



**STRAND**  
ASSOCIATES®

Excellence in Engineering Since 1946

# Stormwater Quality Management Plan Update

## City of Manitowoc

August 2, 2023

**Justin J. Gutoski, P.E.**

[Justin.gutoski@strand.com](mailto:Justin.gutoski@strand.com)

(608) 251-4843





# Overview

- Introduction
- Current/Updated Stormwater Program
- Northeast Lakeshore TMDL
- Stormwater Quality Modeling
- Alternatives Analysis
  - Stormwater Quality BMPs in City's Stormwater-Permitted Area  
(BMP = Best Management Practice)
  - Water Quality Trading
  - Watershed Adaptive Management
- Recommendations



# Introduction

- Wisconsin Pollutant Discharge Elimination System (WPDES) Permitted Municipally Separate Storm Sewer Systems (MS4)
- WPDES Permit No. WI-S050075-03 (Effective-5/1/19; Expiration-4/30/24)
- City Stormwater Plans: Original (2000); Updates (2006, 2007)
- Manitowoc River, Lake Michigan, and Silver Creek area 303(d) listed impaired waters.
- Updated plan prepared to address changing requirements and existing conditions TSS & TP removals in the City.

# WI DNR Urban Nonpoint Source & Stormwater Grant

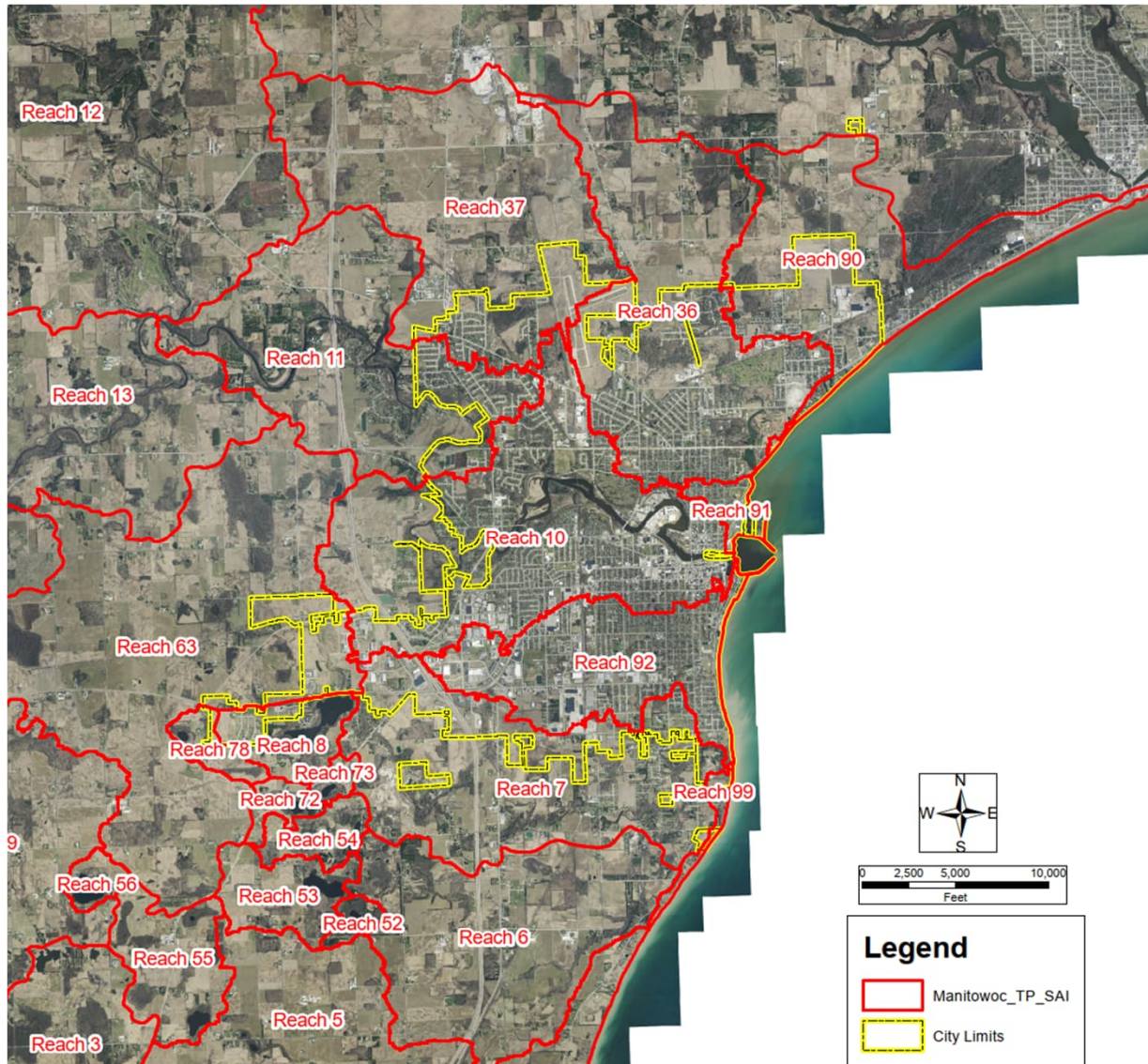
Project Cost	State Share (50.0%)	Local Share (50.0%)
\$176,000	\$85,000	\$91,000

# Northeast Lakeshore Total Maximum Daily Load (TMDL)

- MS4 and Northeast Lakeshore TMDL Requirements
  - TSS = Total Suspended Solids (sediment)
  - TP = Total Phosphorus

