MS4 Storm Water Modeling Update

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1 EXECUTIVE SUMMARY

1.1 Introduction

The Wisconsin Department of Natural Resources (WDNR) regulates municipalities who meet specific thresholds of population density for discharges from municipal separate storm sewer systems (MS4s). These discharges generally consist of runoff from rain events or snow melt. The concern with the runoff is the concentration of pollutants collected within the municipality and discharged into local waterways. Pollutants of concern include organic materials, suspended solids, metals, nutrients, bacteria, pesticides, fertilizers, and other materials introduced by spills or illicit connections.

The State of Wisconsin has authority to regulate these discharges under the Federal Clean Water Act of 1972 (33 U.S.C Navigable Waters) and State of Wisconsin Statutes s. 283 Pollution Discharge Elimination and Wisconsin Administrative Code Chapter NR 216, Storm Water Discharge Permits.

The City of Greenfield (City) is part of the Menomonee Group Wisconsin Pollutant Discharge Elimination Systems (WPDES) Permit (WI-S065404-2). This permit considers activities under the City's direction and requires effective management techniques to minimize pollutants in discharge.

As a comprehensive tool of watershed-level pollution abatement, the permit includes requirements, based on total maximum daily load (TMDL) reports that are approved by the Environmental Protection Agency (EPA). The City is within the EPA-approved Milwaukee River TMDL watershed.

MS4 permittees within the Milwaukee River Basin watershed are required to meet total suspended solids (TSS) and total phosphorus (TP) load reduction goals.

1.2 City of Greenfield MS4 Storm Water Modeling Update

This MS4 Storm Water Modeling Update Summary has been compiled by performing wasteload allocation analysis on the existing conditions within the City. Information from this analysis was used to determine the City's TSS and TP wasteload as compared to the TMDL load reduction requirements. This analysis is designed to inform the City of the updated existing conditions and guide the next stage of TMDL implementation in the ongoing roadmap to TMDL compliance.

The following information constitutes the MS4 Storm Water Modeling Update:

- Introduction,
- Methodology and Rationale, and
- Modeling Update Results.

1.3 Conclusion

The development of the City's MS4 Storm Water Modeling Update provides up-to-date pollutant loading data based on current storm water quality management facilities. This study will aid the City with TMDL compliance planning.

2 INTRODUCTION

The City of Greenfield (City) has been issued a Municipal Separate Storm Sewer System (MS4) permit from the Wisconsin Department of Natural Resources (WDNR) since 2007. The current Menomonee Group Permit (WI-S065404-2) was issued in 2020 and expires in 2025.

The City of Greenfield MS4 discharges to two watersheds, the Milwaukee River Basin and the Pike-Root Watershed. To comply with s. NR216.07(6)(b), Wisconsin Administrative Code, the City must provide an assessment which demonstrates a minimum reduction of 20 percent of total suspended solids (TSS), as compared to no controls, in storm water runoff from existing development that enters waters of the state. The minimum 20 percent reduction of TSS is required for all non-exempt[1] areas of the City, regardless of watershed.

The MS4 permit also addresses storm water quality requirements from the Milwaukee River Basin Total Maximum Daily Load (TMDL) Report, which was approved in 2018. The TMDL was developed to identify pollutants of concern which cause impairments to the Milwaukee River and its tributaries. The Milwaukee River TMDL addresses total suspended solids, total phosphorus (TP), and bacteria. The TMDL Report has established water quality goals for all impaired waterways in the Milwaukee River Basin and will aid in the prioritization of storm water improvements over the next 5-year permit term and beyond.

A portion of the City of Greenfield drains to the Menomonee River and the Kinnickinnic River (Exhibit 1), both of which are included in the Milwaukee River TMDL and subject to the requirements of the TMDL wasteload allocations (WLA) for TSS and TP. To comply with the requirements of the MS4 permit and TMDL, the City is required to demonstrate further pollutant load reductions for TSS and TP in areas which drain to the Menomonee River.

The ultimate goal of the MS4 and TMDL requirements are to improve surface water quality to the maximum extent practicable and eliminate surface water impairments.

2.1 Summary Report Objective

This storm water modeling update summary report is intended to provide the City with the current status of TSS and TP reductions achieved within the City. The next stage of TMDL implementation will be guided by the findings of this assessment. The goals of this storm water modeling update are to:

1. Provide the City with updated water quality loadings, and
2. Determine the gap of pollutant loadings which the City is required to reduce in pursuit of TMDL compliance and improved surface water quality.

2.2 Previous & Current Master Planning Efforts

The City completed a municipal-wide storm water management planning effort in 2008. The plan was updated in 2011 and 2018. The following prior studies were utilized as resources for this effort:

- AECOM, Storm Water Quality Management Analysis, 2008,
- AECOM, City of Greenfield Updated WinSLAMM Assessment of Compliance, 2011, and
- AECOM, City of Greenfield Storm Water Quality Management Plan Update, 2018.

[1] Further information regarding exempt and non-exempt areas can be found in Ch. NR216. Wis. Adm. Code.

2.3 Planning Area

The planning area consists of the area within the corporate limits of the City of Greenfield, which is approximately 11.51 square miles and located within the southwestern portion of Milwaukee County in southeastern Wisconsin.

2.4 Milwaukee River TMDL

The Milwaukee River has been listed as a United States Environmental Protection Agency (US EPA) Section 303(d) Impaired Water for many years. The City is located within the Milwaukee River Basin and includes the following TMDL Reachsheds:

- Kinnickinnic River Reachshed KK-1,
- Kinnickinnic River Reachshed KK-2,
- Kinnickinnic River Reachshed KK-4,
- Kinnickinnic River Reachshed KK-6, and
- Menomonee River Reachshed MN-15.

Excess levels of TSS, TP, and bacteria may lead to nuisance algae growth, oxygen depletion, increased submerged aquatic vegetation, decreased water clarity, and degraded habitat. These impairments can lead to public health concerns, as well as adversely impact fish and other aquatic life, water quality, recreation, and navigation. The WDNR incorporates the TMDL requirements into the MS4 permit program.

The goal of the TMDL is to provide information on how stakeholders can improve waterways to a point at which they may be removed, or "de-listed", from the Section 303(d) Impaired Waters List. To achieve this goal, the TMDL includes pollutant reduction requirements for TSS, phosphorus, and bacteria within the City. Please refer to the WDNR website for additional information on the Milwaukee River Basin TMDL study and associated materials.[2]

2.5 Total Maximum Daily Load Pollutant Wasteload Allocations

The TMDL establishes goals for each reachshed. These goals are managed through allocations of permitted discharge by pollutant type. All allocations are broken down by TMDL reachshed (or sub-watershed). Reachsheds may have drastically different allocations depending on the existing pollutant loading, land use, and the ability of the waterway to remove pollutants. The TMDL report presents the loading capacity of a pollutant into a waterbody, defined in terms of mass of pollutant over a certain period. As part of the Milwaukee River Basin TMDL, each reachshed is assigned an allowable discharge allocation for TSS, phosphorous, and bacteria. These allocations are then expressed in percent reduction goals by watershed. The reduction requirements for the reachsheds located within the City are provided in Table 2.1 below.

Table 2.1 Milwaukee River TMDL Reduction Requirements

Reachshed	TSS Reduction Requirement	TP Reduction Requirement
Kinnickinnic River (KK-1)	78.4%	68.1%
Kinnickinnic River (KK-2)	77.6%	68.1%
Kinnickinnic River (KK-4)	84.0%	89.4%
Kinnickinnic River (KK-6)	77.6%	69.0%
Menomonee River (MN-15)	73.6%	67.2%

[2] WDNR website on the Milwaukee River TMDL Study and Report: http://dnr.wi.gov/topic/TMDLs/Milwaukee/

3 METHODOLOGY AND RATIONALE

In a storm water system planning effort, definitive knowledge is required of the existing storm water management system. Inventories and analyses are required of such factors as the existing land use, existing storm water ordinances, topography, drainage patterns, geology, conditions of receiving waters, and existing storm water facilities within the City. The following is a summary of findings for each of these parameters.

3.1 Land Use

The existing land use is the primary data input in the water quality modeling efforts completed as part of this analysis. City GIS data from the 2020 Comprehensive Plan[3] was accessed for land use information. Land use categories within the City include:

- Vacant
- Single Family Residential
- Two Family Residential/Townhouse
- Mixed Residential
- General Business/Office
- Community Facilities
- Industrial
- Public Parks and Open Spaces
- Water
- Woodlands/Wetlands
- Transportation/Utilities
- Right-of-Way

The area of land use categories within the City is summarized in Table 3.1 below.

