PD 4165-004

PD 4264-001

N

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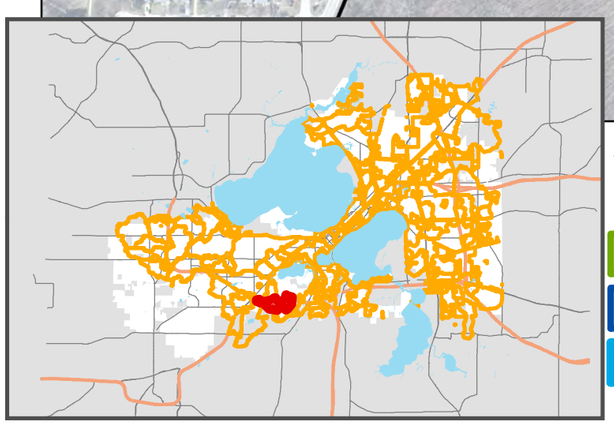
S



WI03A

- Greenway
- Pond
- Ponds in TMDL Model (2)

- Stormwater Pipes
- Private Pipes
- Excluded Pollutants (1)
- PD 4165-004_EXP
- PD 4165-004_MAD
- PD 4264-001_EXP
- PD 4264-001_MAD

Note:
_Sw =more frequent sweeping
_Exp = excluded pollutants
_Mad =not excluded

0 550 1,100 Feet

Date: 2/19/2021

Document Path: M:\MS4_WaterQuality\Model\2019_2020 Modeling Effort\GIS\WorkingMXDs\ModelAreas_DD.mxd

User Name: enles

PD 4564-003

WI03B

- Greenway
- Pond
- Ponds in TMDL Model (1)
- Catchbasins (2)
- ScreenStructures (1)
- Stormwater Pipes
- Private Pipes
- Excluded Pollutants (1)
- PD 4564-003_EXP
- PD 4564-003_MAD
- TD4565-001_EXP
- TD4565-001_MAD