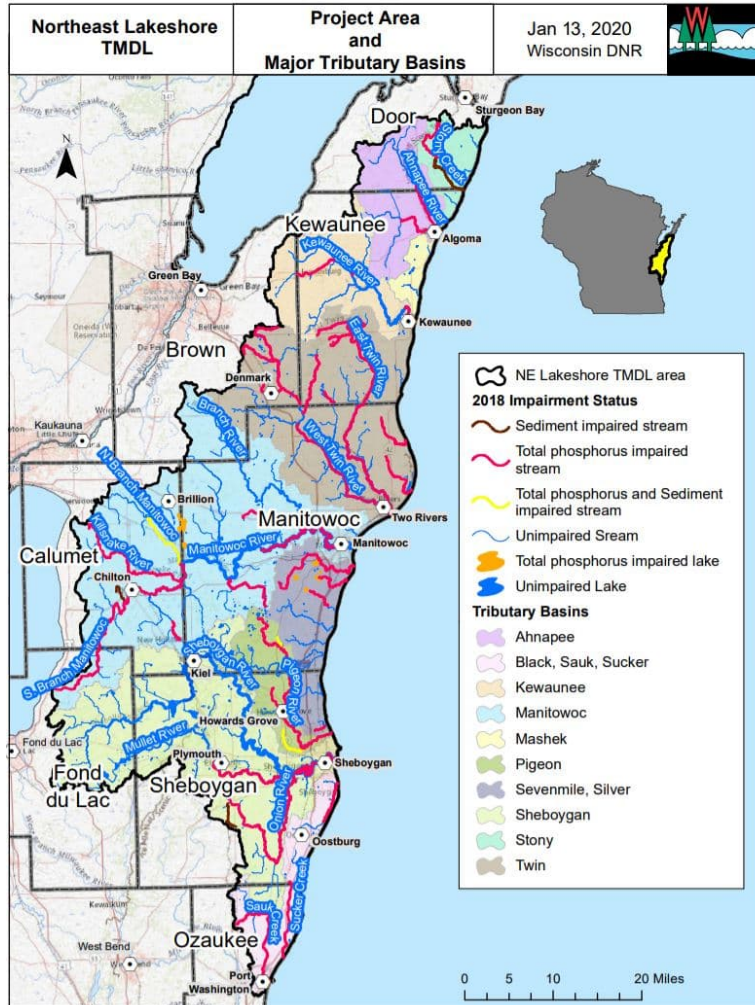
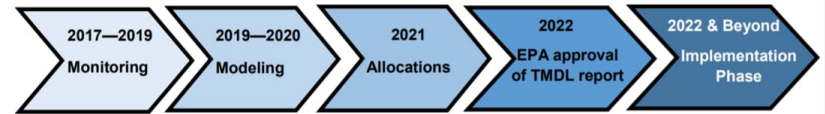
<u>Reach</u>	<u>Waterbody</u>	MS4	TMDL	
		<u>TSS Reduction (%)</u>	<u>TSS Reduction (%)</u>	<u>TP Reduction (%)</u>
7	Silver Lake	20%	79%	45%
8	Silver Creek	20%	0%	65%
10	Manitowoc River	20%	57%	76%
11	Manitowoc River	20%	0%	15%
36	Little Manitowoc River	20%	67%	80%
37	Little Manitowoc River	20%	0%	91%
63	Silver Creek	20%	0%	74%
78	Vetting Lake	20%	0%	58%
90	Lake Michigan	20%	20%	50%
91	Lake Michigan	20%	50%	60%
92	Lake Michigan	20%	20%	15%
99	Lake Michigan	20%	31%	15%

# Northeast Lakeshore Total Maximum Daily Load (TMDL)



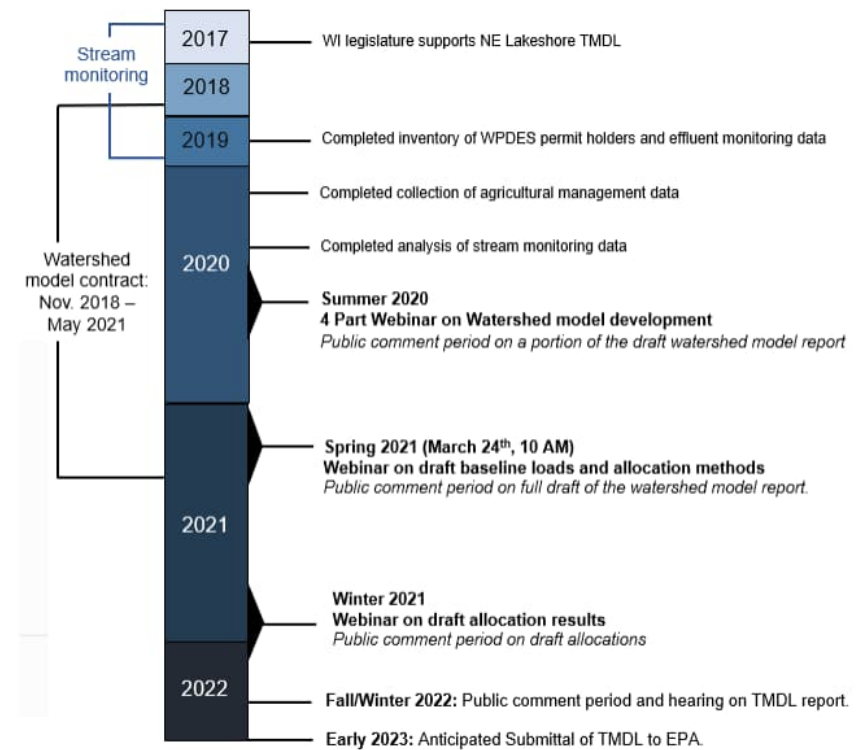
# Northeast Lakeshore TMDL

## Northeast Lakeshore TMDL Projected Timeline



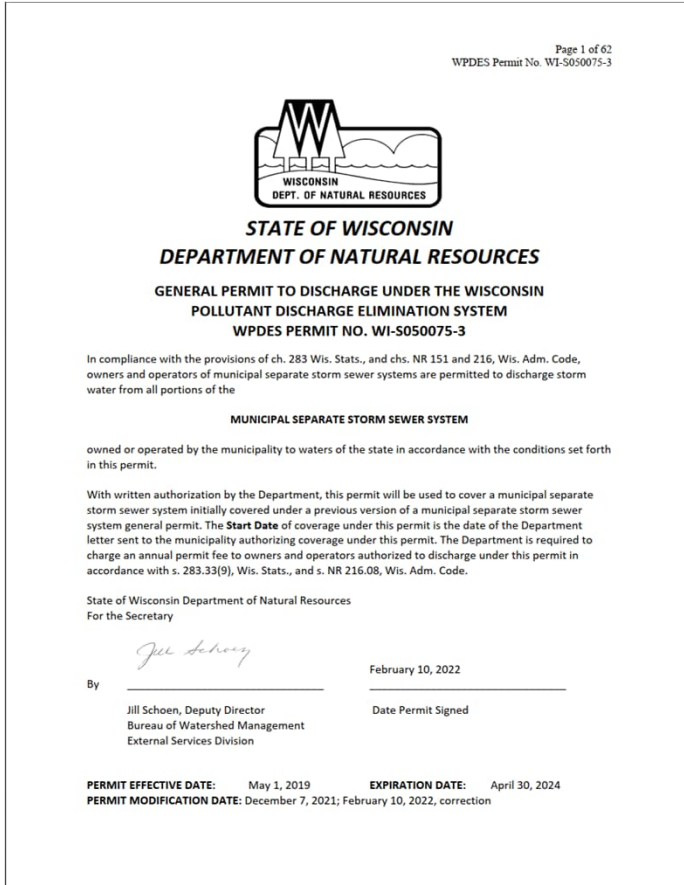
## Northeast Lakeshore TMDL

*Projected Project Milestones*  
 Updated August 2022





# WPDES Permit-Required Stormwater Program



- Permit Conditions
- Public Education/Outreach
- Public Involvement/Participation
- Illicit Discharge Detection & Elimination
- Construction Site Pollutant Control (Erosion Control)
- Post-Construction Stormwater Management
- Pollution Prevention-Municipal Operations
- Stormwater Quality Management
- Storm Sewer System Map
- Annual Report
- Northeast Wisconsin Stormwater Consortium Meetings