Table 3.1 Land Use Summary

Land use	Acres	Percent
Vacant	417	5.6%
Single Family Residential	2,761	37.4%
Two Family Residential/Townhouse	124	1.7%
Mixed Residential	512	6.9%
General Business/Office	588	8.0%
Community Facilities	437	5.9%
Industrial	22	0.3%
Public Parks and Open Spaces	516	7.0%
Water	9	0.1%
Woodlands/Wetlands	185	2.5%
Transportation/Utilities	136	1.8%
Right-of-Way	1,680	22.7%
Total	**7,389**	**100.0%**

[3] https://www.ci.greenfield.wi.us/246/Comprehensive-Land-Use-Plan

3.2 Existing Storm Water Ordinance

The City's existing storm water management ordinance, City of Greenfield Code of Ordinances, Chapter 30 – Post-Construction Storm Water Management, was modeled after Chapters NR 151 and NR 216 of the Wisconsin Administrative Code. The ordinance is also consistent with the technical standards identified, developed, or disseminated by the Milwaukee Metropolitan Sewerage District (MMSD) Chapter 13 "Surface Water and Storm Water" regulations.

The City's ordinance requires water quality controls on new and re-development projects to prevent further degradation of local waterways. The ordinance specifies control requirements for new construction, in-fill development, and redevelopment sites which meet the applicability and jurisdiction requirements defined in Section 30.04. These requirements are detailed in Table 3.1 below. Further detail on the City's post-construction standards, including applicability of a Maximum Extent Practicable variance, is available on the City code website[4].

Table 3.2 City of Greenfield TSS Reduction Standards

Development Type	TSS Reduction Requirement (Percent)
New Development	80%
In-fill Development	80%
Redevelopment	40% of load from parking areas and roads

3.3 Topography and Surface Drainage Patterns

The City drains to the following watersheds: Milwaukee River Basin (Kinnickinnic River and Menomonee River) and the Pike-Root Watershed (Oak Creek and the Root River), as shown in Exhibit 1. The following Milwaukee River Basin reachsheds are located within the municipal boundary: Kinnickinnic River reachsheds KK-1, KK-2, KK-4, and KK-6, and Menomonee River reachshed MN-15. Land within the Pike-Root Watershed was included in this update, though it is not within a TMDL area. Drainage basins for the storm water modeling update have been developed to reflect new private and public storm water facility treatment areas.

3.4 Geologic Conditions

The geologic conditions of an area, including soils, depth to bedrock, and depth to the groundwater table, are important considerations in any storm water management system planning effort. Soil types in the City consist mostly of clay, with some areas of silty and sandy soils.

3.5 Existing Storm Water Management System and Best Management Practices

The existing storm water management system within the City consists of a network of pipes, inlets, bioswales, bio-retention devices, catch basins, detention ponds, mechanical treatment units (MTU), pervious pavement, rain gardens, restrictor manholes, retention ponds, underground detention, constructed wetlands, and drainage ditches. The location and configuration of this storm water system is shown on Exhibit 2. In the evaluation of the updated devices, it is assumed that all storm water facilities are being regularly inspected and maintained.

The City is aware of the need to protect the natural resources located throughout the planning area while also complying with the MS4 permit. To achieve this goal, the City is actively involved in numerous best management practices designed to protect water quality.

[4] https://library.municode.com/wi/greenfield/codes/code_of_ordinances

Current activities include:

- Leaf Collection: The City Division of Public Works (DPW) provides an annual fall roadside leaf collection service.
- Yard Waste Collection: The City provides curbside yard waste collection with garbage service from April through November.
- Street Sweeping: The City utilizes a vacuum assisted street sweeper, performing sweeping approximately 4.5 times per year, depending on weather and available resources.
- Catch Basin Cleaning: Although the City conducts catch basin cleaning, there is not a program in place, and therefore catch basin cleaning is not included in storm water quality models in this effort.

3.6 Existing Conditions: Water Quality Modeling Update

The MS4 permit requires modeling to reflect existing and proposed storm water pollutant reductions produced by the existing land use conditions within the City. Prior modeling efforts are listed in Section 2.2 of this report. The modeling that was completed for this water quality modeling update effort reflects recent developments as well as devices that have been modified since the original design. It also incorporates Wisconsin Department of Natural Resources' (WDNR) TMDL modeling guidance "TMDL Guidance for MS4 Permits: Planning, Implementation, and Modeling Guidance" and related appendices, dated September 2016.

3.6.1 WinSLAMM

This updated water quality analysis was completed using WinSLAMM, Version 10.5.0. The existing level of pollutant control was compared to the pollutant reduction requirements of the MS4 permit and the wasteload allocations in the Milwaukee River TMDL report. The TMDL wasteload reduction targets listed in Table 2.1 are the reductions necessary to meet water quality standards.

Parameter files used with WinSLAMM follow WDNR guidance, including use of the Milwaukee five-year rainfall data, which has been determined by WDNR to be representative of a typical period of rainfall within the City. The resulting pollutant loading levels are then annualized for the presented results.

The land use was based on the City's land use data and synthesized to align with the more general standard land use categories found within WinSLAMM. To replicate the City's existing development, WinSLAMM standard land use files that are representative of the City's land use categories were utilized to generate pollutant loadings for the existing conditions. The standard land use files used in the modeling process are as follows:

- Low Density Residential (LDR),
- Medium Density Residential No Alleys (MDRNA),
- High Density Residential No Alleys (HDRNA),
- Light Industrial,
- Commercial: Downtown,
- Institutional: Miscellaneous, and
- Other Urban (Open Space).

3.6.2 Best Management Practices (BMPs)

When available, device specifications and design modeling results were used for storm water quality facilities with approved storm water management plans and as-built documents. For water quality devices that did not have the support of a storm water management plan, performance was calculated by entering the physical parameters of the water quality device and allowing the WinSLAMM model to calculate the reductions achieved by that device within the corresponding drainage basin.

The BMPs analyzed in this effort are summarized in Table 3.2 below and include the following:

- Newly constructed BMPs (N),
- BMPs missing from the prior study (MI), and
- BMPs which have been modified (MO) since the prior study.

Table 3.3 BMPs Modeled in Storm Water Modeling Update

Structure ID	Reachshed	Development Name	Type	Update Effort Type (N, MI, MO)	Year Built	Ownership
stWSS-003	RR	Layton Terrace	Detention Basin	MI	1998	Private
stWSS-008	MN-15	ALDI (Layton)	Restrictor MH	MI	2006	Private
stWSS-019	MN-15	House of Harley	Retention Basin	MO	2002	Private
stWSS-072	MN-15	ALDI (Layton)	Underground Storage	MI	2006	Private
stWSS-087	MN-15	City Hall Rain Garden	Bio-Retention	MI	2013	City
stWSS-088	MN-15	City Hall Rain Garden	Bio-Retention	MI	2013	City
stWSS-090	MN-15	City Hall Pervious Pavement	Pervious Pavement	MI	2013	City
stWSS-091	MN-15	City Hall Pervious Pavement	Pervious Pavement	MI	2013	City
stWSS-114	RR	Plainfield Ave MTU 2	MTU	MI	2010	City
stWSS-115	RR	Plainfield Ave MTU 1	MTU	MI	2010	City
stWSS-118	MN-15	Allerton Ave MTU	MTU	MI	2010	City
stWSS-119	MN-15	Placid Dr MTU	MTU	MI	2010	City
stWSS-121	MN-15	ALDI (Layton)	MTU	MI	2006	Private
stWSS-129	MN-15	Creekwood Park (43rd St)	Restrictor MH	MI	2016	City
stWSS-143	MN-15	City Hall Pervious Pavement	Pervious Pavement	MI	2013	City
stWSS-144	MN-15	City Hall Pervious Pavement	Pervious Pavement	MI	2013	City
stWSS-145	MN-15	City Hall Pervious Pavement	Pervious Pavement	MI	2013	City
stWSS-149	RR	Sunburst Apartments	Bio-Retention	N	2017	Private
stWSS-152	MN-15	4400 Edgerton	Detention Basin	N	2018	City
stWSS-153	KK-6	The Sanctuary At Cherokee Point	Underground Detention	N	2020	Private
stWSS-154	KK-6	The Sanctuary At Cherokee Point	Underground Detention	N	2020	Private
stWSS-155	KK-6	The Sanctuary At Cherokee Point	Underground Detention	N	2020	Private
stWSS-156	RR	Landmark Credit Union	MTU	N	2020	Private
stWSS-157	MN-15	Layton Avenue Car Wash	Underground Detention	N	2021	Private