Note:
_Sw =more frequent sweeping
_Exp = excluded pollutants
_Mad =not excluded

0 750 1,500 Feet

Date: 2/19/2021

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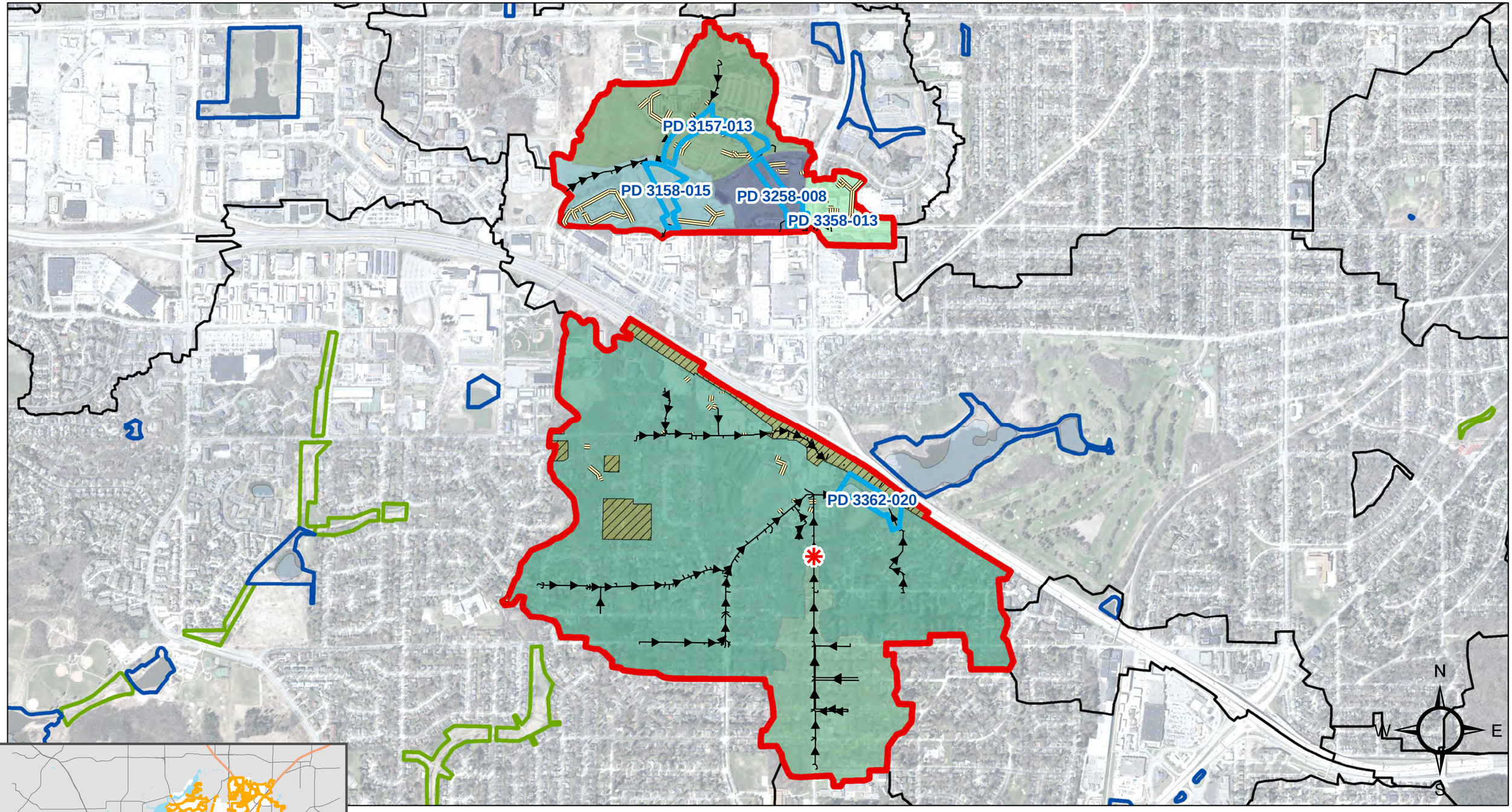
User Name: enles



WW01

- Greenway
- Pond
- Ponds in TMDL Model (5)

- ScreenStructures (1)
- Stormwater Pipes
- Private Pipes
- Excluded Pollutants (1)
- PD 3157-013_MAD
- PD 3158-015_MAD
- PD 3258-008_MAD
- PD 3358-013_MAD
- PD 3362-020_EXP
- PD 3362-020_MAD
- SS3363-030_MAD

Note:
_Sw =more frequent sweeping
_Exp = excluded pollutants
_Mad =not excluded

0 1,250 2,500 Feet

Date: 2/19/2021

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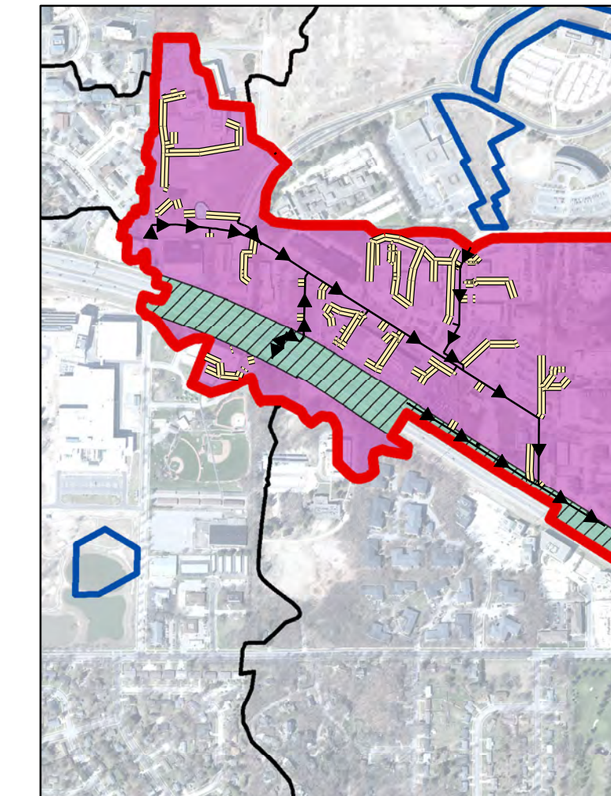

