENTWORTH AVE S	2.66
TOTAL		**2.66**

Sanitary Tunnel & Sewer Rehab Program

- Sewer Reconstruction – 5 projects 0.89 miles of sewer
- Maintenance Hole Reconstruction– 50 sanitary maintenance holes were reconstructed
- Sewer and Maintenance Hole Lining – 0.65 miles of sewer main were CIPP lined and 127 maintenance holes were spray-lined.
- Maintenance Hole Repairs – 98 repairs
- Maintenance Hole Cover Replacement – 58 vented maintenance hole covers were replaced with self-sealing covers in areas where maintenance holes are prone to stormwater inundation



M:\PW\SWS\ES_Directory\Grp2Part\Wrase\Grp2Shared\Sewer Reports\NPDES Reports\2025 NPDES Report_reporting on 2024\GIS_Files\NPDES_Report_2025_All_Figures.aprx

Description of collaborative arrangements with external partners to minimize releases

- There are no additional collaborative arrangements outside of work with MCES.

Annual expenditures

SUMMARY OF ANNUAL EXPENDITURES	
Sanitary Rehab Projects – Repair and replacement	$17,935,875
CIPP lining Projects	$2,606,298
Sewer Separation Projects *	$297,518
Rainleader Disconnect Work	$67,620
Flow Metering	$421,030
Smoke Testing	$511,863
Other I&I Studies	$108,342
Total	$**21,948,547**

**Additional sewer separation costs included in paving projects, not shown here*

APPENDICES

Appendix A: City Council Resolution

Appendix B: Stormwater Monitoring

The Minneapolis Park and Recreation Board (MPRB) monitors stormwater within Minneapolis to comply with the federal National Pollutant Discharge Elimination System (NPDES) permit. The purpose of this monitoring is to better understand pollutant loads in stormwater runoff and to gain knowledge that can be used to improve the effectiveness of treatment best management practices (BMPs). BMPs include procedures and structures designed to help reduce and capture pollutants in stormwater runoff. In 2024, quarterly grab samples, including snowmelt and rainfall, were collected at five stormwater sites. A sixth planned site did not flow actively during active precipitation or melt events. One inlet to Camden Pond as well as the outlet were monitored to better understand the potential water quality benefits of a stormwater pond initially built for flood control. Stormwater from four subwatersheds draining to Powderhorn Lake were monitored to gather information on external pollutant loads that will inform a future diagnostic study of the lake so that pollutant loads can be reduced. Monitoring occurred upstream and downstream of continuous deflection separation (CDS) units in the Powderhorn Lake watershed study. Three green infrastructure basins at Hoyer Heights were monitored for soil chemistry in an ongoing study of basin functionality. This section describes work done in the 2024 monitoring season. Appendix B, C, D, and E contains the 2024 Stormwater monitoring projects and data.

In addition to stormwater monitoring, the MPRB executes an extensive lake monitoring program. The Minneapolis lakes are the receiving water from the city's stormwater infrastructure. All lakes in the monitoring program are sampled twice per month during summer, and once each in winter, spring, and fall. See the MPRB's Water Resources Report for detailed lake monitoring results.

Escherichia coli (E. coli) monitoring per the MPCA's standard is also carried out at the MPRB's 12 official beaches located on six lakes. This monitoring is important for public health and provides indications of elevated bacteria issues. Results of the weekly beach monitoring are posted on the MPRB Lake Water Quality map. E. coli is a bacterium used to indicate the potential presence of waterborne pathogens that can be harmful to human health. Elevated bacteria levels generally occur in aquatic environments after rain events, when bacteria from various sources are washed into the lakes in stormwater runoff.

In 2024, the MPRB continued to monitor for blue-green algae during open-water beach monitoring and year-round lake sampling. Blue-green algae is monitored by reviewing lake risk factor data including chlorophyll-a, Secchi readings, and pH, using a Visual Monitoring Index (VMI) and total algae probe, and sending water samples to a contracted lab for cyanotoxin analysis of microcystin, cylindrospermopsin, and anatoxin-a. Blue-green algae blooms, otherwise known as harmful algal blooms (HABs), are caused by a photosynthetic microorganism called cyanobacteria. Certain taxa of cyanobacteria have the capability to produce cyanotoxins that can be harmful to wildlife, pets, and humans if ingested. While the process of nutrient loading promotes cyanobacteria growth, warmer temperatures, more

intense precipitation events, and longer stratification periods due to climate change will stimulate more intense and frequent future harmful algal bloom events.

This section contains all stormwater monitoring data and calculations from 2024. This includes both grab and composite sampling data.

Additional information on water quality monitoring can be found in the Annual Water Resources Report.

STORMWATER QUARTERLY GRAB MONITORING

BACKGROUND

As part of the federal Clean Water Act, the Minneapolis Park and Recreation Board (MPRB) and the City of Minneapolis are co-permittees on the Environmental Protection Agency (EPA) issued National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit. The MS4 permit outlines a wide variety of stormwater pollution prevention and monitoring activities that MPRB must complete annually. One such requirement is to collect grab samples of stormwater runoff from six or more sites.

The purpose of monitoring via grab samples is to characterize the seasonality of runoff for parameters that cannot be collected with flow-weighted composite auto-monitoring, such as pH, Escherichia coli (E. coli), and Fat Oil & Grease (FOG). Runoff can be characterized by collecting samples across all four seasons. The condition needed for winter snowmelt sample collection was a snowpack melt event, generally triggered by sustained above-freezing temperatures following a snowfall event. The condition needed for spring, summer, and fall grab sample collection was a rain event greater than 0.10 inches separated by at least 8 hours from other rain events.

Grab samples can be challenging to obtain, as specific timing of rain events in relation to MPRB and lab working hours are required for samples to be collected and analyzed. As required in the permit, annual quarterly grab monitoring includes: two snowmelt grab samples and one grab sample each in spring, summer, and fall. Quarterly grab monitoring includes pH measurements and water samples analyzed for E. coli, NPDES water chemistry, and FOG. NPDES chemistry parameters that are analyzed from grab samples, as required by the NPDES permit, are outlined in Table B-1.

Grab sampling characterizes a point in time of a snowmelt or rain event. The first snowmelt event in a year usually has higher pollutant concentrations than subsequent snowmelt events. Chemical concentrations can change over time throughout a storm event. The beginning of a storm mobilizes fine particles and FOG material previously deposited on hard surfaces. Chemical concentrations can have significant variance between storm events depending on the amount of time since the last precipitation event, since pollutants accumulate on surfaces over time and then wash off in a melt or rain event.

In 2024, grab sampling included five sites: Powderhorn Lake Inlets N, S, SE, and W, and Camden Inlet SNW. Due to a lack of snowfall in the winter, snowmelt grabs were only collected

once at Powderhorn Inlet W and Camden Inlet SNW. No snowmelt samples were collected at the other sites, though two attempts were made. The 61st & Lyndale site was dropped from grab sampling due to the beginning of a new NPDES permit cycle.

METHODS

Grab Sampling

Grab samples are taken directly from the storm sewer as an aliquot from a clean white 5-gallon bucket on a rope. The bucket was lowered into the storm sewer and rinsed once before the aliquot was collected. Per sampling protocol, water chemistry sample bottles were rinsed once before sample collection, whereas E. coli and FOG sample bottles were not rinsed. FOG samples were collected in amber glass bottles. All samples were stored and transported on ice to the laboratory, along with a field blank. Table B-1 shows the NPDES chemistry parameters analyzed in each sample collected. Table B-2 shows approved methods, reporting limits, and holding times for each parameter as reported by the contract laboratories Instrumental Research, Inc. (IRI) and Pace Analytics.