Updating Programs Via  
Task Order 22-02

# Current/Updated Stormwater Program

- **Public Education/Outreach Involvement/Participation**
  - Northeast Wisconsin Stormwater Consortium (NEWSC)
  - Additional permit-required efforts.
- **Illicit Discharge Detection and Elimination (IDDE)**
  - Inspection at outfalls (93 annually, 14 every 5 years)
  - Track IDDE program activities for annual reporting
- **Construction Site Pollutant Control**
  - Ordinances/Admin: Appendix D-Const. Site Inspections and Enforcement Procedures
  - Revisions necessary due to NR 151 updates
  - Repeal existing and adopt new erosion control ordinance
- **Postconstruction Stormwater Management**
  - Ordinances/Admin: *Appendix G-Postconstruction SW Facilities-Long-Term Maintenance, Inspection and Enforcement Procedures*
  - Revisions necessary due to NR 151 updates
  - Repeal existing and adopt new post-construction stormwater ordinance
- **Pollution Prevention – Municipal Operations:**
  - Maintenance of City BMPs: Implement program contained in Appendices G and H.
  - Track quantities of street sweeping, catch basin cleaning, deicer/anti-icing, and staff training
  - Stormwater Pollution Prevention Plans (SWPPP) at 3 Municipal Facilities
- **Stormwater Quality Management**
  - WinSLAMM Modeling and Alternatives Analysis
- **Storm Sewer System Map**
  - Update annually
- **Annual Report – March 31, annually**

Report for  
City of Manitowoc, Wisconsin

Stormwater Quality Management Plan Update

Prepared by:  
STRAND ASSOCIATES, INC.\*  
910 West Wingo Drive  
Madison, WI 53715  
www.strand.com  
June 2023



**City:** 9 Wet Ponds  
1 Infiltration Basin  
1 Rain Garden  
3 Bioretention Basins  
3 Hydrodynamic Separators

**Private:** 53 Wet Ponds  
4 Infiltration Basin  
13 Bioretention Basins  
10 Hydrodynamic Separators

# Public and Private BMP Maintenance Programs

- Every year:** Inspect per Erosion Control and Reference Guide Appendix H – Maintenance and Inspection of Stormwater Best Management Practices
  - Public BMPs: record inspection form by October 1 each year
  - Private BMPs: submit inspection form by October 1 each year
- Every five years:** Provide certification by a qualified professional that the BMP is operating as designed
  - Public BMPs: City assess and record assessment
  - Private BMPs: Owner provides record to City
- If BMP not operating as designed, owner provides corrective maintenance plan
  - Routine maintenance within 2 months of assessment
  - Non-routine maintenance within 18 months of submittal of plan
- Table 6.03-1: Stormwater Budget
  - City-owned wet ponds: Dredge one wet pond every 5 years (Project #1: dredging design in 2027 and dredging construction in 2028)

**Storm Water Wet Detention Pond Inspection Form**

This is a general inspection form. Items on this form are to be checked at different times and frequencies. Some items may not apply to your Wet Pond. Complete this form in accordance with the Operation and Maintenance Plan developed by the design engineer.

Facility ID: \_\_\_\_\_ Location: \_\_\_\_\_  
 Facility Name: \_\_\_\_\_ Plot No: \_\_\_\_\_  
 Inspected by: \_\_\_\_\_ Date: \_\_\_\_\_

FUND MAINTENANCE		IMPROVEMENTS	
<small>Inspection Levels in the Pond should be checked once every 2 years. Depth in flow water surface is sufficient. Ponds should maintain a minimum of 3 feet depth to be effective.</small>			
Is there excessive algae or cattail growth in any back water?	YES NO	Describe issues before in additional comments.	
Is there excessive sediment in the pond?	YES NO	Shading	OK
Is there excessive debris in the pond?	YES NO	Flowline	OK
Is there excessive erosion in the pond?	YES NO	Bottom Holes	OK
Is there excessive weed growth in the pond?	YES NO	Flowline	OK
Is there excessive silt in the pond?	YES NO	Inlet Structure	OK
Is there excessive debris in the pond?	YES NO	Outlet Structure	OK
Is there excessive sediment in the pond?	YES NO	Other Damage	OK

**WETLAND VEGETATION**

WETLAND VEGETATION		INLET PIPES/OUTLET STRUCTURES	
Is there excessive algae or cattail growth in any back water?	YES NO	Cracking/Debris Lines	YES NO
Is there excessive sediment in the pond?	YES NO	Structural Integrity	YES NO
Is there excessive debris in the pond?	YES NO	Structural Integrity Description:	

**SEDIMENT REMOVAL**

SEDIMENT REMOVAL		FRESH SEWER SYSTEM	
Clear Action Taken:		Cracking/Debris Lines	YES NO
		Structural Integrity	YES NO
		Structural Integrity Description:	
		Other Damage	OK

Additional Comments: \_\_\_\_\_

**Stormwater Dry Detention Basin Inspection Form**

This is a general inspection form. Items on this form are to be checked at different times and frequencies. Some items may not apply to your treatment device. Complete this form in accordance with the Operation and Maintenance Plan developed by the design engineer for your treatment device.

Facility ID: \_\_\_\_\_ Location: \_\_\_\_\_  
 Facility Name: \_\_\_\_\_ Plot No: \_\_\_\_\_  
 Inspected by: \_\_\_\_\_ Date: \_\_\_\_\_

TYPE OF DRY DETENTION BASIN		FACILITIES/IMPROVEMENTS	
Infiltration Basin	YES NO	Shading of Tanks	OK
Rain Garden	YES NO	Flowline	OK
Grass Swale	YES NO	Bottom Holes	OK
Other	YES NO	Flowline	OK
		Inlet Structure	OK
		Outlet Structure	OK
		Other Damage	OK

**VEGETATION**

VEGETATION		INLET PIPES/OUTLET STRUCTURES	
Is there excessive algae or cattail growth in any back water?	YES NO	Cracking/Debris Lines	YES NO
Is there excessive sediment in the pond?	YES NO	Structural Integrity	YES NO
Is there excessive debris in the pond?	YES NO	Structural Integrity Description:	

**HOURS SINCE LAST RAIN EVENT**

Presence of water grass indicates last flow event is checked. An engineer may be needed to check the infiltration rate (especially once every 5 years). In flow ponding of water indicates an engineered wet pond (more than 24 hours after rain event).