WW02A

- Greenway
- Pond
- Ponds in TMDL Model (2)

- Catchbasins (13)
- ScreenStructures (1)
- Stormwater Pipes
- Private Pipes
- Excluded Pollutants (1)

- NA_WINakGC_MAD
- PD 3462-001_EXP
- PD 3462-001_MAD
- PD 4061-006_EXP
- PD 4061-006_MAD

PD 3462-001

PD 4061-006

N
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Note:
_Sw =more frequent sweeping
_Exp = excluded pollutants
_Mad =not excluded

0 1,000 2,000 Feet

Date: 2/19/2021

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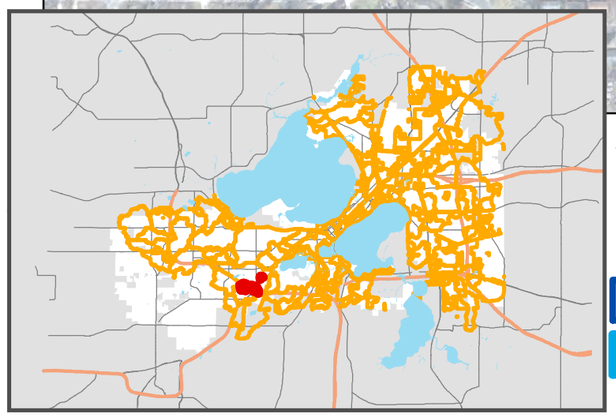
User Name: enles

PD 3564-028



WW02B

- Pond
- Ponds in TMDL Model (1)
- ScreenStructures (1)
- Stormwater Pipes
- Private Pipes
- Excluded Pollutants (1)
- PD 3564-028_EXP
- PD 3564-028_MAD
- SS3862-037_MAD

Note:
_Sw =more frequent sweeping
_Exp = excluded pollutants
_Mad =not excluded

0 500 1,000 Feet

Date: 2/19/2021

N
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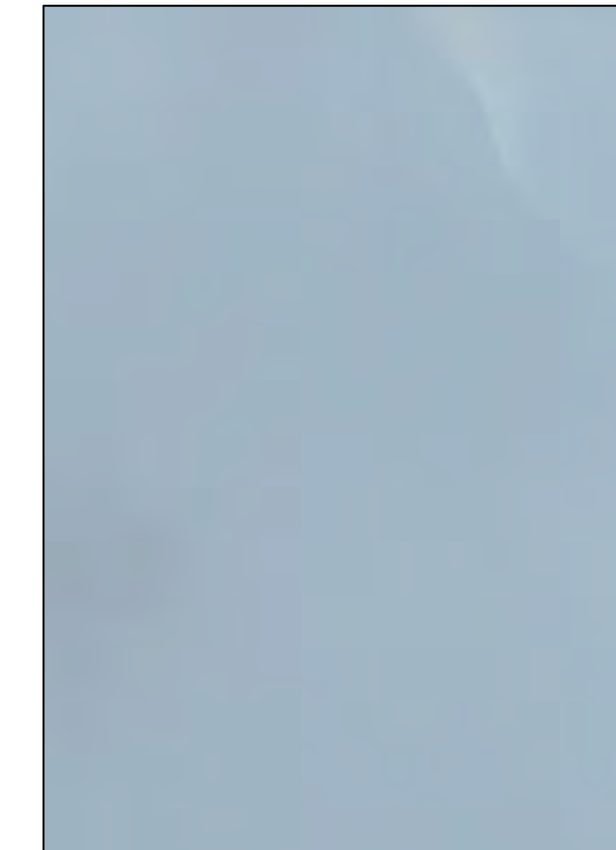
User Name: enles



Y64_01

- Greenway
- Pond
- Private Practice (11)
- Catchbasins (41)
- Stormwater Pipes
- Private Pipes
- Street Sweeping (1)
- NA_YR64_MAD
- NA_YR64_Sw_MAD