The pH measurement was analyzed in the field by a YSI Pro10 pH meter. The pH meter was calibrated prior to sampling using a two-point calibration. In the field, the pH probe was rinsed with the grab sample water and measurements were taken directly from the aliquot.

Grab samples can only be collected when enough flow is present in the pipe. Snowmelt and precipitation events generally need to produce at least 1-inch of stage in the pipe to be sampled. Precipitation events generally need to be greater than 0.10 inches to produce enough runoff. Staff collected quarterly grab samples on 2/20/24, 4/16/24, 6/17/24, and 10/31/24, shown in Table B-4 and Table B-5.

Table B-1. All chemistry parameters monitored as required by the NPDES permit.

Parameter	Abbreviation	Units
Chemical Oxygen Demand	COD	mg/L
Chloride, Total	Cl	mg/L
Copper, Total	Cu	µg/L
Dissolved Organic Carbon	DOC	mg/L
***E. coli* (*Escherichia coli*)**	*E. coli*	MPN/100mL
Fat, Oil, and Grease (FOG)	FOG	mg/L
Hardness	Hard	mg/L
Lead, Total	Pb	µg/L
Nitrite/Nitrate, Total as N	NOx	mg/L
Orthophosphate	OPO4	mg/L

pH	pH	standard unit
Phosphorus, Total	TP	mg/L
Phosphorus, Total Dissolved	TDP	mg/L
Solids, Total Dissolved	TDS	mg/L
Solids, Total Inorganic	ISS	mg/L
Solids, Total Suspended	TSS	mg/L
Solids, Volatile Suspended	VSS	mg/L
Total Nitrogen	TN	mg/L
Zinc, Total	Zn	µg/L

Table B-2. Analysis method, reporting limit, and holding times for parameters used by Instrumental Research, Inc. and Pace Laboratories (Cu, Pb, Zn, and DOC).

Parameter	Method	Reporting Limit	Holding Times
Chloride, Total	SM 4500-Cl^- B	2.0 mg/L	28 days
COD	SM 5220-D	20 mg/L	28 days
Copper, Total	EPA 200.8	1 µg/L	6 months
DOC	SM 5310-C-00	1.5 mg/L	28 days
***E. coli* (*Escherichia coli*)**	SM 9223 B	1 MPN per 100mL	< 24hrs
Fat, Oil, and Grease (FOG)	EPA 1664A	5.0 mg/L	28 days
Hardness	SM 2350 C	5.0 mg/L	6 months
Lead, Total	EPA 200.8	0.10 µg/L	6 months
Nitrite/Nitrate, Total as N	SM 4500-NO_3 E	0.030 mg/L	28 days
Orthophosphate	SM4500-PE	0.003 mg/L	48 hours
pH	SM 4500 H^+ B	0.01 units	15 minutes
Phosphorus, Total	SM 4500-PE	0.010 mg/L	48 hours
Phosphorus, Total Dissolved	SM 4500-PE	0.010 mg/L	48 hours
Solids, Total Dissolved	SM 2540 C	5.0 mg/L	7 days
Solids, Inorganic Suspended	TDS - VSS	5.0 mg/L	7 days
Solids, Total Suspended	SM 2540 D	1.0 mg/L	7 days
Solids, Volatile Suspended	EPA 160.4	2.0 mg/L	7 days
Total Nitrogen	Alk Persulfate Oxidation method	0.500 mg/L	28 days
Zinc, Total	EPA 200.7	20 µg/L	6 months

The 2024 grab sampling sites are shown below. Figure B-1 shows the location of the Camden Pond S NW inlet. Figure B-2 shows the location of the Powderhorn Lake inlets N, S, SE, and W. Table B-3 shows the land use and drainage area for the five grab sampling sites.

Figure B-1 Aerial photo of the Camden Pond quarterly grab monitoring site.

Figure B-2. Aerial photo of the Powderhorn quarterly grab monitoring sites

Table B-3. The quarterly grab monitoring sites for NPDES chemistry, E. coli, pH, and FOG, and their location, main land uses, drainage area, and percent of drainage area covered by impervious surfaces.

Site ID	Camden Inlet S NW	Powderhorn Inlet N	Powderhorn Inlet SE	Powderhorn Inlet S	Powderhorn Inlet W
Location	4200 Newton Ave N	13th Ave S and Powderhorn Terrace	3421 15th Ave S.	13th Ave S. and E. 35th St.	3318 19th Ave S.
Land Use	Single family, right of way	Single family, right of way	Single family, right of way, park	Single family, right of way	Single family, right of way
Drainage Area	127.8 acres	12.87 acres	70.0 acres	81.2 acres	99.4 acres
Imperviousness	44.9%	55.4%	43.9%	49.6%	51.5%

Quality Assurance Practices

A variety of quality assurance quality control (QAQC) measures were taken to ensure sound data. Ten percent of the samples were laboratory quality assurance samples e.g., duplicates, spikes. A field blank was also generated for each sampling trip and was analyzed for all NPDES chemical parameters. Field blanks consisted of deionized water which accompanied samples from the field sites to the analytical laboratory. All field blank parameters measured below the reporting limits in 2024. As part of the department QAQC program, blind monthly performance samples of known concentration were analyzed by IRI. If any parameter failed to meet the acceptable recovery range, all the data for that parameter would be flagged for the entire month. No parameters were flagged in 2024.

Field measurements were recorded on a field sheet in the 2024 Stormwater Monitoring Field Manual. Electronic data from the laboratory were forwarded to the MPRB in preformatted Excel spreadsheets via email and passed quality assurance checks. Protocols for data validity followed those defined in the Stormwater Monitoring Program Manual (MPRB, 2001). For data reported as below the reporting limit, the numerical value was divided by two for statistical calculation purposes.

Manual transcription of data was minimized to reduce error introduction. A minimum of 10% of the final data were checked by hand against the raw data sent by the laboratory to ensure there were no errors entering, manipulating, or transferring the data.

A Chain of Custody form accompanied each set of sample bottles delivered to the lab. Each sample container was labeled indicating the date and time of collection, site location, and field personnel initials. Samples were transported to the laboratory on ice in a cooler. The time that each grab sample was collected was recorded onto field sheets. A complete description of methods can be found in the Stormwater Monitoring Program Manual (MPRB, 2001). Common statistics were calculated using Microsoft Excel.

RESULTS AND DISCUSSION

The 2024 quarterly snowmelt grab sampling schedule is shown in Table B-4. Due to the lack of significant snowfall in the winter of 2023-24, only two snowmelt samples were able to be collected. The 2024 quarterly precipitation grab sampling schedule and associated precipitation event data are shown in Table B-5.

The full 2024 grab sample NPDES chemistry results can be found in Tables E-2 and E-3 in Appendix E. The 2024 grab sampling statistics of geometric mean, arithmetic mean, maximum value (MAX), minimum value (MIN), standard deviation (STDEV), number of samples collected, and the coefficient of variation (COV) are shown in Table B-6 and Table B-7. The geometric mean is a valuable statistic as it accurately controls for data with a wide range and outliers.

The snowmelt samples, show higher concentrations of pollutants as compared to spring, summer, and fall samples, but lower E. coli levels. This is expected, as snowmelt is the release of 4-5 months of deposition and debris from the watershed. E. coli bacteria do not survive well in colder conditions, and thus tend to have low concentrations in snowmelt samples. The pH ranged from 7.07 to 9.12 across all quarterly grab monitoring sites, with a generally higher pH in the colder months.