Structure ID	Reachshed	Development Name	Type	Update Effort Type (N, MI, MO)	Year Built	Ownership
stWSS-158	RR	Greenfield GMX	Underground Detention	N	2021	Private
stWSS-159	RR	Greenfield GMX	Underground Detention	N	2021	Private
stWSS-160	RR	Greenfield GMX	Restrictor MH	N	2021	Private
stWSS-162	RR	Anne's Acres	Bio-Retention	N	2021	Private
stWSS-163	RR	Anne's Acres	Detention Basin	N	2021	Private
stWSS-164	MN-15	Greenbrook Terrace Apartments	Bio-Retention	N	2021	Private
stWSS-165	MN-15	House of Harley Parking Lot Addition	Bio-Retention	N	2021	Private
stWSS-166	RR	Greenfield Rehab Hospital	Bio-Retention	N	2021	Private
stWSS-167	RR	Greenfield Rehab Hospital	Bio-Retention	N	2021	Private
stWSS-168	RR	Greenfield Rehab Hospital	Bio-Retention	N	2021	Private
stWSS-169	RR	Greenfield Rehab Hospital	Bio-Retention	N	2021	Private
stWSS-170	KK-6	Educators Credit Union	Pervious Pavers	N	2021	Private
stWSS-171	KK-4	Festival Foods Entrance Road	Underground Storage	N	2021	Private
stWSS-172	RR	The Woods - A Great Life Community	Retention Basin	N	2022	Private
stWSS-173	RR	The Woods - A Great Life Community	Bio-Retention	N	2022	Private
stWSS-174	RR	The Woods - A Great Life Community	Underground Detention	N	2022	Private
stWSS-175	RR	The Woods - A Great Life Community	Underground Detention	N	2022	Private
stWSS-176	RR	The Woods - A Great Life Community	MTU	N	2022	Private
stWSS-177	KK-4	Interchange South	Retention Basin	N	2022	Private
stWSS-178	KK-4	Interchange South	Underground Detention	N	2022	Private
stWSS-179	KK-4	Interchange South	Bio-Retention	N	2022	Private
stWSS-180	RR	6245 S 27th St Restaurant	Bio-Retention	N	2022	Private
stWSS-181	MN-15	Greater Milwaukee Oral Surgery	Bio-Retention	N	2023	Private
stWSS-182	RR	UW Credit Union	Bio-Retention	N	2023	Private
stWSS-183	KK-4	Lake Ford	Bio-Retention	N	2023	Private
stWSS-188	KK-4	Mr. Car Wash - 27th	Underground Storage	N	2023	Private
stWSS-189	MN-15	Honey Creek Wet Pond	Retention Basin	N	2023	City
stWSS-190	MN-15	Honey Creek Stream Restoration	Stream	N	2023	City

3.6.3 MS4 vs. TMDL Analysis

Following the approach of the prior study, depending on the location, year and type of construction, the BMP is classified in the results by MS4 analysis and TMDL analysis.

3.6.3.1 MS4 Analysis

Devices that are eligible for the MS4 analysis meet at least one of the following parameters:

- Constructed prior to 2004, or
- Redeveloped, but with initial development on the site which occurred prior to 2004.

3.6.3.2 TMDL Analysis

All devices within the TMDL area, regardless of the date they were constructed, are eligible for inclusion in the TMDL analysis if they meet one of the following parameters:

- City-owned, or
- Privately owned with a Storm Water Management Maintenance Agreement (SWMMA).

3.6.4 Exclusion Areas

According to the WDNR TMDL Guidance document, the permittee shall include all areas within the corporate boundary unless it is listed as optional. The percentage pollutant load reduction achieved by the City is impacted by the decision to include or exclude optional areas.

The following areas within the municipal boundary are optional to include in the water quality model:

- State and County highways that are not maintained by the City and any lands that drain to these highways, and
- Areas that never pass through the City's MS4.

Areas of undeveloped land which drain directly to waters of the state without passing through a constructed means of storm water conveyance (City-owned or private) were excluded from the prior study and from this analysis.

Areas of developed land which pass through private storm sewer and/or BMPs and drain to highways or waters of the state without passing through the City's MS4 were excluded from the prior study.

In this analysis, two approaches were utilized, as detailed in the following two sections. The presentation of two datasets demonstrates the difference between achieved pollutant loading reductions depending on whether certain optional areas are included in the analysis.

3.6.4.1 Summary of Approach 1

For Approach 1, the results from the prior study were modified to reflect reductions achieved by BMPs analyzed in this effort. The results were modified to reflect reductions achieved by City-owned BMPs and privately owned BMPs (with SWMMAs) which were modeled in this effort. Areas excluded from the prior study which have undergone no changes were not examined in the course of this study.

Areas of developed land which pass through private storm sewer and/or BMPs and drain to highways or waters of the state without passing through the City's MS4 were **excluded** from the results of this study. This is consistent with the approach of the prior study.

3.6.4.2 Summary of Approach 2

For Approach 2, the results from the prior study were modified to reflect reductions achieved by BMPs analyzed in this effort. The updated results for Approach 2 include reductions achieved by City-owned BMPs and privately owned BMPs (with SWMMAs) which were modeled in this effort. Areas excluded from the prior study which have undergone no changes were not examined in the course of this study.

Areas of developed land which pass through private storm sewer and/or BMPs and drain to highways or waters of the state without passing through the City's MS4 were **included** in the results of this study. This is not consistent with the approach of the prior study.

3.6.5 Application of Current Results to Prior Data

The pollutant reduction results from the prior study were updated with BMP modeling results from this study using the following calculations:

- For BMPs that are on land which was excluded from the prior study, but now must be included due to site modifications, the No Controls loading of the BMP basin was added to the No Controls total for the appropriate reachshed and the With Controls result from the BMP basin was added to the With Controls total for the appropriate reachshed.
- For BMPs that are on land that was previously included in the No Controls total of the prior study, such as sites where a BMP has been constructed since the prior study, the efficiency of the new BMP was subtracted from the With Controls total for the appropriate reachshed. No change was made to the No Controls column for this circumstance because the No Controls loading was accounted for in the prior study.
- It was found that some new BMP basins include land which was both excluded and included in the prior study area. Insufficient data is available from the previous study for informed calculations on the precise loading difference of the previously included and excluded portions of the new basin. Therefore, basins fitting this description were evaluated on a case-by-case basis and treated as fully included or fully excluded based on the relative acreage.

4 MODELING UPDATE RESULTS

4.1 Previous Planning Effort Results

As described in Chapter 1, Section 1.2 of the report, the City performed a planning effort in 2018. The effort included storm water quality modeling to demonstrate progress toward TMDL compliance. The results of the 2018 study are provided in Table 4.1 below.

Table 4.1 Modeling Results from 2018 Study

Analysis	Reachshed	Area (acres)	TSS No Controls (lbs)*	TSS With Controls (lbs)*	TSS Percent Reduction	TP No Controls (lbs)	TP With Controls (lbs)	TP Percent Reduction
NR151 (MS4)	KK-1	83	20,000	10,000	50.0%	74	39	47.3%
	KK-2	94	22,000	18,000	18.2%	85	70	17.6%
	KK-4	424	96,000	58,000	39.6%	361	219	39.3%
	KK-6	360	90,000	56,000	37.8%	312	231	26.0%
	MN-15	1284	320,000	222,000	30.6%	1130	828	26.7%
	OAK CREEK	146	38,000	26,000	31.6%	127	83	34.6%
	ROOT RIVER	2185	506,000	314,000	37.9%	1846	1173	36.5%
	TOTAL	**4576**	**1,092,000**	**704,000**	**35.5%**	**3935**	**2643**	**32.8%**
TMDL	KK-1	91	22,000	10,000	54.5%	77	40	48.1%
	KK-2	94	22,000	18,000	18.2%	84	69	17.9%
	KK-4	424	92,000	56,000	39.1%	352	214	39.2%
	KK-6	355	86,000	54,000	37.2%	307	229	25.4%
	MN-15	1316	324,000	222,000	31.5%	1147	831	27.6%
	TOTAL	**2280**	**546,000**	**360,000**	**34.1%**	**1967**	**1383**	**29.7%**

*The TSS results from the 2018 study were represented in tons. The values were converted to pounds in this update.

4.2 Updated Modeling Results

Since only a fraction of storm water practices within the City were included in this study, the results were incorporated into the results tables from the prior study.

As described in Section 3.6.4, the prior study differentiated MS4 eligibility and TMDL eligibility for each device. A summary that includes device information, efficiency, and eligibility is provided in Attachment B.

4.2.1 Approach 1 Modeling Results

The modeling results shown in Table 4.2 includes devices which meet at least one of the following parameters:

- Public-owned storm water devices,
- Private-owned storm water devices which receive drainage from City-owned storm water conveyance infrastructure, and
- Private-owned storm water devices which discharge to City-owned storm water conveyance infrastructure.

Devices excluded from this modeling results table meet the following parameter:

- Private-owned storm water devices which do not receive runoff from City-owned storm water conveyance infrastructure and which discharge directly to WOTUS or another MS4 (DOT, County, or adjacent municipality), without passing through City-owned storm water conveyance.

Table 4.2 Approach 1 Modeling Results

Analysis	Reachshed	Area (acres)	TSS No Controls (lbs)	TSS With Controls (lbs)	TSS Percent Reduction	TP No Controls (lbs)	TP With Controls (lbs)	TP Percent Reduction
NR151	KK-1	83	20,000	10,000	50.0%	74	39	47.3%
	KK-2	94	22,000	18,000	18.2%	85	70	17.6%
	KK-4	424	96,000	58,000	39.6%	361	219	39.3%
	KK-6	360	90,000	56,000	37.8%	312	231	26.0%
	MN-15	1284	320,000	221,968	30.6%	1130	827.96	26.7%
	OAK CREEK	146	38,000	26,000	31.6%	127	83	34.6%
	ROOT RIVER	2185	506,000	312,770	38.2%	1846	1169.94	36.6%
	TOTAL	**4576**	**1,092,000**	**702,737**	**35.6%**	**3935**	**2639.9**	**32.9%**
TMDL	KK-1	91	22,000	10,000	54.5%	77	40	48.1%
	KK-2	94	22,000	18,000	18.2%	84	69	17.9%
	KK-4	424	92,000	56,000	39.1%	352	214	39.2%
	KK-6	355	86,000	54,000	37.2%	307	229	25.4%
	MN-15	1433	344,039	225,064	34.6%	1228	858	30.1%
	TOTAL	**2397**	**566,039**	**363,064**	**35.9%**	**2048**	**1410**	**31.1%**

Table 4.3 provides a comparison between the City's achieved pollutant reduction and the goals of NR151 and the TMDL. The City is exceeding the state minimum requirement of 20 percent TSS reduction per Wisconsin Administrative Code Chapter NR151.