Note:
_Sw =more frequent sweeping
_Exp = excluded pollutants
_Mad =not excluded

0 2,050 4,100 Feet

Date: 2/19/2021

Document Path: M:\MS4_WaterQuality\Model\2019_2020 Modeling Effort\GIS\WorkingMXDs\ModelAreas_DD.mxd

User Name: enles

Y65_01

Stormwater Pipes

Private Pipes

NA_YR65_MAD

Note:
_Sw =more frequent sweeping
_Exp = excluded pollutants
_Mad =not excluded

0 435 870
Feet

Date: 2/19/2021

N
W E
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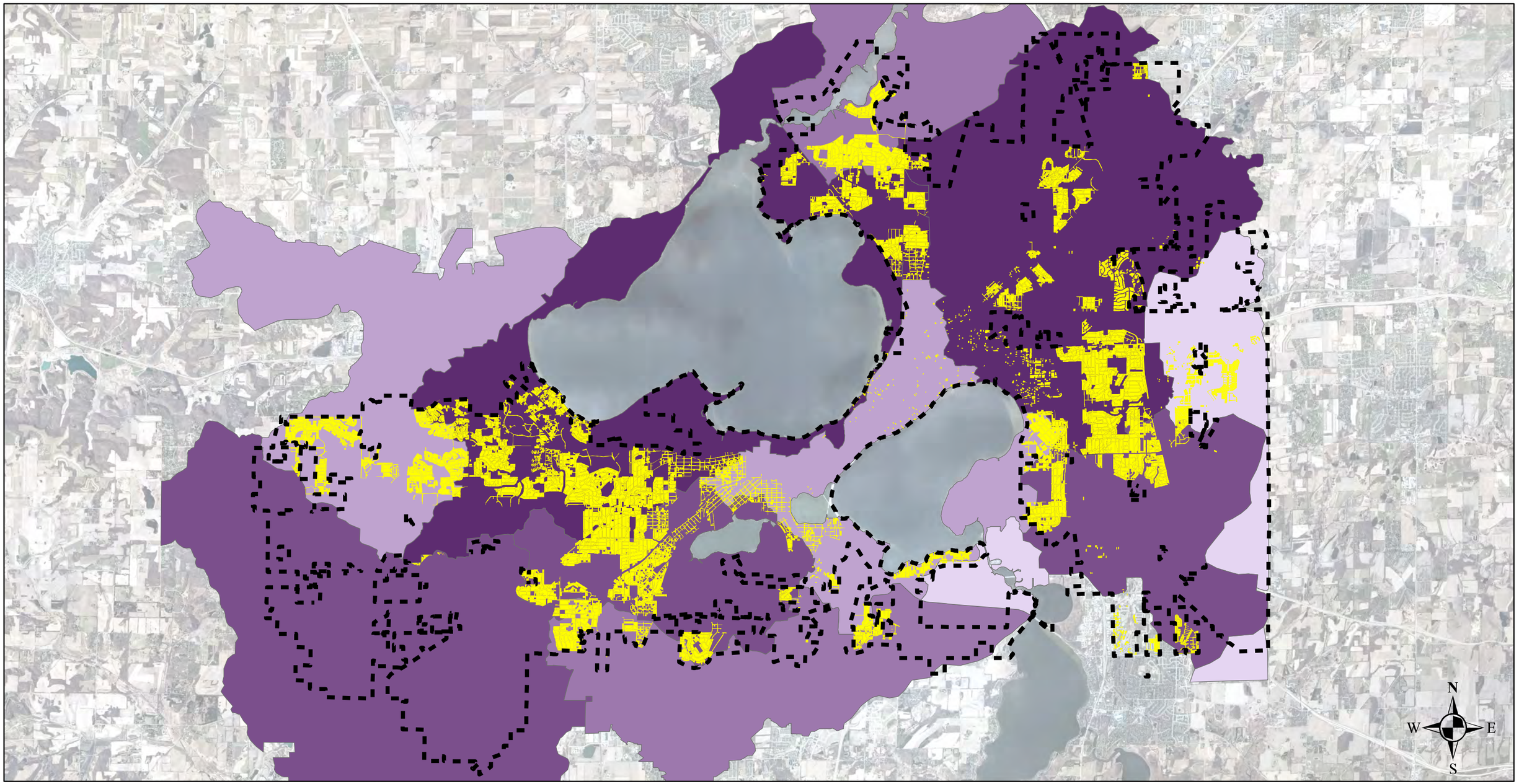
User Name: enles