The winter of 2023-24 had few snowfall events. Between January and March of 2024, only 24.2" of snow fell, compared to the NWS normal snowfall amount of 30.1". These snowfall events were generally small and scattered, preventing significant amounts of snowpack from accumulating. This made it exceptionally difficult to obtain winter grab samples, since melt events would often fail to generate enough runoff to be sampled.

Table B-4. Snowmelt grab sample attempts and successful collections in 2024. X = Grab sample collected. NS = No sample.

Date	Powderhorn In N	Powderhorn In S	Powderhorn In SE	Powderhorn In W	Camden In S NW
2/8	NS	NS	NS	NS	NS
2/20	NS	NS	NS	X	X

Table B-5. Stormwater rainfall grab samples collected with event data in 2024. Pow = Powderhorn, Cam = Camden. X = Grab sample collected.

Start Date	Start Time	End Date	End Time	Rain in.	Duration hrs.	Intensity in/hr.	Hours since last rain	Pow In N	Pow In S	Pow In SE	Pow In W	Cam In S NW
4/16	9:45	**4/17**	3:30	1.69	17.75	0.10	111	X	X	X	X	X
6/17	3:15	**6/17**	8:00	0.62	4.75	0.13	25	X	X	X	X	X
10/31	1:00	**10/31**	14:00	1.26	13	0.10	150	X	X	X	X	X

Table B-6. 2024 snowmelt grab sampling summary statistics. Note that both FOG samples were below the reporting limit of 5 mg/L, so 2.5 was used for calculation purposes.

	TP mg/L	TDP mg/L	SRP mg/L	OPO4 mg/L	TN mg/L	NOx mg/L	Cl mg/L	Hard. mg/L	TSS mg/L	VSS mg/L	ISS mg/L	TDS mg/L	COD mg/L	FOG mg/L	E. Coli MPN	pH Std Unit	Cu µg/L	Pb µg/L	Zn µg/L	DOC mg/L
MEAN (geometric)	0.403	0.218	0.179	0.149	2.04	0.348	577	64.1	32.5	18.2	14.2	1028	83.0	2.50	486	9.00	13.4	9.57	61.5	18.4
MEAN (arithmetic)	0.406	0.223	0.183	0.151	2.07	0.387	635	65.5	32.5	18.3	14.3	1119	83.1	2.50	541	9.01	13.6	10.6	61.8	18.5
MAX	0.452	0.274	0.221	0.177	2.46	0.556	900	79.0	34.4	19.2	15.2	1563	84.3	2.50	776	9.12	15.2	15.0	68.1	19.2
MIN	0.359	0.173	0.145	0.125	1.68	0.218	370	52.0	30.7	17.3	13.3	676.3	81.8	2.50	305	8.89	11.9	6.10	55.5	17.7
MEDIAN	0.406	0.223	0.183	0.151	2.07	0.387	635	65.5	32.5	18.3	14.3	1119	83.1	2.50	541	9.01	13.6	10.6	61.8	18.5
STDEV	0.0658	0.0710	0.0537	0.0369	0.549	0.239	375	19.1	2.64	1.32	1.32	626.7	1.78	0.00	333	0.163	2.33	6.29	8.91	1.06
NUMBER	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
COV	0.162	0.318	0.293	0.244	0.265	0.619	0.590	0.291	0.0811	0.0723	0.0925	0.560	0.0215	0.00	0.616	0.0181	0.172	0.597	0.144	0.0575

Table B-7. 2024 rainfall grab sampling summary statistics.

	TP mg/L	TDP mg/L	SRP mg/L	OPO4 mg/L	TN mg/L	NOx mg/L	Cl mg/L	Hard. mg/L	TSS mg/L	VSS mg/L	ISS mg/L	TDS mg/L	COD mg/L	FOG mg/L	E. Coli MPN	pH Std Unit	Cu µg/L	Pb µg/L	Zn µg/L	DOC mg/L
MEAN (geometric)	0.270	0.175	0.114	0.152	1.25	0.433	3.05	19.4	17.0	9.09	10.3	53.0	36.3	4.64	4,349	7.41	9.18	5.44	35.7	10.9
MEAN (arithmetic)	0.359	0.237	0.151	0.192	1.52	0.716	4.73	20.8	31.3	14.1	18.5	61.5	52.2	6.03	8,328	7.41	9.70	7.09	46.8	17.0
MAX	1.42	0.733	0.390	0.445	3.12	2.57	16.0	38.0	155	48.0	107	162	168	20.0	24,196	7.69	14.3	22.5	83.3	53.7
MIN	0.0858	0.0457	0.0271	0.0394	0.575	0.114	1.0	10.0	0.500	1.00	2.80	22.5	10.0	2.50	384	7.07	4.70	1.20	10.0	2.70
MEDIAN	0.279	0.170	0.114	0.163	1.03	0.339	3.0	18.0	24.0	10.5	8.90	60.0	52.2	3.20	8,164	7.43	10.9	6.00	51.0	11.8
STDEV	0.334	0.194	0.112	0.127	0.978	0.814	4.80	8.0	38.0	12.6	27.0	36.5	42.7	5.02	7,696	0.144	3.00	5.38	27.9	15.7
NUMBER	15	15	15	15	15	15	15	15	15	15	14	15	15	15	15	15	15	15	15	15
COV	0.930	0.819	0.744	0.659	0.645	1.14	1.0	0.386	1.21	0.893	1.46	0.593	0.818	0.833	0.924	0.0195	0.310	0.758	0.597	0.923

FOG (Fat, Oil, and Grease) Monitoring Study

Beginning in 2018, the FOG Monitoring Study was conceptualized as a 2-year study to gather FOG data over the course of the NPDES permit. If no FOG values were found to be greater than 15 mg/L, the study would end. If a FOG value exceeded 15 mg/L, that site would continue to be monitored for FOG. Powderhorn Inlet N was the only site to exceed the 15 mg/L threshold in 2024. Overall, FOG levels in 2024 were generally lower than in the past 5 years of the study. Table B-8 contains FOG data from 2024. Table B-9 contains FOG data from 2023 and 2024. See Table E-4 in Appendix E for FOG data from the entire duration of the study.

Table B-8. FOG results from grab samples collected in 2024. Samples over 15 mg/L are in red.

2024 Sites	Snowmelt	Rainfall		
	2/20	4/16	6/17	10/31
CAM IN SNW	<5.00	<5.00	<5.00	9.8
POW IN N		6.7	<5.00	20
POW IN S		<5.00	<5.00	3.2
POW IN SE		<5.00	8.1	<5.00
POW IN W	<5.00	<5.00	<5.00	8.4

Table B-9. FOG event dates and grab samples collected from the last 2 years. Data greater than 15 mg/L are in red.