Table 4.3 Approach 1 Compliance Results

Analysis	Reachshed	TSS Percent Reduction	TSS Percent Requirement	TSS Compliance Gap	TP Percent Reduction	TP Percent Requirement	TP Compliance Gap
NR151	KK-1	50.0%	-	-	47.3%	N/A	-
	KK-2	18.2%	-	-	17.6%	N/A	-
	KK-4	39.6%	-	-	39.3%	N/A	-
	KK-6	37.8%	-	-	26.0%	N/A	-
	MN-15	30.6%	-	-	26.7%	N/A	-
	OAK CREEK	31.6%	-	-	34.6%	N/A	-
	ROOT RIVER	38.5%	-	-	37.2%	N/A	-
	TOTAL	**35.8%**	**20.0%**	**N/A**	**33.2%**	**N/A**	-
TMDL	KK-1	54.5%	78.4%	23.9%	48.1%	68.1%	20.0%
	KK-2	18.2%	77.6%	59.4%	17.9%	68.1%	50.2%
	KK-4	39.1%	84.0%	44.9%	39.2%	89.4%	50.2%
	KK-6	37.2%	77.6%	40.4%	25.4%	69.0%	43.6%
	MN-15	34.6%	73.6%	39.0%	30.1%	67.2%	37.1%
	TOTAL	**35.9%**	**-**	**-**	**31.1%**	**-**	

4.2.2 Approach 2 Modeling Results

The modeling results shown in Table 4.4 include all devices which were modeled in this effort. The devices are either owned by the City or the owner has a Long-Term Maintenance Agreement with the City. The devices meet at least one of the following parameters:

- Public-owned storm water devices,
- Private-owned storm water devices which receive drainage from City-owned storm water conveyance infrastructure,
- Private-owned storm water devices which discharge to City-owned storm water conveyance infrastructure, or
- Private-owned storm water devices which do not receive runoff from City-owned storm water conveyance infrastructure and which discharge directly to WOTUS or another MS4 (DOT, County, or adjacent municipality), without passing through City-owned storm water conveyance.

Table 4.4 Approach 2 Modeling Results

Analysis	Reachshed	Area (acres)	TSS No Controls (lbs)	TSS With Controls (lbs)	TSS Percent Reduction	TP No Controls (lbs)	TP With Controls (lbs)	TP Percent Reduction
NR151	KK-1	83	20,000	10,000	50.0%	74	39	47.3%
	KK-2	94	22,000	18,000	18.2%	85	70	17.6%
	KK-4	427.2	96,998	58,452	39.7%	363.8	220.68	39.3%
	KK-6	360	90,000	55,900	37.9%	312	230.78	26.0%
	MN-15	1295.55	322,992	221,394	31.5%	1137.68	826.9552	27.3%
	OAK CREEK	146	38,000	26,000	31.6%	127	83	34.6%
	ROOT RIVER	2194.68	508,854	313,753	38.3%	1855.15	1173.3	36.8%
	TOTAL	**4600.43**	**1,098,845**	**703,498**	**36.0%**	**3935**	**2643.7152**	**32.8%**
TMDL	KK-1	91	22,000	10,000	54.5%	77	40	48.1%
	KK-2	94	22,000	18,000	18.2%	84	69	17.9%
	KK-4	427.2	92,998	54,827	41.0%	354.8	211.66	40.3%
	KK-6	355.74	86,398	53,980	37.5%	308.14	229.15	25.6%
	MN-15	1446.34	347,510	224,600	35.4%	1236.92	857.6452	30.7%
	TOTAL	**2414.28**	**570,907**	**361,407**	**36.7%**	**2060.86**	**1407.4552**	**31.7%**

Table 4.5 provides a comparison between the City's achieved pollutant reduction and the goals of NR151 and the TMDL. The City is exceeding the state minimum requirement of 20 percent TSS reduction per Wisconsin Administrative Code Chapter NR151.

Table 4.5 Approach 2 Compliance Results

Analysis	Reachshed	TSS Percent Reduction	TSS Percent Requirement	TSS Compliance Gap	TP Percent Reduction	TP Percent Requirement	TP Compliance Gap
NR151	KK-1	50.0%	-	-	47.3%	-	-
	KK-2	18.2%	-	-	17.6%	-	-
	KK-4	39.7%	-	-	39.3%	-	-
	KK-6	37.9%	-	-	26.0%	-	-
	MN-15	31.5%	-	-	27.3%	-	-
	OAK CREEK	31.6%	-	-	34.6%	-	-
	ROOT RIVER	38.3%	-	-	36.8%	-	-
	TOTAL	36.0%	20.0%	N/A	32.8%	N/A	-
TMDL	KK-1	54.5%	78.4%	23.9%	48.1%	68.1%	20.0%
	KK-2	18.2%	77.6%	59.4%	17.9%	68.1%	50.2%
	KK-4	41.0%	84.0%	43.0%	40.3%	89.4%	49.1%
	KK-6	37.5%	77.6%	40.1%	25.6%	69.0%	43.4%
	MN-15	35.4%	73.6%	38.2%	30.7%	67.2%	36.5%
	TOTAL	36.7%	-	-	31.7%	-	-

4.3 Conclusion

Based on the results of this study, including the reduction achieved by BMPs in exclusion areas (Approach 2), such as those which receive runoff that does not enter the City's MS4, increases the pollutant reduction percentage achieved by the City.

Continued effort is needed to bridge the gap between current pollutant reduction practices and the TMDL reduction targets. The City aims to reduce storm water pollutants to the maximum extent practicable in the pursuit of water quality.

Exhibit 1: Watershed Map

Ruekert · Mielke

MS4 Storm Water Modeling Update
City of Greenfield
Milwaukee County, Wisconsin

Watersheds

Project #: 8083-10039
Drawn By: TMW
Approved By: CMP
Name: TMDL Reachshed
Date Saved: 3/8/2024

Exhibit 1

Waterways
City Limits

Watershed

- Kinnickinnic River (KK-1)
- Kinnickinnic River (KK-2)
- Kinnickinnic River (KK-4)
- Kinnickinnic River (KK-6)
- Menomonee River (MN-15)
- Oak Creek (OC)
- Root River (RR)