YES NO

**NATIVE PLANTS**

Native plants are required to be present in wet ponds to improve the infiltration rate (especially once every 5 years). Native plants have deep root systems which keep the soil firm. Please describe the type of plant present and the condition of them below.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Additional Comments: \_\_\_\_\_

**Mechanical Separator Inspection Form**

This is a general inspection form. Items on this form are to be checked at different times and frequencies. Some items may not apply to your mechanical device. Complete this form in accordance with the Operation and Maintenance Plan developed by the design engineer and per the manufacturer.

Facility ID: \_\_\_\_\_ Location: \_\_\_\_\_  
 Facility Name: \_\_\_\_\_ Plot No: \_\_\_\_\_  
 Inspected by: \_\_\_\_\_ Date: \_\_\_\_\_

TYPE OF MECHANICAL SEPARATOR AND MANUFACTURER		SEDIMENT LEVELS DEPTH	
		From Bottom	_____
		Floatables present?	YES NO
		Oil Present?	YES NO
		Date last cleaned:	_____

**INLET PIPES/OUTLET STRUCTURES**

INLET PIPES/OUTLET STRUCTURES		FRESH SEWER SYSTEM	
Cracking/Debris Lines	YES NO	Cracking/Debris Lines	YES NO
Structural Integrity Description:		Structural Integrity	YES NO
		Structural Integrity Description:	

Additional Comments: \_\_\_\_\_

# Stormwater Quality Modeling

Pollutant	TMDL Reach	MS4 Permit Required Reductions	Northeast Lakeshore TMDL Required Reductions (%)	Existing Conditions Reductions (%)	TMDL Pollutant Reduction Gap or Excess (%)	TMDL Pollutant Reduction Gap or Excess (lb)
TSS	Reach 7	20%	79.0%	55.3%	23.7%	47,923
	Reach 8		0.0%	72.6%	(72.6%)	(19,036)
	Reach 10		76.0%	33.2%	42.8%	316,356
	Reach 11		0.0%	41.2%	(41.2%)	(39,391)
	Reach 36		67.0%	27.8%	39.2%	131,784
	Reach 37		0.0%	26.9%	(26.9%)	(19,397)
	Reach 63		0.0%	74.2%	(74.2%)	(19,316)
	Reach 78		0.0%	0.0%	NA	0
	Reach 90		20.0%	29.7%	(9.7%)	(10,179)
	Reach 91		50.0%	27.7%	22.3%	7,959
	Reach 92		20.0%	51.5%	(31.5%)	(180,460)
	Reach 99		31.0%	0.0%	NA	0
	City Total				<b>39.9%</b>	
TP	Reach 7	NA	45.0%	37.9%	7.1%	31
	Reach 8		65.0%	48.3%	16.7%	12
	Reach 10		57.0%	21.1%	35.9%	717
	Reach 11		15.0%	22.0%	(7.0%)	(21)
	Reach 36		80.0%	19.9%	60.1%	623
	Reach 37		91.0%	16.0%	75.0%	186
	Reach 63		74.0%	61.7%	12.3%	8
	Reach 78		58.0%	0.0%	N/A	0
	Reach 90		50.0%	22.2%	27.8%	79
	Reach 91		60.0%	20.5%	39.5%	41
	Reach 92		15.0%	37.9%	(22.9%)	(331)
	Reach 99		15.0%	0.0%	N/A	0
	City Total				<b>26.8%</b>	

Tradeable Pollutants  
 19,036 lbs TSS (51.4 lbs TP) to Reach 7  
 39,391 lbs TSS (106.4 lbs TP) to Reach 10