2023	14-Feb	31-Mar	3-Apr	19-Apr	26-Jul	14-Aug	25-Sep	29-Sep	6-Oct
61st & Lyndale	22.0	<5.00	<5.00						
CAM IN NNW	8.8	<5.00		<5.00		<5.00	<5.00		
CAM IN SNW	9.4	<5.00		<5.00		<5.00	<5.00		
CAM IN SW	5.2	<5.00		<5.00		<5.00			12.7
POW IN S	19.6	7.5		7.3	13.4			<5.00	
POW IN SE		<5.00	<5.00	<5.00		<5.00		<5.00	
POW IN W		<5.00	<5.00	5.3	<5.00		<5.00	60.5	
2024	**20-Feb**	**16-Apr**	**17-Jun**	**31-Oct**					
CAM IN SNW	<5.00	<5.00	<5.00	9.8					
POW IN N		6.7	<5.00	20					
POW IN S		<5.00	<5.00	3.2					
POW IN SE		<5.00	8.1	<5.00					
POW IN W	<5.00	<5.00	<5.00	8.4					

Powderhorn Inlet W has had unusually high levels of FOG for several years, likely due to illegal dumping activities in the watershed. In 2024, MPRB water resources staff observed several instances of an oily sheen being present on stormwater in the curb next to the site as well as on the stormwater composite samples. On June 24th, a citizen reported witnessing street vendors dumping their fryer oil into a storm drain approximately 1.5 blocks upstream from the monitoring site. MPRB staff located the dumping site and found significant evidence of grease, including greasy residue on the grates and surrounding pavement and a thick layer of grease floating in the Powderhorn W CDS (Continuous Hydrodynamic Separator) sump. The City of

Minneapolis Environmental Inspectors were notified, and they issued warnings and tickets to the vendors, in addition to providing educational pamphlets about why dumping grease down a storm drain is harmful to the environment. Minneapolis Public Works staff cleaned the grease out of the CDS unit on June 26th using a vacuum truck, preventing the grease from clogging the CDS unit and making its way to the lake. More grease was observed in the CDS sump during the weeks after the incident as it was washed down the storm sewer. Additionally, MPRB's Green Team members applied stencils by storm drains around Powderhorn Park that read "Drains to Lake" in both English and Spanish, to educate and dissuade further dumping activity.

CONCLUSIONS

In 2024, five sites were monitored via grabs for NPDES water chemistry, E. coli, pH, and FOG. The sites included:

- Camden Pond Inlet S NW
- Powderhorn Inlets N, S, SE, and W

Grab samples of stormwater represent storm event chemistry at a specific point in time. Due to limited holding times and the necessity for glass bottles, some parameters can only be characterized by a grab sample, e.g., pH, E. coli, and FOG. Timing of a runoff event is critical for grab sample collection. Flow must occur when staff are available, travel between sites during a storm is possible, and the laboratory is available to receive samples with short holding times like E. coli. In 2024, only two winter snowmelt samples were collected at Powderhorn Inlet W and Camden Inlet SNW. Rainfall samples were successfully collected at all sites during the spring, summer, and fall quarters.

While limited to just two winter datapoints, 2024 grab sampling data showed that snowmelt had higher values for most chemical parameters when compared to runoff at other times of the year. Phosphorus, solids, metals, and pH were higher during snowmelt, while E. coli levels were much higher in the warmer months. This was expected since E. coli are temperature-dependent organisms. All chloride concentrations were high during the winter and lower in the rest of the year. Chloride levels during the winter of 2023-24 were not as high as in previous years due to the lack of significant snowfall since the main source of chloride is from deicing salt.

FOG data have been collected from 2018 to 2024. Most FOG samples that were greater than 15 mg/L were seen during the 2019 to 2023 snowmelt events. The only non-snowmelt FOG samples that exceeded the 15 mg/L threshold were on 9/29/23 at Powderhorn Inlet W, and on 10/31/24 at Powderhorn Inlet N. It appears that FOG values greater than 15 mg/L generally do not occur outside of snowmelt, with some exceptions. Snowmelt is a unique event that contributes pollution from material deposited in the watershed over 4-5 months during a few low-flow events, so it is common to see an oily sheen on a snowmelt grab sample.

Appendix C: Powderhorn Lake Inlet Monitoring

Appendix D: Camden Pond Monitoring

Appendix E: Stormwater Monitoring Data

This section contains all stormwater monitoring data from 2024. This includes both grab and composite sampling data.

Table E-1. All chemistry parameters monitored as required by the NPDES permit.

Parameter	Abbreviation	Units
Chemical Oxygen Demand	COD	mg/L
Chloride, Total	Cl	mg/L
Copper, Total	Cu	µg/L
Dissolved Organic Carbon	DOC	mg/L
***E. coli* (*Escherichia coli*)**	*E. coli*	MPN/100mL
Fat, Oil, and Grease (FOG)	FOG	mg/L
Hardness	Hard	mg/L
Lead, Total	Pb	µg/L
Nitrite/Nitrate, Total as N	NOx	mg/L
Orthophosphate	OPO4	mg/L
pH	pH	standard unit
Phosphorus, Total	TP	mg/L
Phosphorus, Total Dissolved	TDP	mg/L
Solids, Total Dissolved	TDS	mg/L
Solids, Total Inorganic	ISS	mg/L
Solids, Total Suspended	TSS	mg/L
Solids, Volatile Suspended	VSS	mg/L
Total Nitrogen	TN	mg/L
Zinc, Total	Zn	µg/L

Table E-2. 2024 stormwater monitoring site reference key.

Site Name	Abbreviated Name
Camden Inlet SNW	Cam In SNW
Camden Outlet	Cam Out
Powderhorn Inlet N	Pow In N
Powderhorn Inlet S	Pow In S
Powderhorn Inlet SE	Pow In SE
Powderhorn Inlet W	Pow In W

Grab Sampling Results

Table E-3. 2024 snowmelt NPDES chemistry grab sample results.

Date	Time	Site	TP mg/L	TDP mg/L	SRP mg/L	OPO4 mg/L	TN mg/L	NOx mg/L	Cl mg/L	Hard mg/L	TSS mg/L	VSS mg/L	ISS mg/L	TDS mg/L	COD mg/L	FOG mg/L	*E. Coli* MPN	pH Std Unit	Cu µg/L	Pb µg/L	Zn µg/L	DOC mg/L
2/20	14:20	POW W	0.452	0.274	0.221	0.177	2.46	0.556	370	52	34.4	19.2	15.2	676	81.8	<5.0	305	8.12	15.2	15.0	68.1	17.7
2/20	14:55	CAM SNW	0.359	0.173	0.145	0.125	1.68	0.218	900	79	30.7	17.3	13.3	1563	84.3	<5.0	776	8.64	11.9	6.10	55.5	19.2

Table E-4. 2024 rainfall NPDES chemistry grab sample results. FOG data in red are greater than 15 mg/L.