KK-1
KK-2
KK-4
KK-6
RR
MN-15
OC
Root River
Cherokee Park Creek
Honey Creek

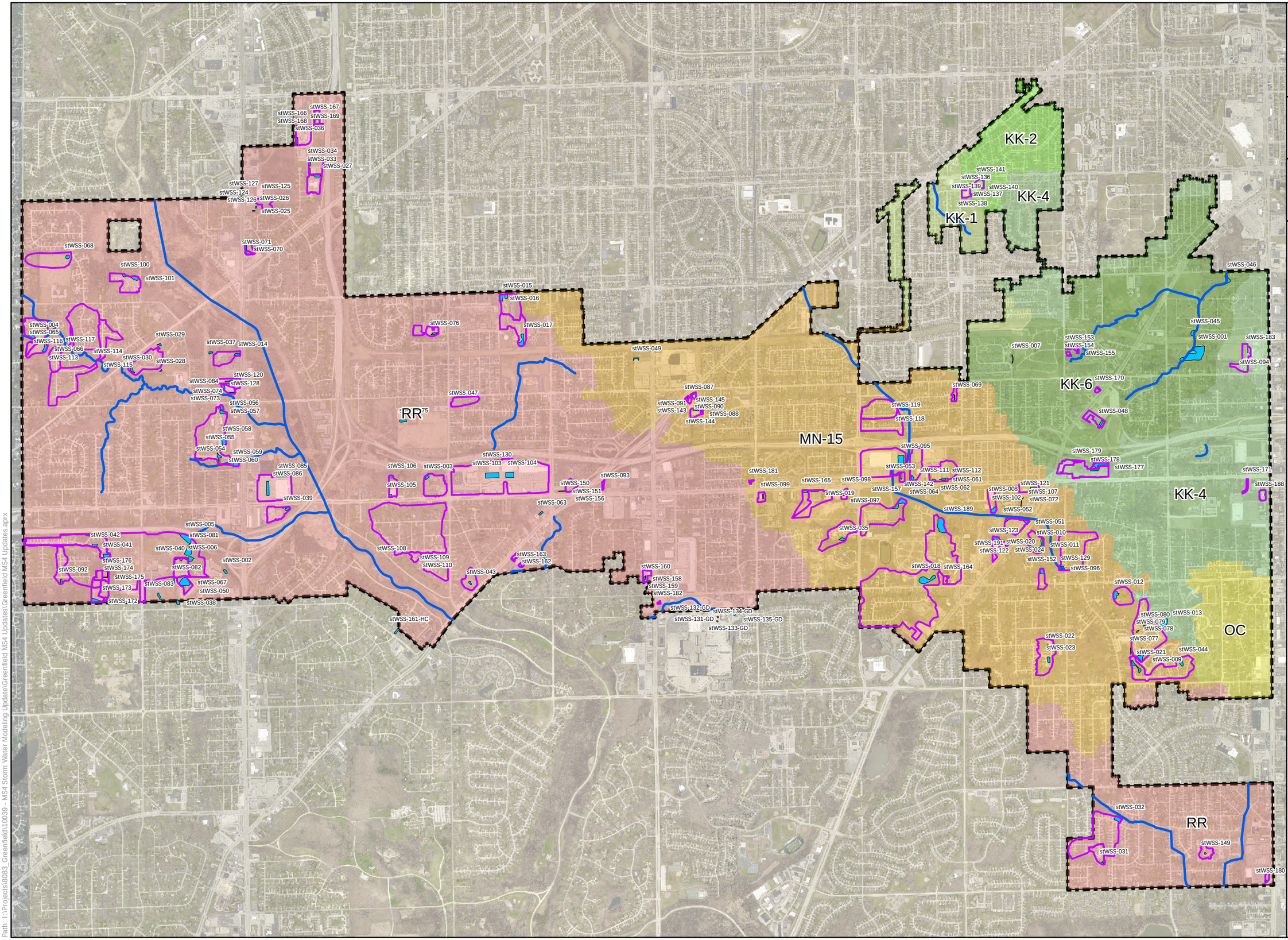
N

0 1,500 3,000
Feet

March 2024

Path: I:\Projects\8083_Greenfield\10039 - MS4 Storm Water Modeling Update\Greenfield MS4 Updates\Greenfield MS4 Updates.aprx

Exhibit 2: Water Quality BMP Map



Ruekert · Mielke

MS4 Storm Water Modeling Update
City of Greenfield
Milwaukee County, Wisconsin

Water Quality BMPs

Project #: 8083-10039
Drawn By: TMW
Approved By: CMP
Name: WaterQualityBMPs
Date Saved: 3/8/2024

Exhibit 2

- Waterways
- City Limits
- BMP Device
- BMP Basin

Watershed

- Kinnickinnic River (KK-1)
- Kinnickinnic River (KK-2)
- Kinnickinnic River (KK-4)
- Kinnickinnic River (KK-6)
- Menomonee River (MN-15)
- Oak Creek (OC)
- Root River (RR)

N

CITY OF Greenfield WISCONSIN

0 1,500 3,000
Feet

March 2024

Path: I:\Projects\8083_Greenfield\10039 - MS4 Storm Water Modeling Update\Greenfield MS4 Updates\Greenfield MS4 Updates.aprx

Exhibit 3: Approach 1 Exclusion Areas Map

Ruekert · Mielke

MS4 Storm Water Modeling Update
City of Greenfield
Milwaukee County, Wisconsin

Approach 1 Exclusion Area

Project #: 8083-10039
Drawn By: TMW
Approved By: CMP
Name: Approach1
Date Saved: 3/8/2024

Exhibit 3

- Waterways
- BMP Basin
- City Limits
- Exclusion Area
- Milwaukee County Owned
- WDOT Owned

N

0 1,500 3,000
Feet

March 2024

Path: I:\Projects\8083_Greenfield\10039 - MS4 Storm Water Modeling Update\Greenfield MS4 Updates\Greenfield MS4 Updates.aprx

Exhibit 4: Approach 2 Exclusion Areas Map

Ruekert · Mielke

MS4 Storm Water Modeling Update
City of Greenfield
Milwaukee County, Wisconsin

Approach 2 Exclusion Area

Project #: 8083-10039
Drawn By: TMW
Approved By: CMP
Name: Approach2
Date Saved: 3/8/2024

Exhibit 4

- Waterways
- BMP Basin
- City Limits
- Exclusion Area
- Milwaukee County Owned
- WDOT Owned

N

0 1,500 3,000
Feet

February 2024

Path: I:\Projects\8083_Greenfield\10039 - MS4 Storm Water Modeling Update\Greenfield MS4 Updates\Greenfield MS4 Updates.aprx

Attachment A: WinSLAMM Modeling Results

City of Greenfield Modeling Results for the Milwaukee River TMDL Reachshed KK-1												
Land Use Analyzed					Storm Water Treatment Practices		Total Suspended Solids			Total Phosphorus		
Identification	Description	Year Built	Acreage	Conveyance Method	Main Treatment Type	Other Treatment	Discharge No Controls	Discharge Controls	TSS Control	Discharge No Controls	Discharge Controls	TP Control
(label)			(acres)	(GS, CG, UR)	(WP, IB, etc.)	(SC, LM)	(pounds)	(pounds)	(%)	(pounds)	(pounds)	(%)
Storm Water Facilities - Publicly Owned*												
No publicly owned storm water facilities within Reachshed KK-1 were included in this study.												
Storm Water Facilities - Privately Owned with Maintenance Agreement*												
No privately owned storm water faciliites within Reachshed KK-1 were included in this study.												

*Please refer to the prior study for pollutant removal efficiency of storm water facilities not modeled in this analysis.

City of Greenfield Modeling Results for the Milwaukee River TMDL Reachshed KK-2												
Land Use Analyzed					Storm Water Treatment Practices		Total Suspended Solids			Total Phosphorus		
Identification (label)	Description	Year Built	Acreage (acres)	Conveyance Method (GS, CG, UR)	Main Treatment Type (WP, IB, etc.)	Other Treatment (SC, LM)	Discharge No Controls (pounds)	Discharge Controls (pounds)	TSS Control (%)	Discharge No Controls (pounds)	Discharge Controls (pounds)	TP Control (%)
Storm Water Facilities - Publicly Owned*												
No publicly owned storm water facilities within Reachshed KK-2 were included in this study.												
Storm Water Facilities - Privately Owned with Maintenance Agreement*												
No privately owned storm water faciliites within Reachshed KK-2 were included in this study.												

*Please refer to the prior study for pollutant removal efficiency of storm water facilities not modeled in this analysis.

City of Greenfield Modeling Results for the Milwaukee River TMDL Reachshed KK-4												
Land Use Analyzed					Storm Water Treatment Practices		Total Suspended Solids			Total Phosphorus		
Identification (label)	Description	Year Built	Acreage (acres)	Conveyance Method (GS, CG, UR)	Main Treatment Type (WP, IB, etc.)	Other Treatment (SC, LM)	Discharge No Controls (pounds)	Discharge Controls (pounds)	TSS Control (%)	Discharge No Controls (pounds)	Discharge Controls (pounds)	TP Control (%)
Storm Water Facilities - Publicly Owned*												
No publicly owned storm water facilities within Reachshed KK-4 were included in this study.												
Storm Water Facilities - Privately Owned with Maintenance Agreement*												
stWSS-171	Festival Foods Parking Lot	2021	0.38		Underground Storage	N/A	224.97	110.86	50.72%	0.72	0.45	38.40%
stWSS-177-179	Interchange South	2022	10.42		Retention Basin	N/A	2,536.13	911.89	64.04%	7.88	3.86	51.07%
stWSS-183	Lake Ford	2023	1.86		Bio-Retention	N/A	309.10	78.75	74.52%	0.75	0.35	52.96%
stWSS-188	Mr. Car Wash - 27th	2023	0.96		Underground Storage	N/A	464.36	262.03	43.57%	1.33	0.88	34.34%
SUBTOTAL			**13.62**				**3,534.56**	**1,363.52**	**61.42%**	**10.69**	**5.53**	**48.26%**

*Please refer to the prior study for pollutant removal efficiency of storm water facilities not modeled in this analysis.

City of Greenfield
Modeling Results for the Milwaukee River TMDL Reachshed KK-6

Land Use Analyzed					Storm Water Treatment Practices		Total Suspended Solids			Total Phosphorus		
Identification (label)	Description	Year Built	Acreage (acres)	Conveyance Method (GS, CG, UR)	Main Treatment Type (WP, IB, etc.)	Other Treatment (SC, LM)	Discharge No Controls (pounds)	Discharge Controls (pounds)	TSS Control (%)	Discharge No Controls (pounds)	Discharge Controls (pounds)	TP Control (%)
Storm Water Facilities - Publicly Owned*												
No publicly owned storm water facilities within Reachshed KK-6 were included in this study.												
Storm Water Facilities - Privately Owned with Maintenance Agreement*												
stWSS-153	The Sanctuary at Cherokee Point	2019	0.21		Underground Detention	N/A	112.22	20.73	81.52%	0.33	0.10	70.81%
stWSS-154	The Sanctuary at Cherokee Point	2019	0.24		Underground Detention	N/A	133.54	27.44	79.45%	0.41	0.14	67.20%
stWSS-155	The Sanctuary at Cherokee Point	2019	0.29		Underground Detention	N/A	152.21	31.47	79.32%	0.40	0.13	68.29%
stWSS-170	Educators Credit Union	2021	0.31		Pervious Pavers	N/A	124.40	24.28	80.48%	0.32	0.10	67.73%
SUBTOTAL			**1.04**				**522.37**	**103.93**	**80.10%**	**1.46**	**0.46**	**68.43%**

*Please refer to the prior study for pollutant removal efficiency of storm water facilities not modeled in this analysis.