Document Path: M:\MS4_WaterQualityModel\2019_2020 Modeling Effort\GIS\WorkingMXDs\ModelAreas_DD.mxd

Figure 6: Annual TP Reductions per Leaf Management Guidance By Reachshed



Legend

City of Madison Municipal Boundary

MDRNA Land Use

TP Reductions Per Leaf Guidance

- 0 - 0.5 lbs
- 0.5-17 lbs
- 17-23 lbs
- 23-53 lbs
- 53-87 lbs

0 0.5 1 2 3 4 Miles

CITY OF MADISON ENGINEERING

Appendix B: Models and Input Files

See the files included with the report: No Controls Models (v10.5.037), With Controls 5 Year Models (v10.5.037), and MS4Input2020Creater_ReducedSize.mdb.

Appendix C: Limitations

This document is governed by the specific scope of work authorized by the City; it is not intended to be relied upon by any other party except for regulatory authorities contemplated by the scope of work.

The main purpose of this document is to help the City meet the federal and state regulatory program requirements for stormwater pollution reduction. Flooding issues related to stormwater conveyance system capacity, or flood elevations, were not the focus of this document and are not addressed in this report.

This document is a planning level study. Information used to develop the results and recommendations were based on available data sources and limited field investigation. The plan provides City decision makers a sound basis for proceeding with a stormwater management program to meet federal and state stormwater pollution regulations. It is important to note however, that the recommended structural stormwater pollution management measures will require significant additional engineering and design and possible federal/state permitting, before implementation. Factors or site conditions discovered during the engineering and design phase of a project may result in modifications in the scale, scope, costs, or ultimate feasibility of the project.

It is important to note that no Waters of the State were included in this modeling effort. Some water bodies eligible for inclusion under the terms of the TMDL, including Tenney Lagoons and Warner Lagoons, were omitted from this project due to lack of necessary data.

Appendix D: References

City of Madison (2017) Modeling Post-Construction Stormwater Management and Treatment NR 151, Wis. Adm. Code. 26 December 2017.

Selbig W.R. (2016) Evaluation of leaf removal as a means to reduce nutrient concentrations and loads in urban stormwater. Science of the Total Environment, 571, pp. 124-133.

WDNR (2012) Total Maximum Daily Load and Watershed Management Plan for Total Phosphorus and Total Suspended Solids in the Lower Fox River Basin and Lower Green Bay. March 2012.

WDNR (2020) Explore Wisconsin's Waters. Accessed online at: http://dnr.wi.gov/water/default.aspx

Appendix E: WDNR Documents

Modeling guidance

City of Madison/WDNR MS4 Meeting Minutes

WDNR Correspondence

CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: November 24, 2010

TO: Regional Water Leaders, Basin Leader & Experts
Stormwater Permit Staff (via Email)

FROM: Russ Rasmussen, Director
Bureau of Watershed Management

SUBJECT: Developed Urban Areas and the 20% and 40% TSS Reductions
Sections NR 151.13(2) and NR 216.07(6), Wis. Adm. Code

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. This guidance does not establish or affect legal rights or obligations, and is not finally determinative of any of the issues addressed. This guidance does not create any rights enforceable by any party in litigation with the State of Wisconsin or the Department of Natural Resources. 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. ***This document supersedes the guidance memo dated June 6, 2005, subsequent errata dated 8/15/05 and April, 2009 and the guidance memo dated May 14, 2010.***

Issue

Under s. NR 151.13 (2), Wis. Adm. Code, a municipality subject to the municipal stormwater permit requirements of subch. I of ch. NR 216, Wis. Adm. Code, must, to the maximum extent practicable, implement a 20% and a 40% reduction in total suspended solids in runoff that enters waters of the state as compared to no controls, by March 10, 2008 and March 10, 2013, respectively. Staff who work with affected municipalities need guidance on what areas under the municipalities' jurisdictions will be included in this requirement. They also need to know what is meant by "no controls" and "with controls", and what methods are acceptable for making these calculations.