Date	Time	Site	TP mg/L	TDP mg/L	SRP mg/L	OPO4 mg/L	TN mg/L	NOx mg/L	Cl mg/L	Hard mg/L	TSS mg/L	VSS mg/L	ISS mg/L	TDS mg/L	COD mg/L	FOG mg/L	*E. Coli* MPN	pH Std Unit	Cu µg/L	Pb µg/L	Zn µg/L	DOC mg/L
4/16	2:30	CAM SNW	0.270	0.183	0.135	0.178	3.09	1.80	16.0	34	25.0	10.5	14.5	108	40.6	<5.0	546	7.69	11.4	4.50	76.0	11.4
4/16	1:52	POW N	0.270	0.179	0.115	0.163	2.48	2.30	5.5	18	31.0	13.5	17.5	57.5	47.2	6.7	529	7.29	12.0	5.70	63.0	10.6
4/16	1:25	POW S	0.279	0.169	0.108	0.160	2.83	0.706	7.0	18	47.0	25.5	21.5	62.5	52.2	<5.0	384	7.35	11.9	12.0	80.0	11.8
4/16	1:20	POW SE	0.299	0.170	0.103	0.165	2.43	0.717	4.5	16	54.6	25.8	28.8	52.5	69.0	<5.0	988	7.43	12.9	11.8	83.3	13.3
4/16	1:35	POW W	0.305	0.166	0.105	0.153	3.12	2.57	6.0	20	46.5	20.0	26.5	47.5	53.3	12.0	1,782	7.29	14.3	22.5	78.0	12.0
6/17	11:10	CAM SNW	0.181	0.136	0.114	0.129	0.889	0.339	3.0	38	5.60	2.80	2.80	62.5	14.6	<5.0	10,462	7.54	7.20	1.40	<20.0	4.30
6/17	10:25	POW N	0.0858	0.0457	0.0271	0.0394	0.582	0.186	<2.0	16	6.40	3.00	3.40	25.0	<20.0	<5.0	6,131	7.51	5.20	1.20	<20.0	2.80
6/17	9:15	POW S	0.127	0.0677	0.0483	0.0665	0.809	0.167	1.0	12	15.6	5.80	9.80	25.0	<20.0	<5.0	9,804	7.46	8.40	4.60	22.0	2.90
6/17	9:00	POW SE	0.115	0.0702	0.0452	0.0583	0.702	0.114	<2.0	10	7.00	3.33	3.67	22.5	<20.0	8.1	11,199	7.36	4.70	2.20	<20.0	3.20
6/17	9:50	POW W	0.111	0.0606	0.0394	0.0528	0.702	0.138	<2.0	12	10.0	4.60	5.40	25.0	<20.0	<5.0	11,199	7.45	4.90	4.00	<20.0	2.70
10/31	10:20	CAM SNW	1.42	0.733	0.243	0.307	1.55	0.256	15.0	18	155	48.0	107	162	168	9.8	24,196	7.07	11.2	7.60	64.3	53.7
10/31	9:55	POW N	0.319	0.280	0.180	0.247	1.13	0.302	<2.0	26	<1.0	<2.0	0.0	60	59.0	20	4,884	7.53	10.9	6.00	52.6	23.7
10/31	9:28	POW S	0.558	0.451	0.350	0.400	1.03	0.463	4.0	28	24.0	20.0	4.0	75.0	81.5	3.2	10,462	7.43	10.1	9.10	51.0	36.8
10/31	9:16	POW SE	0.631	0.493	0.390	0.445	0.575	0.408	2.5	22	24.0	18.0	6.0	77.5	98.4	4.7	24,196	7.29	9.40	6.40	47.4	38.4
10/31	9:40	POW W	0.408	0.345	0.261	0.320	0.818	0.269	2.5	24	18.0	10.0	8.0	60.0	58.8	8.4	8,164	7.45	11.0	7.40	43.9	27.6

Table E-5. FOG event dates and grab samples collected from 2020 to 2024 of the FOG Monitoring Study. Data greater than 15 mg/L are in red. Refer to the 2023 MPRB Water Resources Report for data from 2018 and 2019.

24th & Elm In N	NA	<5.0	<5.0	NA	<5.0	<5.0	NA	NA	NA
24th & Elm In S	NA	<5.0	<5.0	NA	<5.0	<5.0	NA	NA	NA
24th & Elm N Out	NA	NA	NA	NA	7.0	NA	NA	NA	NA
61st & Lyndale	NA	NA	NA	6.0	NA	<5.0	NA	NA	NA
POW IN S	31	14	NA	3.0	NA	<5.0	NA	NA	NA
POW IN SE	NA	6.0	6.0	5.0	NA	<5.0	NA	NA	NA
POW IN W	109	13	NA	4.0	NA	<5.0	NA	NA	NA
2021	**22-Feb**	**23-Feb**	**24-Feb**	**25-Feb**	**8-Apr**	**27-May**	**14-Jul**	**24-Aug**	
24th & Elm N	11	<5.0	NA	NA	<5.0	<5.0	<5.0	<5.0	NA
24th & Elm S	14	31	NA	NA	<5.0	<5.0	NS	<5.0	NA
61st & Lyndale	16	15	NA	NA	6.0	<5.0	<5.0	<5.0	NA
POW IN S	NA	NA	23	18	5.0	<5.0	15	<5.0	NA
POW IN SE	NA	NA	14	17	5.0	11	<5.0	<5.0	NA
POW IN W	63	85	NA	NA	<5.0	<5.0	9.0	<5.0	NA
2022	**28-Feb**	**8-Mar**	**15-Mar**	**5-Apr**	**25-May**	**13-Jun**	**12-Aug**		
61st & Lyndale	25	9.9	NA	<5.0	NA	3.6	<5.0	NA	NA
CAM IN NNW	NA	NA	2.2	NA	<5.0	NA	<5.0	NA	NA
CAM IN SNW	26	NA	4.7	NA	<5.0	NA	<5.0	NA	NA
CAM IN SW	<5.0	NA	6.5	<5.0	<5.0	NA	<5.0	NA	NA
POW IN S	36	14	NA	<5.0	<5.0	NA	<5.0	NA	NA
POW IN SE	34	16	NA	<5.0	<5.0	NA	<5.0	NA	NA
POW IN W	44	7.6	NA	<5.0	<5.0	NA	<5.0	NA	NA
2023	**14-Feb**	**31-Mar**	**3-Apr**	**19-Apr**	**26-Jul**	**14-Aug**	**25-Sep**	**29-Sep**	**6-Oct**
61st & Lyndale	22	<5.0	<5.0	NA	NA	NA	NA	NA	NA
CAM IN NNW	8.8	<5.0	NA	<5.0	NA	<5.0	<5.0	NA	NA
CAM IN SNW	9.4	<5.0	NA	<5.0	NA	<5.0	<5.0	NA	NA
CAM IN SW	5.2	<5.0	NA	<5.0	NA	<5.0	NA	NA	13
POW IN S	20	7.5	NA	7.3	13	NA	NA	<5.0	NA
POW IN SE	NA	<5.0	<5.0	<5.0	NA	<5.0	NA	<5.0	NA
POW IN W	NA	<5.0	<5.0	5.3	<5.0	NA	<5.0	61	NA
2024	**20-Feb**	**16-Apr**	**17-Jun**	**31-Oct**					
CAM IN SNW	<5.0	<5.0	<5.0	9.8	NA	NA	NA	NA	NA
POW IN N	NA	6.7	<5.0	20	NA	NA	NA	NA	NA
POW IN S	NA	<5.0	<5.0	3.2	NA	NA	NA	NA	NA
POW IN SE	NA	<5.0	8.1	<5.0	NA	NA	NA	NA	NA
POW IN W	<5.0	<5.0	<5.0	8.4	NA	NA	NA	NA	NA

Camden Stormwater Pond Composite Sampling Results

Table E-6. Camden Inlet S NW 2024 composite sample chemistry results. X = sample damaged in transit to lab.