City of Greenfield
Modeling Results for the Milwaukee River TMDL Reachshed MN-15

Land Use Analyzed					Storm Water Treatment Practices		Total Suspended Solids			Total Phosphorus		
Identification (label)	Description	Year Built	Acreage (acres)	Conveyance Method (GS, CG, UR)	Main Treatment Type (WP, IB, etc.)	Other Treatment (SC, LM)	Discharge No Controls (pounds)	Discharge Controls (pounds)	TSS Control (%)	Discharge No Controls (pounds)	Discharge Controls (pounds)	TP Control (%)
Storm Water Facilities - Publicly Owned*												
stWSS-087, stWSS-088,stWSS-090, stWSS-91,stWSS-143,stWSS-144,stWSS-145[1]	City Hall Rain Gardens and Pervious Pavement	2013	4.75	CG	Bio-Retention, Pervious Pavement	N/A	1,847.61	1108.61	40.00%	4.49	3.01	32.89%
stWSS-129, stWSS-096	Creekwood Park (43rd St)	2016	15.27	CG	Restrictor MH	N/A	2,542.34	0.00	100.00%	11.32	0.00	100.00%
stWSS-152	4400 Edgerton	2018	1.87	CG	Detention Basin	N/A	311.31	0.57	99.82%	1.39	0.00	99.74%
stWSS-118-119[1]	2008_01	2010	17.43	CG	MTU	N/A	3,917.58	2,796.56	28.62%	15.38	12.38	19.50%
stWSS-189	Honey Creek Wet Pond	2023	115.53	CG	Retention Basin	SC	19,727.95	5,218.91	73.55%	79.69	41.11	48.42%
stWSS-190[2]	Honey Creek Stream Restoration	2023	-	-	Stream Restoration	N/A	-	-	-	-	-	-
SUBTOTAL			**154.85**				**28,346.80**	**9,124.64**	**67.81%**	**112.26**	**56.50**	**49.67%**
Storm Water Facilities - Privately Owned with Maintenance Agreement*												
stWSS-008, stWSS-072, stWSS-121	Aldi (Layton)	2006	2.53	CG	Underground Detention	N/A	1,012.05	0.00	100.00%	2.60	0.00	100.00%
stWSS-019, stWSS-165[1]	House of Harley Davidson	2002/2021	9.02	CG	Bio-Retention	N/A	1,980.00	165.00	91.67%	5.08	0.48	90.65%
stWSS-157	Layton Avenue Car Wash	2021	0.9	CG	Underground Detention	N/A	371.00	85.16	77.05%	0.74	0.26	64.83%
stWSS-164	Greenbrook Terrace Apartments	2021	0.49	CG	Bio-Retention	N/A	107.82	24.58	77.20%	0.42	0.12	72.28%
stWSS-181	Greater Milwaukee Oral Surgery	2023	0.14	CG	Bio-Retention	N/A	57.81	25.62	55.68%	0.10	0.06	46.44%
SUBTOTAL			**13.08**				**3,528.68**	**300.36**	**91.49%**	**8.95**	**0.91**	**89.86%**

[1]These storm water facilities were modeled in a treatment chain.

[2]Due to this project receiving TRM grant funding, the Honey Creek Stream Restoration project cannot receive TSS and TP pollutant loading credit.

*Please refer to the prior study for pollutant removal efficiency of storm water facilities not modeled in this analysis.

City of Greenfield Modeling Results for the Non-TMDL Oak Creek Reachshed												
Land Use Analyzed					Storm Water Treatment Practices		Total Suspended Solids			Total Phosphorus		
Identification (label)	Description	Year Built	Acreage (acres)	Conveyance Method (GS, CG, UR)	Main Treatment Type (WP, IB, etc.)	Other Treatment (SC, LM)	Discharge No Controls (pounds)	Discharge Controls (pounds)	TSS Control (%)	Discharge No Controls (pounds)	Discharge Controls (pounds)	TP Control (%)
Storm Water Facilities - Publicly Owned*												
No publicly owned storm water facilities within the Oak Creek Reachshed were included in this study.												
Storm Water Facilities - Privately Owned with Maintenance Agreement*												
No privately owned storm water faciliites within the Oak Creek Reachshed were included in this study.												

*Please refer to the prior study for pollutant removal efficiency of storm water facilities not modeled in this analysis.

City of Greenfield
Modeling Results for the Non-TMDL Root River Reachshed

Land Use Analyzed					Storm Water Treatment Practices		Total Suspended Solids			Total Phosphorus		
Identification (label)	Description	Year Built	Acreage (acres)	Conveyance Method (GS, CG, UR)	Main Treatment Type (WP, IB, etc.)	Other Treatment (SC, LM)	Discharge No Controls (pounds)	Discharge Controls (pounds)	TSS Control (%)	Discharge No Controls (pounds)	Discharge Controls (pounds)	TP Control (%)
Storm Water Facilities - Publicly Owned*												
stWSS-114[1]	2007_28	2010	-	-	MTU	-	-	-	-	-	-	-
stWSS-115[1]	2007_28	2010	-	-	MTU	-	-	-	-	-	-	-
SUBTOTAL			**0.00**				**0.00**	**0.00**	**#DIV/0!**	**0.00**	**0.00**	**#DIV/0!**
Storm Water Facilities - Privately Owned with Maintenance Agreement*												
stWSS-149	Sunburst Apartments	2017	2.15	CG	Bio-Retention	N/A	1,065.74	428.30	59.81%	3.17	1.50	52.71%
stWSS-003	Layton Terrace	1998	6.85	CG	Detention Basin	N/A	1,425.72	157.16	88.98%	5.33	0.80	84.94%
stWSS-156	Landmark Credit Union	2019	1.65	CG	MTU	N/A	420.08	231.98	44.78%	1.03	0.68	34.08%
stWSS-158-160[2]	Greenfield GMX	2021	1.09	CG	Underground Detention	N/A	500.01	262.83	47.44%	1.75	1.14	35.29%
stWSS-162-163[2]	Anne's Acres	2021	1.68	CG	Bio-Retention and Detention Basin	N/A	259.02	41.65	83.92%	1.06	0.43	59.03%
stWSS-166	Greenfield Rehab Hospital	2020	0.36	CG	Bio-Retention	N/A	144.01	14.12	90.19%	0.37	0.07	82.36%
stWSS-167	Greenfield Rehab Hospital	2020	0.33	CG	Bio-Retention	N/A	134.42	26.62	80.19%	0.35	0.10	69.80%
stWSS-168	Greenfield Rehab Hospital	2020	0.44	CG	Bio-Retention	N/A	176.41	21.98	87.54%	0.45	0.10	78.44%
stWSS-169	Greenfield Rehab Hospital	2020	0.54	CG	Bio-Retention	N/A	216.35	36.54	83.11%	0.56	0.15	72.75%
stWSS-172-173[1]	The Woods - A GreatLife Community	2022	5.51	CG	Retention Basin	N/A	1,122.63	178.79	84.07%	4.31	1.64	61.93%
stWSS-174-176[1]	The Woods - A GreatLife Community	2022	1.98	CG	Underground Detention	N/A	563.92	0.00	100.00%	1.84	0.00	100.00%
stWSS-180	6245 S 27th St Restaurant	2022	0.6	CG	Bio-Retention	N/A	21.76	0.73	96.62%	0.09	0.01	92.30%
st-WSS-182	UW Credit Union	2023	0.09	CG	Bio-Retention	N/A	508.23	330.94	34.88%	1.04	0.74	28.94%
SUBTOTAL			**23.27**				**6,558.31**	**1,731.63**	**73.60%**	**21.34**	**7.35**	**65.55%**

[1]These storm water facilities were included in this effort to QA/QC the prior study drainage basin size. From R/M analysis, the prior model drainage basin is correct and no updates were made.
[2]These storm water facilities were modeled in a treatment chain.
*Please refer to the prior study for pollutant removal efficiency of storm water facilities not modeled in this analysis.