Discussion

Chapter NR 216, Wis. Adm. Code, is the implementation code for the developed urban area performance standard. Applicability for permit coverage purposes is dictated by s. NR 216.02, Wis. Adm. Code. Under this provision, owners or operators of the following municipal separate storm sewer systems (MS4s) are required to obtain coverage under a WPDES municipal stormwater permit:

- MS4s serving populations of 100,000 or more.
- Previously notified owners or operators of municipal separate storm sewer systems.
- MS4s within urbanized areas as identified by EPA.
- MS4s serving populations over 10,000 unless exempted by DNR.

"MS4" is defined under s. NR 216.002 (17), Wis. Adm. Code, as a conveyance or system of conveyances, including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, constructed channels or storm drains, which meets all the following criteria:

- Owned or operated by a municipality.
- Designed or used for collecting or conveying stormwater.
- Not a combined sewer conveying both sanitary and stormwater.

- Not part of a publicly owned wastewater treatment works that provides secondary or more stringent treatment.

"Waters of the state" is defined under s. 283.01 (20), Stats., and it includes surface water, wetlands and groundwater. Waters of the state may overlap with the definition of MS4. For this purpose, if a waterway meets the definition of an MS4, it will be regulated as an MS4. The significant language in that definition is whether or not the municipality owns or operates the drainage way (i.e., maintains, has easement access for work, dredges, etc.). For example, when a "stream" is designed or used for collecting or conveying stormwater such as flowing through a municipally owned or operated culvert or bridge restriction, that "stream" is part of the MS4.

Under s. NR 216.07 (6)(a), Wis. Adm. Code, a municipality must develop a stormwater management program to achieve compliance with the developed urban area performance standard (s. NR 151.13 (2), Wis. Adm. Code). Developed areas are generally those that were not subject to the post-construction performance standards (s. NR 151.12 or NR 151.24, Wis. Adm. Code). The total suspended solids control requirements of s. NR 151.13 (2)(b)1.b. and 2., Wis. Adm. Code, may be achieved on an individual municipal basis. Control does not have to apply uniformly across the municipality. The control may also be applied on a watershed or regional basis by involving several municipalities. However, note that the Department is proposing to revise s. NR 151.12, Wis. Adm. Code, to limit the geographic extent of the watershed or regional area that municipalities may collectively meet the developed urban area standard.

A municipality is required under s. NR 216.07 (6)(b), Wis. Adm. Code, to provide an assessment of the actions taken to comply with the performance standards. This assessment may take the form of an annual progress report. The initial assessment must include a pollutant-loading analysis using a model such as SLAMM, P8 or equivalent methodology that is approved by the department. At a minimum, a pollutant-loading analysis must be conducted for total suspended solids and phosphorus. A model would not be run again after the initial assessment unless significant management changes occurred that should be accounted for, or the progress report indicates a re-run is necessary.

DNR Guidance

To comply with the code, the developed urban area must be modeled under a "no control" condition and a "with controls" condition. The 20% and 40% TSS reductions are assessed against the "no control" condition for the entire area served by the MS4 as defined below. They are not applied uniformly across the municipality, nor are they applied drainage area by drainage area within the municipal boundary. In most cases however, a calculation drainage basin by drainage basin will be used to determine the total loading and the achieved reductions.

Areas Required to be Included in the Calculations

A municipality must include the following areas when calculating compliance with the developed urban area standard (s. NR 151.13, Wis. Adm. Code):

1. Any developed area that was not subject to the post-construction performance standards of s. NR 151.12 or 151.24, Wis. Adm. Code, for new development only, that drains to the MS4 owned or operated by the municipality. The baseline developed urban area does not change due to future redevelopment of existing urban areas.
2. Any area covered by an NOI submitted prior to October 1, 2004 where development is still underway. The pollutant load shall be based on full build out. If it is known that the future development of some parcels may require compliance with s. NR 151.12 or NR 151.24, Wis. Adm. Code, then these areas may be excluded from the calculation.
3. Any undeveloped (in-fill) areas under 5 acres. These areas must be modeled as fully developed, with a land use similar to the properties around them.
4. For municipalities with large areas of agricultural lands separating areas of development, only the developed areas within the urbanized area as defined by the U.S. Census Bureau.