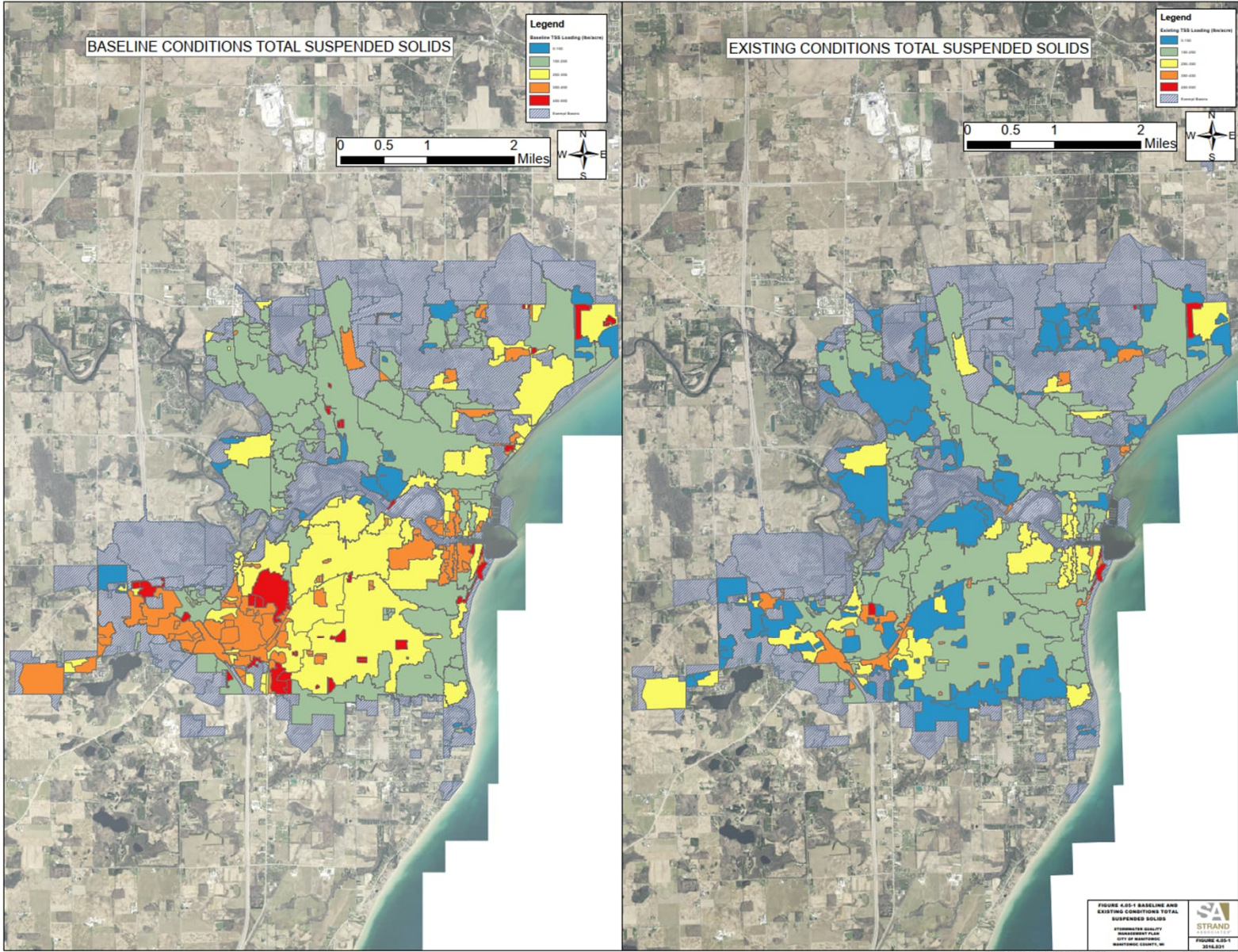
21 lbs TP to Reach 10

**Total: 178.8 lbs TP**

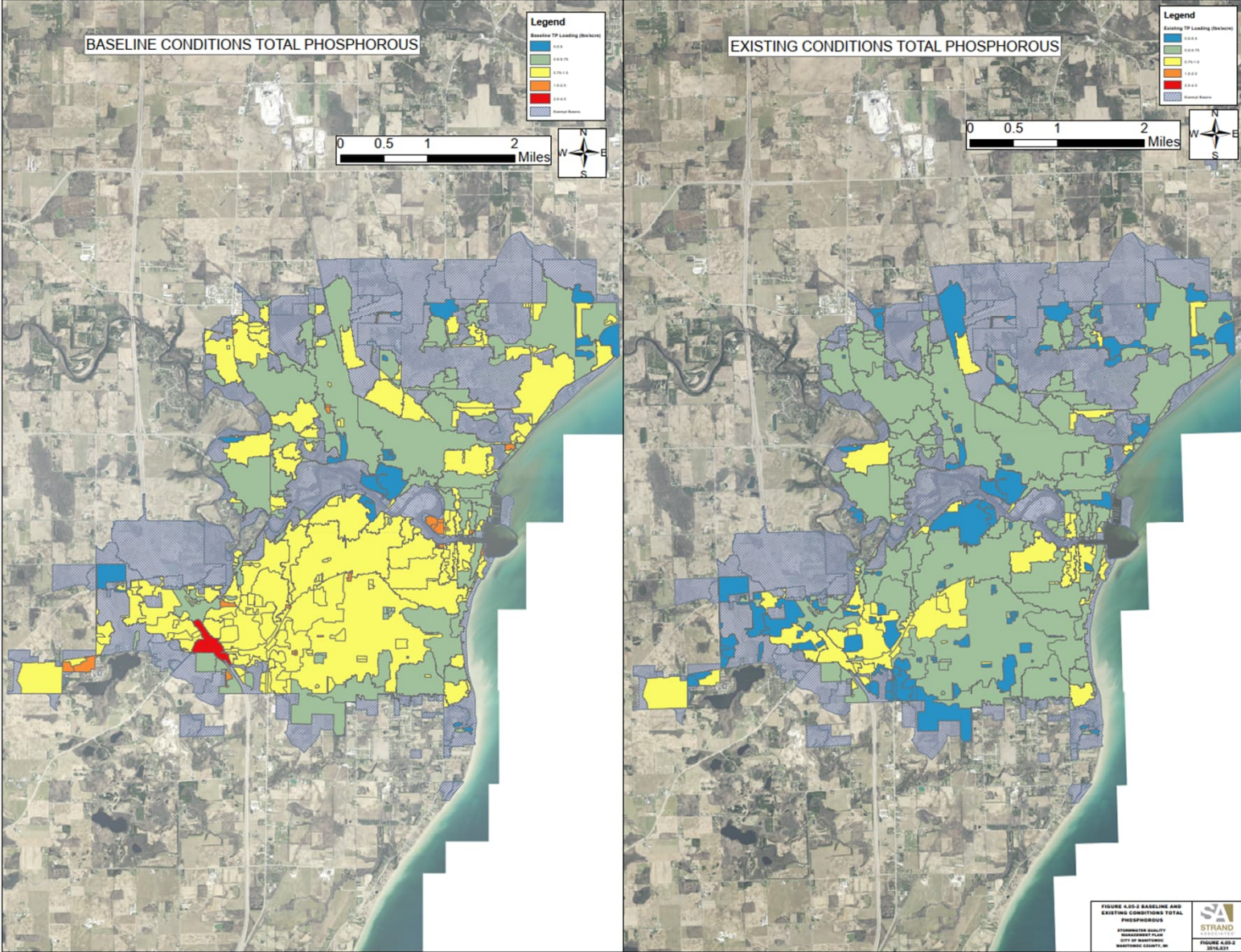
SSC=Site Specific Criteria

**Table 5.01-1 Required and Existing Conditions Pollutant Reductions According to Northeast Lakeshore TMDL Reach**

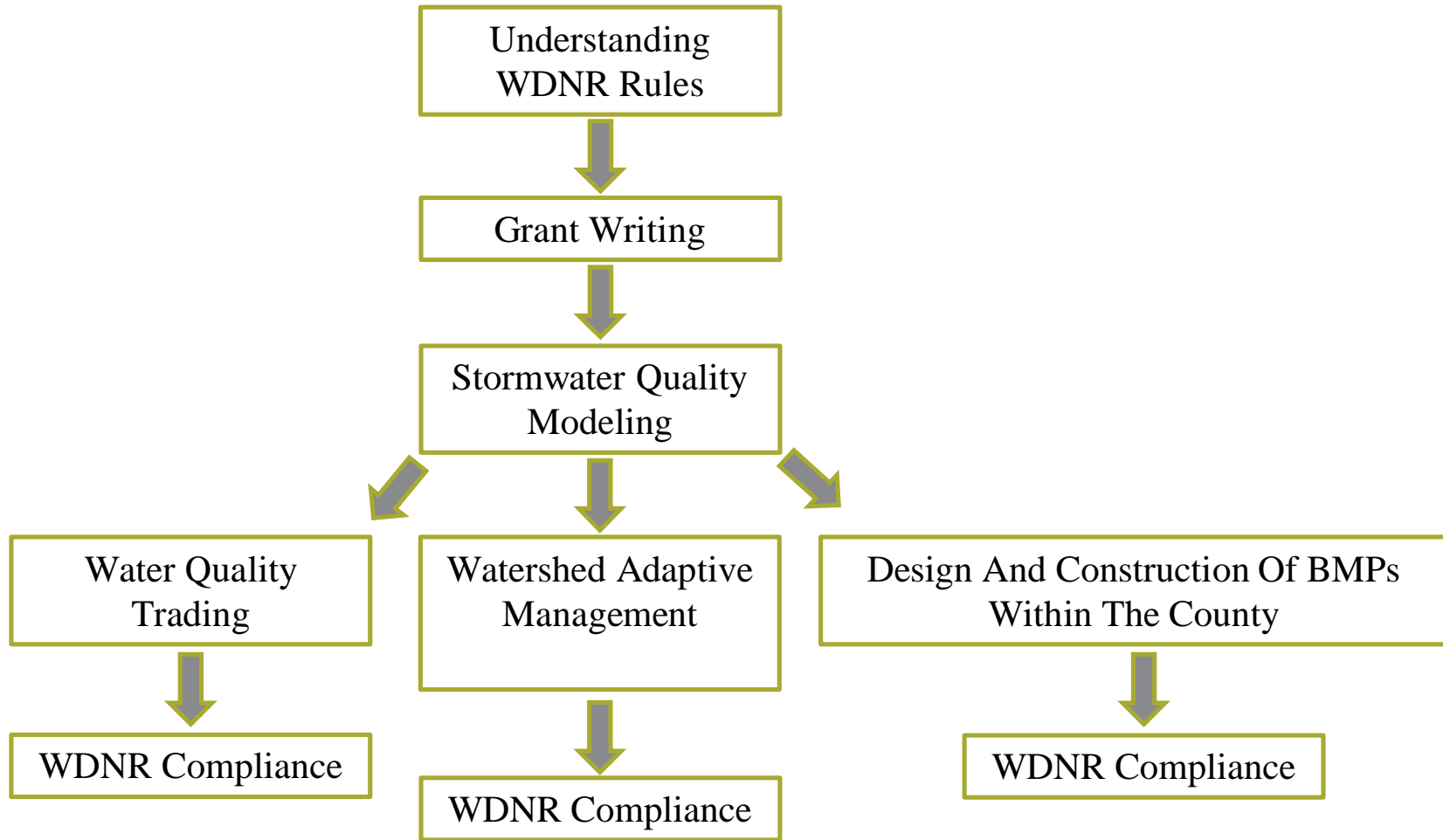