Date Sampled	Time	Site	TP mg/L	TDP mg/L	SRP mg/L	OPO4 mg/L	TN mg/L	NOx mg/L	Cl mg/L	Hard mg/L	TSS mg/L	VSS mg/L	ISS mg/L	TDS mg/L	COD mg/L	Cu µg/L	Pb µg/L	Zn µg/L	DOC mg/L
6/3	10:29	Cam In SNW	0.240	0.154	0.124	0.158	1.98	0.411	17.5	98	23.0	10	13.0	175	32.1	9.90	4.5	24	6.6
6/16	5:59	Cam In SNW	0.161	0.084	0.058	0.079	1.12	0.282	<2.0	34	26.4	11	15.4	42.5	14.5	6.80	3.2	<20.0	4.0
6/17	17:00	Cam In SNW	0.209	0.160	0.146	0.162	1.13	0.669	16.0	50	12.0	5.3	6.67	165	11.1	9.80	0.96	<20.0	5.4
7/2	9:44	Cam In SNW	0.286	0.134	0.117	0.166	1.69	0.827	X	X	26.0	14	12.0	X	45.1	X	X	X	X
7/10	12:00	Cam In SNW	0.135	0.103	0.089	0.103	1.62	1.32	35.0	160	7.14	4.0	3.14	292	69.0	9.50	0.51	<20.0	5.2
7/15	10:40	Cam In SNW	0.341	0.137	0.023	0.077	3.26	2.10	38.0	158	55.0	28	27.0	310	85.9	18.0	8.9	50.0	16.7
7/22	19:29	Cam In SNW	0.323	0.129	0.022	0.072	2.43	1.41	<2.0	22	82.0	30	52.0	52.5	64.6	8.00	2.9	<20.0	6.8
7/29	2:30	Cam In SNW	0.203	0.112	0.056	0.025	1.45	0.888	<2.0	20	36.5	15	22.0	25.0	33.9	14.7	4.2	<20.0	5.6
8/1	10:20	Cam In SNW	0.136	0.099	0.081	0.055	0.980	0.581	<2.0	28	15.3	7.7	7.60	37.5	<20.0	11.6	3.3	<20.0	4.5
8/4	16:16	Cam In SNW	0.238	0.183	0.124	0.103	2.08	1.49	22.0	114.0	10.3	6.7	3.60	209	20.7	17.0	1.3	<20.0	8.1
8/5	18:00	Cam In SNW	0.168	0.0990	0.088	0.066	1.98	1.23	<2.0	26.0	36.0	15	21.1	50.0	17.1	14.4	8.6	27.7	3.5
8/15	7:49	Cam In SNW	0.226	0.137	0.007	0.045	1.50	0.645	4.5	36.0	33.3	21	12.0	70.0	40.5	13.3	2.8	<20.0	7.3
8/27	8:00	Cam In SNW	0.236	0.148	0.006	0.040	1.92	0.164	9.5	64	27.0	16	11.3	105	40.6	19.0	5.1	21.1	7.6
10/24	9:31	Cam In SNW	1.08	0.845	0.573	0.816	2.25	1.67	19.0	96	34.0	24	10.0	199	153	29.8	4.4	49.6	50.3
10/31	9:06	Cam In SNW	0.865	0.720	0.437	0.566	1.28	0.237	8.5	24	94.0	42	52.0	110	114	20.8	7.7	52.4	41.7
11/3	14:31	Cam In SNW	0.143	0.134	0.036	0.051	2.13	0.571	37.5	125	24.0	24	0.00	233	42.0	21.4	0.60	<20.0	6.6

Table E-7. Camden Outlet 2024 composite sample chemistry results.

Sample Date	Time	Site	TP mg/L	TDP mg/L	SRP mg/L	OPO4 mg/L	TN mg/L	NOx mg/L	Cl mg/L	Hard mg/L	TSS mg/L	VSS mg/L	ISS mg/L	TDS mg/L	COD mg/L	Cu µg/L	Pb µg/L	Zn µg/L	DOC mg/L
5/21	19:46	Cam Out	0.154	0.067	0.009	0.032	1.48	0.182	24.0	88	11.3	6.70	4.60	185	<20.0	6.8	1.1	21	7.6
5/23	12:31	Cam Out	0.147	0.061	0.010	0.026	1.22	0.0840	29.5	72	10.0	6.30	3.70	133	<20.0	12.8	1.3	22	6.4
6/18	9:01	Cam Out	0.132	0.060	0.006	0.023	1.12	0.0713	21.5	38	11.2	9.20	2.00	138	28.5	12.9	0.69	23.7	7.3
6/19	16:46	Cam Out	0.084	0.048	0.004	0.013	1.16	0.0760	19.0	60	6.20	4.40	1.80	133	<20.0	16.9	<0.50	<20.0	6.5
7/11	10:16	Cam Out	0.124	0.058	<0.003	0.025	1.25	0.233	14.5	60	12.0	10.0	2.00	117	41.4	7.8	<0.500	<20.0	6.1
7/15	9:16	Cam Out	0.142	0.069	0.003	0.037	1.60	0.172	12.0	61	15.3	13.0	2.30	128	37.0	14.7	<0.500	<20.0	5.8
7/21	10:18	Cam Out	0.187	0.066	0.003	0.044	2.33	1.28	11.0	56	26.3	22.0	4.30	128	47.2	7.2	0.62	<20.0	7.1
7/23	10:01	Cam Out	0.187	0.078	0.003	0.048	2.22	1.45	10.0	60	22.0	19.5	2.50	113	47.8	9.5	<0.500	<20.0	6.4
7/24	11:46	Cam Out	0.209	0.134	0.033	<0.003	2.25	1.52	9.5	60	19.5	16.5	3.00	105	40.6	14.1	<0.5	<20.0	6.5
7/29	3:32	Cam Out	0.160	0.068	0.048	0.003	2.19	0.431	9.0	56	22.7	20.7	2.00	103	51.3	8.2	<0.5	<20.0	7.3
7/30	7:46	Cam Out	0.156	0.056	0.053	0.003	2.09	0.167	10.0	58	22.6	20.6	2.00	105	23.9	10.2	<0.5	<20.0	7.5
8/1	10:40	Cam Out	0.176	0.093	0.056	0.004	2.43	1.01	8.5	56	26.4	22.4	4.00	90	23.6	8.4	0.5	<20.0	6.9
8/5	14:02	Cam Out	0.188	0.105	0.055	0.003	2.90	0.963	8.0	58	25.0	21.8	3.25	108	27.4	13.7	0.6	<20.0	6.2
8/15	10:46	Cam Out	0.185	0.071	0.003	0.069	3.17	0.590	7.5	66	37.0	33.0	4.00	115	37.3	8.8	0.7	<20.0	7.6
8/27	8:02	Cam Out	0.184	0.055	0.003	0.069	3.40	0.131	7.5	66	35.7	29.0	6.67	105	47.3	13.0	0.7	<20.0	8.0
10/31	20:31	Cam Out	0.320	0.218	0.007	0.021	2.92	1.08	9.0	113	43.0	32.0	11.0	185	105	8.7	0.69	<20.0	17.3
11/6	10:31	Cam Out	0.346	0.161	0.008	0.023	2.59	0.187	10.0	106	32.0	28.0	4.00	155	71.5	30.8	23.2	87.3	12.3

Powderhorn Lake Composite Sampling Results

Table E-8. Powderhorn Inlet North 2024 composite sample chemistry results.