Attachment B: BMP Efficiency

City of Greenfield MS4 Storm Water Modeling Update BMP Efficiency Table											
Structure ID	BMP Description	Reachshed	Drainage Area (Acres)	BMP Type	Year Built	Maint. Agreement (Yes/No)	Ownership (Public/Private)	BMP TSS Efficiency (pounds)	TMP TP Efficiency (pounds)	Eligible for MS4 Analysis	Eligible for TMDL Analysis
N/A	Swale KK-1	KK-1	67.39	Swale	N/A	Yes	Public	1380.00	0.67	Yes	Yes
N/A	Swale KK-2	KK-2	26.4	Swale	N/A	Yes	Public	940.00	0.45	Yes	Yes
N/A	Swale KK-4	KK-4	227.24	Swale	N/A	Yes	Public	1540.00	0.75	Yes	Yes
N/A	Swale KK-6	KK-6	37.12	Swale	N/A	Yes	Public	1060.00	0.05	Yes	Yes
N/A	Swale MN-15	MN-15	382.03	Swale	N/A	Yes	Public	1520.00	0.75	Yes	Yes
stWSS-001	Pondview Park Pond	KK-6	211.91	Retention Basin	1997	Yes	Public	1300.00	0.44	Yes	Yes
stWSS-003	Layton Terrace	RR	6.85	Detention Basin	1998	Yes	Private	1268.57	4.52	Yes	No
stWSS-004	Wildcat Creek Pond*	RR	6.59	Retention Basin	1999	Yes	Private	1260.00	0.42	Yes	No
stWSS-005	Whitnall High School Pond 1*	RR	107.95	Retention Basin	2012	Yes	Private	1040.00	0.35	Yes	No
stWSS-008, stWSS-072, stWSS-121	Aldi (Layton)	MN-15	2.53	Restrictor MH, Underground Detention, MTU	2006	Yes	Private	1012.05	2.60	Yes	Yes
stWSS-009, stWSS-077, stWSS-078, stWSS-079, stWSS-080	Fountain View Condos Pond	MN-15	18.42	Retention Basin	2002	Yes	Private	1720.00	0.58	Yes	Yes
stWSS-010	Honey Creek Condo Pond 2*	MN-15	-	Retention Basin	2003	Yes	Private	1740.00	0.59	Yes	Yes
stWSS-011	Honey Creek Condo Pond 1*	MN-15	3.93	Retention Basin	2003	Yes	Private	1740.00	0.59	Yes	Yes
stWSS-014, stWSS-037	Vici Aveda Pond*	RR	4.16	Bio-Filter	2003	Yes	Private	1600.00	0.54	Yes	No
stWSS-015	Woodland Ridge Pond 2*	RR	-	Detention Basin	2002	Yes	Private	1700.00	0.57	Yes	No
stWSS-016	Woodland Ridge Pond 1*	RR	6.62	Retention Basin	2002	Yes	Private	1700.00	0.57	Yes	No
stWSS-017	Woodland Ridge Pond 3	RR	6.84	Retention Basin	2002	Yes	Private	1700.00	0.57	Yes	No
stWSS-018	Heritage Village Pond*	MN-15	61.45	Retention Basin	1987	Yes	Private	1420.00	0.51	Yes	Yes
stWSS-019, stWSS-165	House of Harley BR*	MN-15	2.22	Bio-Retention Basin	2002	Yes	Private	1815.00	4.60	Yes	Yes
stWSS-020, stWSS-122, stWSS-123	Stus Flooring*	MN-15	1.93	MTU & Detention Basin	2004	Yes	Private	1600.00	0.54	Yes	Yes
stWSS-021, stWSS-044	Amberwood Condos Ponds*	MN-15	13.59	Retention Basin	1980	Yes	Private	1340.00	0.47	Yes	Yes
stWSS-022	Stonewater Ridge North Pond*	MN-15	8.3	Retention Basin	2005	Yes	Private	1860.00	0.63	Yes	Yes
stWSS-023	Stonewater Ridge South Pond*	MN-15	-	Retention Basin	2005	Yes	Private	1860.00	0.63	Yes	Yes
stWSS-024, stWSS-191	Pain Management Center*	MN-15	1.07	MTU & Detention Basin	2005	Yes	Private	1900.00	0.64	Yes	Yes
stWSS-025, stWSS-026, stWSS-124	Russ Darrow MTU*	RR	2.52	MTU	2002	Yes	Private	1600.00	0.54	Yes	No
stWSS-027	Progressive Insurance Pond*	RR	3.7	Retention Basin	2005	Yes	Private	1720.00	0.58	No	No
stWSS-028, stWSS-029, stWSS-030	Woodlands Condos Pond	RR	8.12	Retention Basin	2007	Yes	Private	1860.00	0.63	No	No
stWSS-031	Granada Meadows Pond	RR	2.95	Detention Basin	2007	Yes	Private	1860.00	0.63	No	No
stWSS-032	Ramsey Meadows Pond*	RR	19.56	Retention Basin	2007	Yes	Private	1600.00	0.54	No	No
stWSS-033, stWSS-034	KOA Pond*	RR	3.35	Retention Basin	2008	Yes	Private	1500.00	0.50	No	No
stWSS-035	Forest Ridge Pond	MN-15	7.91	Retention Basin	2008	Yes	Private	1620.00	0.55	No	Yes
stWSS-036	Greenway Medical Pond*	RR	4.32	Retention Basin	2006	Yes	Private	1600.00	0.54	No	No
stWSS-039	First Weber Pond*	RR	3.87	Detention Basin	2006		Private	1600.00	0.54	Yes	No
stWSS-040	Whitnall Pond*	RR	4.16	Retention Basin	2007	Yes	Private	1600.00	0.54	No	No
stWSS-041, stWSS-042	Winter Park Pond*	RR	13.1	Retention Basin	2007	Yes	Private	1740.00	0.59	No	No
stWSS-043	Orchard Apartments Pond*	RR	3.38	Retention Basin	2007	Yes	Private	1720.00	0.58	No	No
stWSS-047	Garden Village Condos Basin*	RR	3.24	Infiltration Basin	2006	Yes	Private	2000.00	0.68	No	No
stWSS-048	Wisconsin Bank Trust US*	RR	2.14	Underground Storage	2006	Yes	Private	1620.00	0.55	Yes	No
stWSS-051	Loomis Medical Offices Pond 1*	MN-15	4.26	Retention Basin	2006	Yes	Private	1620.00	0.55	No	Yes
stWSS-052	Loomis Medical Offices Pond 2*	MN-15	-	Retention Basin	2007	Yes	Private	1620.00	0.55	No	Yes
stWSS-053	BILTRITE Pond*	MN-15	5.4	Retention Basin	2005	Yes	Private	1960.00	0.66	Yes	Yes
stWSS-054	Highlands BS	RR	20.83	Bio-Swale	2007	Yes	Private	1600.00	0.54	No	No
stWSS-055	Highlands RG	RR	-	Rain Garden	2007	Yes	Private	1600.00	0.54	No	No
stWSS-056	Highlands Pond B	RR	-	Retention Basin	2007	Yes	Private	1600.00	0.54	No	No
stWSS-057	Highlands Pond A	RR	-	Retention Basin	2007	Yes	Private	1600.00	0.54	No	No
stWSS-058	Highlands Pond C	RR	-	Retention Basin	2007	Yes	Private	1600.00	0.54	No	No
stWSS-059	Highland Pond E	RR	-	Retention Basin	2007	Yes	Private	1600.00	0.54	No	No
stWSS-060	Highland Pond D	RR	-	Retention Basin	2007	Yes	Private	1600.00	0.54	No	No
stWSS-064	Greenfield High School Pond*	MN-15	89.8	Retention Basin	2008	Yes	Private	640.00	0.22	Yes	Yes
stWSS-065	Creekside Condos Pond 2	RR	3.92	Retention Basin	2007	Yes	Private	1780.00	0.60	No	No
stWSS-066	Creekside Condos Pond 1	RR	1.11	Retention Basin	2007	Yes	Private	1780.00	0.60	No	No
stWSS-067	Falconers Reserve Pond*	RR	2.34	Retention Basin	2007	Yes	Private	1660.00	0.56	No	No
stWSS-068	Clear Channel Pond*	MN-15	9.14	Retention Basin	2017	Yes	Private	1660.00	0.81	Yes	Yes
stWSS-069	Meadows of Greenfield BS*	MN-15	0.93	Bio-Swale	2011	Yes	Private	700.00	0.23	No	Yes
stWSS-070	Vet Hospital RG*	RR	0.31	Rain Garden	2007	Yes	Private	1300.00	0.44	Yes	No
stWSS-071	Vet Hospital US*	RR	1.25	Underground Storage	2007	Yes	Private	1300.00	0.44	Yes	No
stWSS-074	Aldi 108th RG*	RR	1.32	Rain Garden	2011	Yes	Public	1020.00	0.34	Yes	No
stWSS-076	Our Lady of the Angels Pond*	RR	2.88	Detention Basin	2011	Yes	Private	920.00	0.31	Yes	No
stWSS-081	Witnall High School Pond 2*	RR	-	Retention Basin	2012	Yes	Private	1040.00	0.35	Yes	No
stWSS-084	Boucher US*	RR	1.67	Underground Storage	2013	Yes	Private	1580.00	0.53	Yes	No
stWSS-085	Walmart US 1*	RR	13.13	Underground Storage	2012	Yes	Private	1160.00	0.39	Yes	No
stWSS-086	Walmart US 2*	RR	-	Underground Storage	2012	Yes	Private	1160.00	0.39	Yes	No
stWSS-087, stWSS-088, stWSS-090, stWSS-091, stWSS-143, stWSS-144, stWSS-145	City Hall Rain Gardens and Pervious Pavers	MN-15	0.37	Bioretention, Pervious Pavement	2013	Yes	Public	739.00	1.48	Yes	Yes
stWSS-092	Holmes and 122nd BR*	RR	5.18	Bio-Retention Basin	2014	Yes	Public	780.00	0.26	No	No
stWSS-094	Salvation Army BS*	KK-4	1.67	Bio-Swale	2015	Yes	Private	720.00	0.24	Yes	Yes
stWSS-095	Meijer Pond*	MN-15	16.86	Retention Basin	2015	Yes	Private	1340.00	0.45	Yes	Yes
stWSS-096, stWSS-129	Creekwood Park BR*	MN-15	15.27	Bio-Retention Basin	2016	Yes	Public	2542.34	11.32	No	Yes
stWSS-097	Culvers BR 1*	MN-15	0.71	Bio-Retention Basin	2016	Yes	Private	920.00	0.31	Yes	Yes
stWSS-098	Culvers BR 2*	MN-15	-	Bio-Retention Basin	2016	Yes	Private	920.00	0.31	Yes	Yes
stWSS-099	Shorewest US*	MN-15	1.02	Underground Storage	2016	Yes	Private	1120.00	0.38	Yes	Yes
stWSS-100	The Glen BR*	RR	-	Bio-Retention Basin	2016	Yes	Private	1760.00	0.59	No	No
stWSS-101	The Glen Pond*	RR	6.19	Retention Basin	2016	Yes	Private	1760.00	0.59	No	No
stWSS-102	Konkel Park BR*	RR	2.28	Bio-Retention Basin	2016	Yes	Public	1080.00	0.36	Yes	No
stWSS-103, stWSS-104, stWSS-130	84 South US 1 & 2*	RR	85.91	Underground Storage	2016	Yes	Private	1120.00	0.38	Yes	No
stWSS-105	Layton Baptist Church Sound Pond*	RR	-	Retention Basin	2016	Yes	Private	1620.00	0.55	No	No
stWSS-106	Layton Baptist Church North Pond*	RR	2.34	Retention Basin	2016	Yes	Private	1620.00	0.55	No	No
stWSS-108	Root River Pkwy MTU*	RR	48.96	MTU	2007	Yes	Private	220.00	0.07	No	No
stWSS-109	Brookdale Dr MTU 2*	RR	3.95	MTU	2007	Yes	Public	220.00	0.07	No	No
stWSS-110	Brookdale Dr MTU 1*	RR	1.22	MTU	2007	Yes	Public	220.00	0.07	No	No