# Stormwater Quality Modeling (TSS)



# Stormwater Quality Modeling (TP)



# Alternatives Analysis

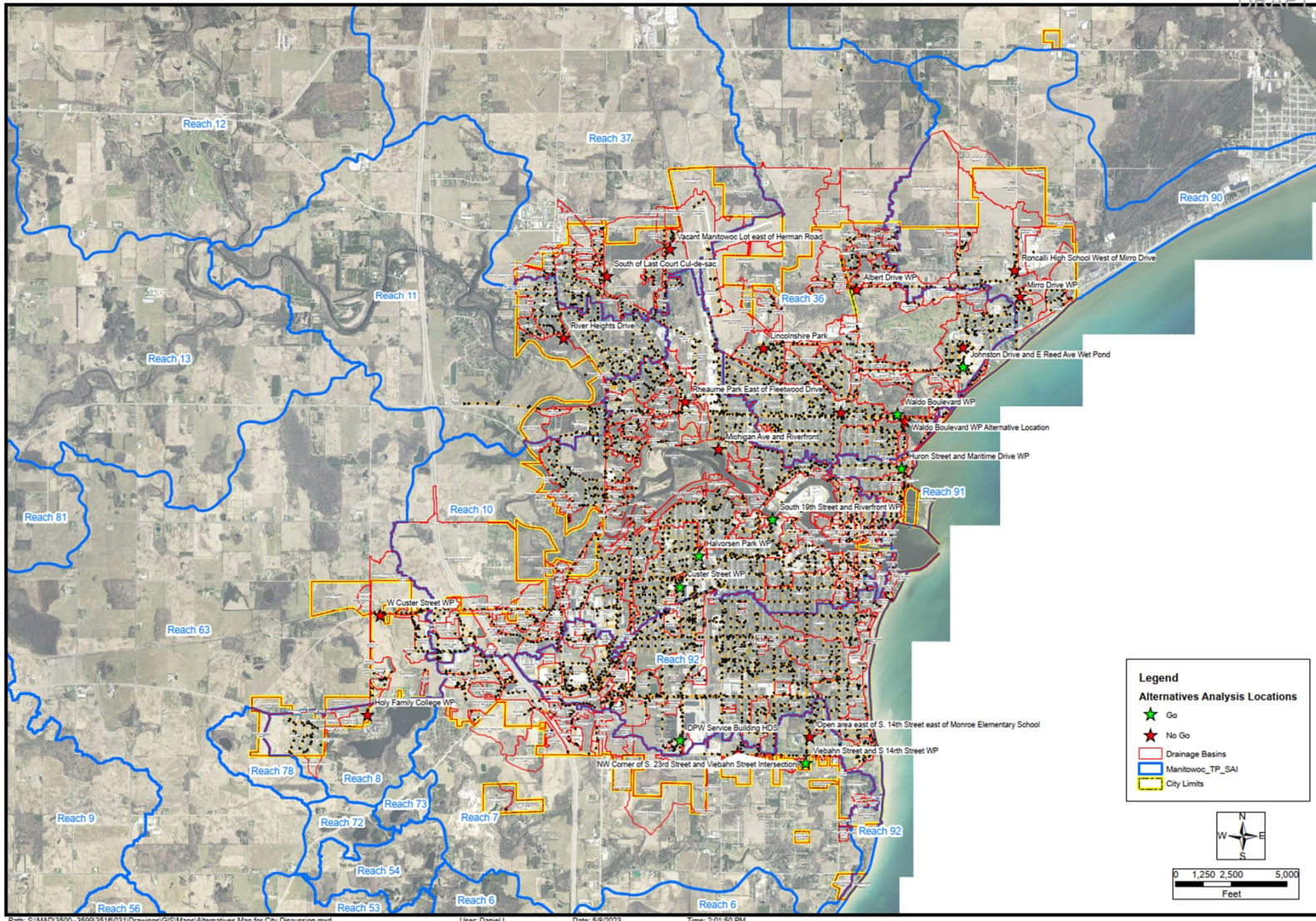


MS4 Achieves 20% TSS Reduction and is Allowed to do Water Quality Trading

Must be in jurisdiction of WWTP (NR 217)