Date Sampled	Time	Site	TP mg/L	TDP mg/L	SRP mg/L	OrthoP mg/L	TN mg/L	NOx mg/L	Cl mg/L	Hard mg/L	TSS mg/L	VSS mg/L	ISS mg/L	TDS mg/L	COD mg/L	Cu µg/L	Pb µg/L	Zn µg/L	DOC mg/L
6/13	3:15	Pow In N	0.352	0.106	0.056	0.111	2.68	0.588	<2.0	24	115	38.0	77.0	65.0	85.4	25.8	30.3	89.6	6.6
6/16	6:29	Pow In N	0.116	0.066	0.039	0.055	0.902	0.229	<2.0	14	16.0	6.33	9.67	27.5	<20.0	15.5	5.00	23.2	2.8
6/17	6:49	Pow In N	0.200	0.105	0.015	0.048	1.98	0.621	<2.0	20	24.3	12.3	12.0	37.5	21.5	16.7	6.00	35.7	6.8
6/19	0:24	Pow In N	0.242	0.081	0.034	0.076	1.73	0.401	<2.0	16	71.5	24.5	47.0	52.5	47.0	22.1	26.1	69.0	4.7
6/21	7:30	Pow In N	0.235	0.132	0.065	0.101	1.25	0.344	<2.0	24	21.7	10.3	11.3	67.5	37.2	12.8	3.20	23.7	6.9
6/28	7:04	Pow In N	0.193	0.092	0.066	0.092	1.40	0.349	<2.0	14	37.3	16.7	20.7	22.5	37.6	9.70	4.40	25.0	4.3
7/2	7:39	Pow In N	0.177	0.110	0.086	0.113	1.01	0.392	<2.0	12	23.7	11.7	12.0	32.5	48.8	20.6	4.60	35.0	6.7
7/22	18:39	Pow In N	0.345	0.131	0.059	0.165	1.97	1.08	<2.0	18	137	50.7	86.3	70.0	60.2	16.2	30.0	52.0	5.4
8/1	7:35	Pow In N	0.327	0.097	0.219	0.053	2.05	1.19	<2.0	28	115	27.5	87.5	40.0	56.9	24.4	22.9	65.6	6.3
8/5	21:10	Pow In N	0.126	0.061	0.056	0.034	1.20	0.831	<2.0	14	34.7	11.0	23.7	37.5	16.9	13.6	12.7	33.6	2.4
8/15	6:01	Pow In N	0.337	0.230	0.099	0.131	2.23	1.18	2.5	20	38.4	19.0	19.4	50.0	59.9	18.0	8.90	47.7	10.2
8/26	20:25	Pow In N	0.340	0.194	0.086	0.122	2.04	0.636	<2.0	18	70.3	22.0	48.3	32.5	50.0	15.3	13.8	41.0	4.5
8/27	6:55	Pow In N	0.229	0.131	0.083	0.113	1.41	0.415	<2.0	10	56.7	19.3	37.3	22.5	44.1	16.2	20.0	43.5	3.1
10/24	21:05	Pow In N	1.21	0.860	0.311	0.852	4.83	1.17	10.5	54	74.0	50.0	24.0	170	265	36.9	23.3	145	82.2
10/31	20:50	Pow In N	0.330	0.237	0.116	0.187	1.42	0.256	4.0	30	28.0	18.0	10.0	75.0	76.1	16.5	8.40	52.1	25.2
11/4	11:25	Pow In N	0.207	0.107	0.064	0.102	1.50	0.286	4.0	42	64.0	34.0	30.0	105	127	26.5	29.6	86.8	24.8

Table E-9. Powderhorn Inlet South 2024 composite sample chemistry results.

Date Sampled	Time	Site	TP mg/L	TDP mg/L	SRP mg/L	OrthoP mg/L	TN mg/L	NOx mg/L	Cl mg/L	Hard mg/L	TSS mg/L	VSS mg/L	ISS mg/L	TDS mg/L	COD mg/L	Cu µg/L	Pb µg/L	Zn µg/L	DOC mg/L
6/3	8:04	Pow In S	0.137	0.073	0.056	0.072	1.89	0.578	<2.0	22	17.0	4.0	13.0	50.0	14.8	12.7	5.50	44.5	6.60
6/13	15:48	Pow In S	0.443	0.142	0.100	0.196	3.00	0.473	<2.0	24	147	60.0	87.0	55.0	121	25.5	56.1	118	7.90
6/13	0:48	Pow In S	0.315	0.096	0.051	0.106	2.98	0.401	6.5	26	86.0	31.0	55.0	70.0	61.9	21.5	28.7	64.1	9.00
6/16	23:46	Pow In S	0.232	0.108	0.069	0.097	1.48	0.330	<2.0	20	55.0	25.5	29.5	42.5	38.5	18.7	17.0	49.1	5.50
6/18	23:18	Pow In S	0.353	0.099	0.059	0.119	2.06	0.454	<2.0	18	119	44.0	75.0	60.0	94.3	27.7	50.9	86.0	4.50
6/21	6:57	Pow In S	0.193	0.105	0.065	0.103	1.25	0.420	<2.0	16	29.5	13.5	16.0	57.5	34.2	16.8	9.90	32.3	5.80
6/28	6:08	Pow In S	0.236	0.136	0.096	0.128	1.38	0.497	<2.0	16	31.0	15.0	16.0	27.5	45.1	13.0	9.20	30.8	6.50
7/2	5:48	Pow In S	0.227	0.169	0.114	0.135	1.05	0.377	<2.0	14	14.3	7.30	7.00	30.0	31.6	14.9	4.10	24.6	7.20
7/10	16:12	Pow In S	0.319	0.081	0.040	0.125	1.70	0.541	<2.0	16	148	49.4	98.7	47.5	120	18.1	50.5	79.8	6.40
7/13	13:29	Pow In S	0.511	0.172	0.091	0.170	2.83	1.34	<2.0	24	181	59.0	122	82.5	229	43.4	80.0	143	9.20
7/21	13:29	Pow In S	0.285	0.133	0.077	0.116	1.54	0.616	<2.0	18	67.2	24.8	42.4	42.5	54.3	16.8	14.7	40.0	5.30
7/22	20:44	Pow In S	0.233	0.128	0.067	0.118	1.65	1.06	<2.0	18	56.5	17.5	39.0	50.0	57.1	25.3	18.8	45.0	6.50
8/15	4:41	Pow In S	0.525	0.235	0.070	0.138	2.64	0.452	5.5	24	106	44.0	62.0	77.5	113	22.0	18.1	57.8	21.9
8/26	21:08	Pow In S	0.344	0.153	0.035	0.072	1.92	0.197	3.0	22	101	35.3	66.0	40.0	64.6	17.9	24.8	65.0	5.20
10/24	21:39	Pow In S	2.02	1.50	0.851	1.48	4.81	3.62	14	86	83.0	55.0	28.0	275	453	28.5	15.4	144	152
10/31	8:36	Pow In S	0.839	0.715	0.507	0.658	2.41	1.13	6.0	50	50.0	26.0	24.0	153	197	23.5	13.1	71.5	69.4
11/4	11:04	Pow In S	0.641	0.333	0.257	0.280	1.68	0.355	6.5	60	58.0	34.0	24.0	152	175	7.90	0.690	<20.0	43.4

Table E-10. Powderhorn Inlet Southeast 2024 composite sample chemistry results.