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City of Greenfield MS4 Storm Water Modeling Update BMP Efficiency Table											
Structure ID	BMP Description	Reachshed	Drainage Area (Acres)	BMP Type	Year Built	Maint. Agreement (Yes/No)	Ownership (Public/Private)	BMP TSS Efficiency (pounds)	TMP TP Efficiency (pounds)	Eligible for MS4 Analysis	Eligible for TMDL Analysis
stWSS-111	LEC MTU 2*	MN-15	-	MTU	2006	Yes	Public	260.00	0.09	No	Yes
stWSS-112	LEC MTU 3*	MN-15	-	MTU	2006	Yes	Public	260.00	0.09	No	Yes
stWSS-113	Waterford Ave MTU 3*	RR	18.08	MTU	2010	Yes	Public	260.00	0.09	No	No
stWSS-114	Plainfield Ave MTU 2*	RR	5.83	MTU	2010	Yes	Public	260.00	0.09	No	No
stWSS-115	Plainfield Ave MTU 1*	RR	14.09	MTU	2010	Yes	Public	260.00	0.08	No	No
stWSS-116	Waterford Ave MTU 1*	RR	4.21	MTU	2010	Yes	Public	180.00	0.06	No	No
stWSS-117	Waterford Ave MTU 2*	RR	0.83	MTU	2010	Yes	Public	260.00	0.09	No	No
stWSS-118, stWSS-119	Allerton Ave MTU*	MN-15	17.43	MTU	2010	Yes	Public	1121.03	3.00	No	Yes
stWSS-120	Aldi 108th MTU*	RR	0.54	MTU	2011	Yes	Private	1020.00	0.34	Yes	No
stWSS-136, stWSS-137, stWSS-138, stWSS-139	Glenwood School West BF's	KK-1	1.36	Bio-Filter	2017	Yes	Private	1520.00	0.51	Yes	Yes
stWSS-140, stWSS-141	Glenwood School BR & US	KK-2	1.16	Bio-Retention/Underground Storage	2017	Yes	Private	1160.00	0.39	Yes	Yes
stWSS-142	LEC MTU 1*	MN-15	6.91	MTU	2006	Yes	Public	260.00	0.09	No	Yes
stWSS-149	Sunburst Apartments	RR	2.15	Bio-Retention	2017	Yes	Private	637.44	1.67	Yes	No
stWSS-152	4400 Edgerton	MN-15	1.87	Detention Basin	2018	Yes	Public	310.74	1.38	Yes	Yes
stWSS-153	The Sanctuary At Cherokee Point	KK-6	0.21	Underground Detention	2020	Yes	Private	91.49	0.24	No	Yes
stWSS-154	The Sanctuary At Cherokee Point	KK-6	0.24	Underground Detention	2020	Yes	Private	106.09	0.28	No	Yes
stWSS-155	The Sanctuary At Cherokee Point	KK-6	0.29	Underground Detention	2020	Yes	Private	120.74	0.27	No	Yes
stWSS-156	Landmark Credit Union	RR	1.65	MTU	2020	Yes	Private	188.11	0.35	Yes	No
stWSS-157	Layton Avenue Car Wash	MN-15	0.9	Underground Detention	2021	Yes	Private	285.85	0.48	No	Yes
stWSS-158, stWSS-159, stWSS-160	Greenfield GMX	RR	1.09	Underground Detention, Restrictor MH	2021	Yes	Private	237.19	0.62	Yes	No
stWSS-162, stWSS-163	Anne's Acres	RR	1.68	Bio-Retention, Detention Basin	2021	Yes	Private	217.37	0.63	No	No
stWSS-164	Greenbrook Terrace Apartments	MN-15	0.49	Bio-Retention	2021	Yes	Private	83.24	0.31	No	Yes
stWSS-166	Greenfield Rehab Hospital	RR	0.36	Bio-Retention	2021	Yes	Private	129.89	0.31	Yes	No
stWSS-167	Greenfield Rehab Hospital	RR	0.33	Bio-Retention	2021	Yes	Private	107.80	0.24	Yes	No
stWSS-168	Greenfield Rehab Hospital	RR	0.44	Bio-Retention	2021	Yes	Private	154.43	0.36	Yes	No
stWSS-169	Greenfield Rehab Hospital	RR	0.54	Bio-Retention	2021	Yes	Private	179.81	0.41	Yes	No
stWSS-170	Educators Credit Union	KK-6	0.31	Pervious Pavers	2021	Yes	Private	100.12	0.22	Yes	Yes
stWSS-171	Festival Foods Entrance Road	KK-4	0.31	Underground Storage	2021	Yes	Private	114.11	0.28	Yes	Yes
stWSS-172, stWSS-173	The Woods - A Great Life Community	RR	5.51	Retention Basin, Bio-Retention	2022	Yes	Private	943.84	2.67	No	No
stWSS-174, stWSS-175, stWSS-176	The Woods - A Great Life Community	RR	1.98	Underground Detention, MTU	2022	Yes	Private	563.92	1.84	No	No
stWSS-177, stWSS-178, stWSS-179	Interchange South	KK-4	10.42	Retention Basin, Underground Detention, Bio-Retention	2022	Yes	Private	1624.25	4.03	No	Yes
stWSS-180	6245 S 27th St Restaurant	RR	0.6	Bio-Retention	2022	Yes	Private	21.02	0.08	Yes	No
stWSS-181	Greater Milwaukee Oral Surgery	MN-15	0.14	Bio-Retention	2023	Yes	Private	32.19	0.05	Yes	Yes
stWSS-182	UW Credit Union	RR	0.09	Bio-Retention	2023	Yes	Private	177.29	0.30	Yes	No
stWSS-183	Lake Ford	KK-4	1.86	Bio-Retention	2023	Yes	Private	230.36	0.40	Yes	Yes
stWSS-184-187	Weatherization Services	KK-4	5.26	CB, CB, MH-sumped, Grass Swale	2023	Yes	Private	1080.12	2.61	Yes	Yes
stWSS-188	Mr. Car Wash - 27th	KK-4	0.96	Underground Storage	2023	Yes	Private	202.33	0.46	Yes	Yes
stWSS-189	Honey Creek Wet Pond	MN-15	115.53	Retention Basin	2023	Yes	Public	14509.05	38.58	No	Yes
stWSS-190	Honey Creek Stream Restoration	MN-15	-	Stream Restoration	2023	Yes	Public	-	-	-	-

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