# Potential Structural BMPs in the City

DRAFT 05/22/2023



**PROPOSED BMPs MAP**  
**STORMWATER QUALITY**  
**MANAGEMENT PLAN**  
**CITY OF MANITOWOC**  
**MANITOWOC COUNTY, WI**

**STRAND**  
ASSOCIATES®

**FIGURE 5.03-1**  
**3516.031**

Path: S:\MAD\3500-3569\3516\031\Drawings\GIS\Maps\Alternatives Map for City Discussion.mxd User: DanielJ Date: 5/8/2023 Time: 2:01:50 PM



# Water Quality Trading (WQT)

- **Definition:** Purchase of TP reduction credits for stormwater quality BMPs implemented by others.
- Tool available in future to potentially purchase lower-cost TP credits for stormwater quality BMPs implemented on/by:
  - Agricultural lands (ie: buffer strips, streambank stabilization)
  - Other MS4s (If exists, excess existing conditions TP reduction cannot be sold)
  - Local WWTPs
  - Private Point Dischargers
  - ▼ Notes: Trade ratios and credit thresholds apply.
- Cost Range: assumed \$150/lb TP NPW
- Other Considerations:
  - Water Quality Trading Clearinghouse



## Guidance for Implementing Water Quality Trading in WPDES Permits

Guidance Number: 3200-3400-3800-2020-03  
Wisconsin Department of Natural Resources  
6/1/2020  
Edition: 2

*This document is intended solely as guidance and does not contain any mandatory requirements except where requirements found in statute or administrative rule are referenced. Any regulatory decisions made by the Department of Natural Resources in any matter addressed by this guidance will be made by applying the governing statutes and administrative rules to the relevant facts.*

APPROVED:

*Adrian Stocks*

6/18/2020

Adrian Stocks  
Director, Bureau of Water Quality  
Wisconsin Department of Natural Resources

# Watershed Adaptive Management (WAM)

- **Definition: Point** (ie: MS4 and WWTF) and **nonpoint** (agricultural lands) sources work collaboratively to improve water quality and meet water quality standards through implementation of agricultural stormwater quality BMPs (ie: buffer strips, streambank stabilization).
- Tool available in future to potentially purchase lower-cost TP credits for stormwater quality BMPs implemented through a WAM initiative with the following caveats:
  - Program administered by one or more local WWTFs
  - Broker works between WWTF(s) and farmers to implement Agricultural BMPs
  - In-Stream water quality monitoring required but no trade ratios or credit thresholds.
  - WWTF gets less restrictive interim TP limits.
  - WAM timeframe is up to 15 years (3 permit terms)
- **Cost Range:** \$70 to \$130/lb TP NPW. Assumes cost share dollars available and counties provide technical/outreach assistance.
- No current WAM efforts in area.



## Adaptive Management Technical Handbook

A Guidance Document for Stakeholders

Wisconsin Department of Natural Resources  
6/1/2020

Guidance Number: 3400-2020-11

Edition: 2

*This document is intended solely as guidance and does not contain any mandatory requirements except where requirements found in statute or administrative rule are referenced. Any regulatory decisions made by the Department of Natural Resources in any matter addressed by this guidance will be made by applying the governing statutes and administrative rules to the relevant facts.*

Approved:

*Adrian Stocks*

Adrian Stocks, Director  
Bureau of Water Quality  
Wisconsin Department of Natural Resources

*6/18/2020*

Date



# Alternatives Analysis

Alternative #	Total 20-Year NPW	\$/lb TP Removed (20-year NPW)
1 – All 7 BMPs + 3 Non-Structural BMPs	\$ 11.6 million	\$490.2
2 – 3 BMPs + 1 Non-Structural BMP + AG WQT	\$ 7.6 million	\$338.1
3 – 3 BMPs + 0 Non-Structural BMP + AG WQT	\$ 1.2 million	\$170.5

Alternative	Structural BMPs	Nonstructural BMP: 40% TSS Requirement for Redevelopment	TP Leaf Collection Credit for Leaf Collection Program (TP Only)	WQT with Agricultural Lands
1	1 in Reach 7 3 in Reach 10 2 in Reach 36 1 in Reach 91 1 in Reach 92	Yes	Yes	Yes
2	0 in Reach 7 3 in Reach 10 1 in Reach 36 1 in Reach 91 0 in Reach 92	Yes	Yes	Yes
3	0 in Reach 7 1 in Reach 10 1 in Reach 36 0 in Reach 91 0 in Reach 92	Yes	Yes	Yes

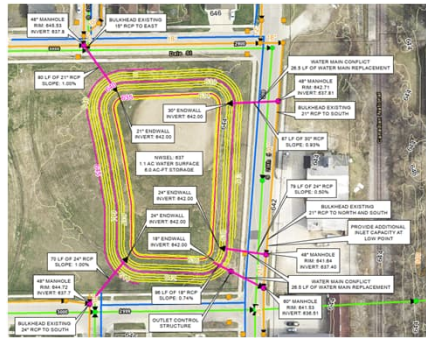
Note: See Table 5.04-1 for detailed alternatives analysis information.

**Table 5.02-1 Alternatives Analysis Summary of Components**

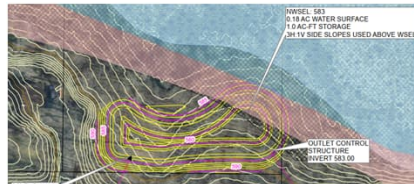
# Alternative #2

## Structural BMPs

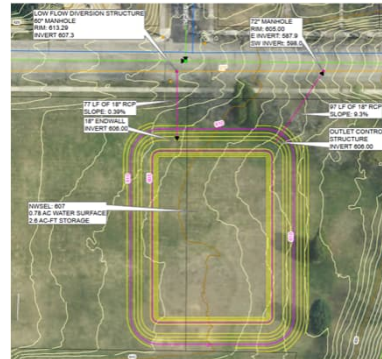
## Non-Structural BMPs



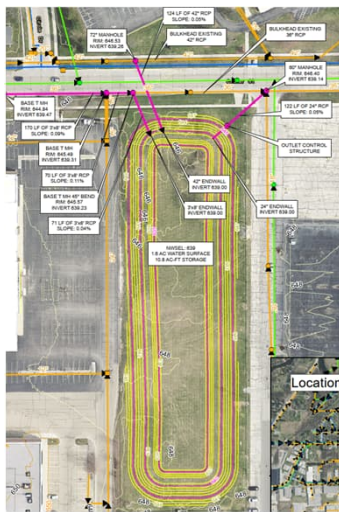
Halvorsen Park  
Wet Detention Basin  
(Flood Study and SQMP)  
(Reach 10 – 39.1 lbs TP)