Date Sampled	Time	Site	TP mg/L	TDP mg/L	SRP mg/L	OrthoP mg/L	TN mg/L	NOx mg/L	Cl mg/L	Hard mg/L	TSS mg/L	VSS mg/L	ISS mg/L	TDS mg/L	COD mg/L	Cu µg/L	Pb µg/L	Zn µg/L	DOC mg/L
5/7	8:56	Pow In SE	0.320	0.153	0.009	0.053	2.06	0.380	4.0	42	53.0	30.7	22.3	88.7	101	22.5	8.30	72.9	24.1
5/20	6:54	Pow In SE	0.498	0.125	0.028	0.041	2.95	0.369	<2.0	22	118	54.0	64.0	65.0	130	24.7	21.0	110	7.80
5/21	18:30	Pow In SE	0.365	0.095	0.041	0.078	2.48	0.192	<2.0	20	180	76.0	104	57.5	143	21.1	43.4	113	14.5
6/3	7:58	Pow In SE	0.336	0.137	0.094	0.130	2.02	0.234	<2.0	16	52.5	22.5	30.0	33.8	79.4	21.7	26.6	60.4	5.30
6/4	22:21	Pow In SE	0.499	0.216	0.129	0.210	3.21	0.420	3.0	48	110	52.0	57.5	75.0	150	28.9	21.0	112	14.2
6/13	1:06	Pow In SE	0.468	0.176	0.126	0.178	3.26	0.530	<2.0	24	127	58.0	69.0	70.0	124	26.1	34.2	96.8	10.0
6/16	1:29	Pow In SE	0.222	0.113	0.057	0.084	1.44	0.263	<2.0	16	46.0	19.0	27.0	45.0	28.8	19.0	11.6	43.0	5.00
6/18	23:55	Pow In SE	0.379	0.131	0.061	0.110	2.21	0.363	<2.0	20	126	48.0	78.0	57.5	102	25.5	47.4	97.0	6.60
6/21	7:30	Pow In SE	0.268	0.153	0.091	0.129	1.60	0.349	<2.0	20	28.5	15.5	13.0	63.7	51.8	11.1	3.90	31.5	7.90
7/2	6:39	Pow In SE	0.443	0.303	0.219	0.272	4.46	0.263	8.0	44	42.0	26.0	16.0	45.0	61.4	18.3	7.30	43.7	14.2
7/9	16:12	Pow In SE	0.517	0.224	0.094	0.158	2.77	0.569	<2.0	24	154	64.5	89.5	47.5	121	27.2	43.0	102	10.8
7/10	16:56	Pow In SE	0.404	0.108	0.076	0.157	2.46	0.690	<2.0	12	151	58.0	93.0	47.5	113	20.9	48.2	79.0	4.20
7/13	16:52	Pow In SE	0.342	0.175	0.117	0.161	2.42	1.44	<2.0	20	86.0	34.0	52.0	62.5	86.9	29.4	33.4	76.0	7.80
7/14	4:56	Pow In SE	0.281	0.120	0.082	0.121	1.93	0.937	<2.0	12	67.5	27.0	40.5	40.0	55.0	22.3	26.9	53.0	4.70
7/20	23:09	Pow In SE	0.568	0.518	0.217	0.302	3.78	2.02	4.5	56	43.0	25.0	18.0	155	150	20.3	11.1	71.7	33.3
7/21	11:01	Pow In SE	0.261	0.137	0.065	0.082	1.43	0.611	<2.0	14	44.7	18.7	26.0	50.0	17.4	14.7	14.5	51.0	5.10
7/22	22:28	Pow In SE	0.310	0.131	0.055	0.124	1.96	0.972	<2.0	16	77.7	29.0	48.7	40.0	57.7	11.8	10.2	26.0	5.70
8/15	7:33	Pow In SE	0.431	0.223	0.051	0.097	3.01	0.206	2.5	26	63.0	38.0	25.0	72.5	77.0	14.4	9.00	46.4	33.9
8/26	20:48	Pow In SE	0.439	0.205	0.026	0.070	2.61	0.294	<2.0	20	122	49.4	72.4	41.2	108	22.7	35.2	79.7	6.10
10/24	20:03	Pow In SE	2.33	1.80	1.08	1.75	5.51	4.13	15.5	80	88.0	56.0	32.0	280	508	38.5	16.1	162	163
10/31	11:29	Pow In SE	0.872	0.780	0.581	0.674	1.78	1.33	5.0	38	39.0	30.0	9.00	124	179	20.7	11.7	76.0	66.8
11/4	9:42	Pow In SE	0.970	0.652	0.516	0.522	2.39	2.02	8.5	68	50.0	34.0	16.0	230	299	23.4	16.6	97.8	97.5
11/5	18:29	Pow In SE	0.632	0.461	0.361	0.414	1.38	1.38	3.0	50	44.0	32.0	12.0	130	195	22.8	13.3	64.7	56.2

Table E-11. Powderhorn Inlet West 2024 composite sample chemistry results.

Date Sampled	Time	Site	TP mg/L	TDP mg/L	SRP mg/L	OrthoP mg/L	TN mg/L	NOx mg/L	Cl mg/L	Hard mg/L	TSS mg/L	VSS mg/L	ISS mg/L	TDS mg/L	COD mg/L	Cu µg/L	Pb µg/L	Zn µg/L	DOC mg/L
5/7	8:48	Pow In W	0.331	0.191	0.039	0.076	2.54	0.506	6.5	34	33.0	20.7	12.3	87.5	74.6	26.9	11.2	71.5	22.0
5/19	17:16	Pow In W	0.722	0.157	0.057	0.114	4.44	0.295	<2.0	26	268	100	168	67.5	283	43.8	106	223	10.5
5/21	18:46	Pow In W	0.154	0.108	0.059	0.079	2.05	0.345	<2.0	20	106	50.0	56.0	47.5	117	17.5	38.9	84.0	6.60
6/13	11:41	Pow In W	0.654	0.102	0.049	0.184	3.93	0.282	8.5	30	307	111	196	87.5	234	39.1	102	197	12.3
6/15	20:57	Pow In W	0.244	0.097	0.056	0.089	1.58	0.315	<2.0	18	57.5	20.0	37.5	42.5	39.0	20.1	25.9	53.4	5.30
6/18	23:50	Pow In W	0.394	0.099	0.039	0.105	2.2	0.377	<2.0	22	147	54.5	92.5	57.5	104	27.2	56.7	92.0	5.10
6/21	8:15	Pow In W	0.213	0.103	0.070	0.117	1.35	0.468	<2.0	22	32.7	15.3	17.3	62.5	36.9	20.8	12.4	34.1	7.20
6/28	6:12	Pow In W	0.299	0.118	0.031	0.062	1.48	0.253	<2.0	22	69.5	33.5	36.0	35.0	84.6	13.2	11.2	37.5	7.20
7/2	9:01	Pow In W	0.263	0.172	0.111	0.140	1.14	0.334	<2.0	18	27.4	16.3	11.1	50.0	51.2	17.5	6.30	28.7	8.0
7/9	22:02	Pow In W	0.410	0.184	0.047	0.086	2.32	0.626	4.0	52	76.4	34.4	42.0	72.5	91.5	22.3	23.6	68.0	15.2
7/10	23:58	Pow In W	0.240	0.093	0.056	0.117	1.32	0.594	<2.0	16	79.3	26.7	52.6	40.0	58.2	18.4	42.6	63.9	3.00
7/14	12:53	Pow In W	0.295	0.100	0.050	0.106	2.36	1.10	<2.0	22	88.8	29.0	59.8	62.5	80.7	22.4	45.9	80.0	6.00
7/21	18:08	Pow In W	0.292	0.126	0.052	0.091	1.64	0.765	<2.0	21	87.5	33.0	54.5	47.5	74.4	21.3	27.0	56.0	5.50
7/23	5:10	Pow In W	0.287	0.109	0.039	0.108	1.83	0.985	<2.0	20	93.2	28.0	65.2	55.0	77.3	13.8	15.4	33.0	6.40
7/29	7:17	Pow In W	0.486	0.263	0.121	0.009	3.39	1.89	5.5	60	66.0	38.0	28.0	108	152	32.3	18.4	67.0	46.9
8/5	17:26	Pow In W	0.132	0.071	0.041	0.021	2.08	1.21	<2.0	24	33.5	15.4	18.1	45.0	31.0	17.0	11.9	31.4	5.60
8/15	9:13	Pow In W	0.309	0.174	0.004	0.069	2.33	1.15	4.5	26	48.7	28.0	20.7	67.5	63.9	16.0	9.70	42.4	9.70
10/24	22:26	Pow In W	1.70	1.19	0.350	1.11	5.51	2.03	17.0	84	100	56.0	44.0	235	382	53.0	33.6	153	113
10/31	8:18	Pow In W	0.831	0.557	0.457	0.642	1.82	0.709	6.0	44	66.0	34.0	32.0	122	151	28.9	21.7	88.7	49.5
11/4	17:17	Pow In W	0.571	0.294	0.151	0.255	1.68	0.473	6.5	66	50.0	25.0	25.0	160	164	26.8	20.8	72.1	44.7