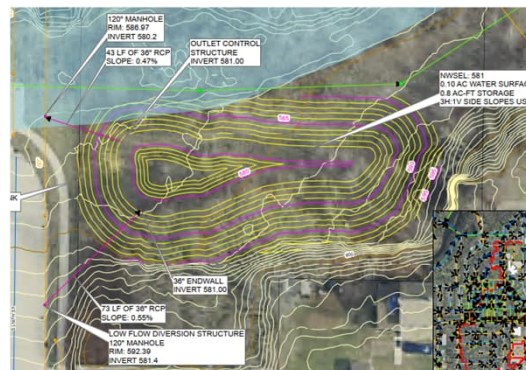
Waldo Boulevard  
Wet Detention Basin  
(Reach 36 – 19.4 lbs TP)



Huron Street and Maritime Drive  
Wet Detention Basin  
(Reach 91 – 23.9 lbs TP)



Custer Street  
Wet Detention Basin  
(Flood Study and SQMP)  
(Reach 10 – 55.6 lbs TP)



South 19<sup>th</sup> Street and Riverfront  
Wet Detention Basin  
(Reach 10 – 25.8 lbs TP)

### Internal MS4 Water Quality Trading

19,036 lbs TSS (51.4 lbs TP)  
from Reach 8 to Reach 7  
39,391 lbs TSS (106.4 lbs TP)  
from Reach 11 to Reach 10  
21 lbs TP From Reach 11 to Reach 10  
**Total: 178.8 lb TP**

### 20 Years Redevelopment @ 40% TSS

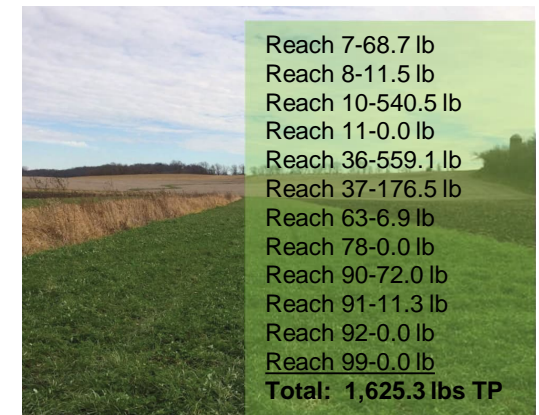
Reach 7-5.5 lb  
Reach 8-0.7 lb  
Reach 10-28.4 lb  
Reach 36-14.9lb  
Reach 37-3.8 lb  
Reach 63-0.8 lb  
Reach 90-4.6 lb  
Reach 91-1.6 lb  
**Total: 60.3 lbs TP**

### TP Leaf Collection Credit

Reach 7-3.8 lb  
Reach 10-41.7 lb  
Reach 36-29.5 lb  
Reach 37-5.7 lb  
Reach 90-2.3lb  
Reach 91-4.2 lb  
**Total: 87.2 lb TP**

## Water Quality Trading

Reach 7-68.7 lb  
Reach 8-11.5 lb  
Reach 10-540.5 lb  
Reach 11-0.0 lb  
Reach 36-559.1 lb  
Reach 37-176.5 lb  
Reach 63-6.9 lb  
Reach 78-0.0 lb  
Reach 90-72.0 lb  
Reach 91-11.3 lb  
Reach 92-0.0 lb  
Reach 99-0.0 lb  
**Total: 1,625.3 lbs TP**



Agricultural Water Quality Trading

# Recommendations

- **MS4 Programs:** Continue existing practices and initiate updates to Stormwater Programs discussed in Section 3.
  - Generally increased documentation for annual reporting
  - Implement modified IDDE screening at outfalls
  - New erosion control and stormwater ordinances
  - New construction site procedures
  - New long-term maintenance of public and private stormwater BMPs
- **Stormwater Quality:** Consider pursuit of Alternative 2 for Northeast Lakeshore TMDL Compliance as discussed in Section 5 (see *Table 5.04-1 TMDL Implementation Plan*)
  - Constructed BMPs - Pursue WDNR UNPS grant funds for any constructed BMPs. ***April 15, 2024, Grant Application Deadline***
  - Water Quality Trading - Further investigate opportunities with other MS4s and Private Point Dischargers. Investigate WQT clearinghouse under Wisconsin Act 151.
  - Watershed Adaptive Management – If materializes in future, reanalyze City’s position at that time.
  - TP Credit for Leaf Collection Program – Work with WDNR to confirm existing leaf collection program meets or exceeds the intentions of the WDNR guidance.
  - Streambank Erosion: Discretionarily pursue streambank restoration projects.

# Recommendations

- **Stormwater Quality (Cont.):** Consider pursuit of Alternative 2 for Northeast Lakeshore TMDL Compliance as discussed in Section 5 (see *Table 5.04-1 TMDL Implementation Plan*)
  - WinSLAMM Modeling: Update existing conditions modeling approx. every 5 years to account for BMPs since December 2022.
  - Consider enhanced phosphorus reduction through chemical treatment of proposed wet ponds or iron-enhanced sand filter around proposed pond edges.
  - Track WDNR's Standard's Oversight Committee (SOC) dry pond technical standards related to dry stormwater basins (1011-dry stormwater basins and 1012-enhanced dry treatment system).
  - Consider officially mapping proposed wet pond locations to preserve them for future implementation.
- **Stormwater Quantity:** Consider pursuit of conveyance and detention upgrades discussed in City's Flood Study also completed by Strand (Halvorsen Park Pond and Custer Street Pond). Pursue WDNR Municipal Flood Control grant funds for one of the new ponds. March 15, 2024, Grant Application Deadline.

# Potential TMDL Implementation Next Steps

- Provide formal request to WDNR for internal Water Quality Trade of 178.8 lbs TP.
- Pursue stormwater BMPs that have joint water quality and water quantity benefits for the City including Halvorsen Park Wet Pond and Custer Street Wet Pond
- Develop internal plan for operational activities tracking and maintenance/inspection procedures.

Funding Opportunities	Cost Share	Maximum WDNR Funding	Project Amount to Fully Utilize Maximum WDNR Funding
<b>Wisconsin Department of Natural Resources</b>			
Urban Nonpoint Source Grant (Planning)	50% State/50% Local	\$85,000	\$170,000
Urban Nonpoint Source Grant (Construction)	50% State/50% Local	\$150,000 \$50,000 (property acquisition)	\$300,000 \$100,000 (property acquisition)







**STRAND**  
ASSOCIATES®

Excellence in Engineering Since 1946