5. Non-manufacturing areas of industrial facilities such as customer or employee parking lots. (The manufacturing, outside storage and vehicle maintenance areas of these industrial facilities are covered under subch. II of ch. NR 216, Wis. Adm. Code, industrial permit.)
6. Any industry that has certified a condition of "no exposure" in accordance with s. NR 216.21(3), Wis. Adm. Code.
7. Any connecting highways as identified and listed in the Official Highway State Truck Highway System Maps at: http://www.dot.wisconsin.gov/localgov/highways/connecting.htm

Areas Prohibited from Inclusion in the Calculations

Areas and loadings that shall not be included:

1. Lands zoned for agricultural use and operating as such.
2. Pollutant loadings from an upstream MS4 (independent of whether it is regulated under a ch. NR 216, Wis. Adm. Code, permit) unless the municipality has an agreement to share the pollutant control credit with the upstream municipality.
3. Undeveloped land parcels over 5 acres within the municipality. These areas will be subject to the new development post-construction performance standards of s. NR 151.12 or 151.24, Wis. Adm. Code, when developed.
4. Any internally drained area with natural infiltration. (This does not include engineered or constructed infiltration areas.) However, a separate guidance memo dated April 6, 2009 (Subject: Developed Urban Areas and the 20% and 40% Reductions - Internally Drained Areas) provides conditions under which an internally drained area may be included in the calculation.
5. Any active or inactive mining site unless it has been reclaimed into another land use. The pollutant load associated with a mining site is not included in the calculation. However, runoff which drains into a mining site would be eligible for treatment credit in accordance with the April 6, 2009 guidance memo.
6. Areas subject to the new development performance standards of s. NR 151.12, Wis. Adm. Code.

Optional Areas to Include in the Calculations

Areas a municipality may, but is not required to, include in the developed urban area load calculation:

1. Property that drains to *waters of the state* without passing through the permittee's MS4.
2. Any area that discharges to an adjacent municipality's MS4 (Municipality B) without passing through the jurisdictional municipality's MS4 (Municipality A). Municipality B that receives the discharge into their MS4 may choose to be responsible for this area from Municipality A. If Municipality B has a stormwater treatment practice that serves a portion of A as well as a portion of B, then the practice must be modeled as receiving loads from both areas, independent of who carries the responsibility for the area. However, if runoff from an area within Municipality A's jurisdiction drains into Municipality B's MS4 but then drains back into Municipality A's MS4 farther downgradient, then Municipality B does not have the option of including the load from Municipality A in their analysis and the load from that area is Municipality A's responsibility.
3. Industrial facilities subject to a permit under subch. II of ch. NR 216, Wis. Adm. Code, except the pollutant load associated with an active or inactive mining site. This exclusion covers the facilities that are required to have permit coverage. Contact the regional stormwater specialist or central office to get a list of permitted facilities within a municipality.
    - The industrial NR 216 permit covers areas with industrial materials and activities, specifically areas with manufacturing, vehicle maintenance, storage of materials, etc.

A municipality may include any of the areas identified above in their developed urban area as part of their load calculation provided the areas are not prohibited from inclusion in the calculation. If they choose to include an area, it must be included in both the "no controls" and "with controls" condition. Inclusion of areas they choose to be responsible for will allow them to take credit for any of those areas that may have controls in place. For example, if an industrial park would have been excluded because all the industries in the industrial park have an NR 216 industrial permit, but the municipality chooses to keep this area in their "no controls" area, then any best management practices existing or built to serve the industrial park can be included in the "with controls" scenario.

Model Inputs

Model Version:
To model the TSS load in the area served by the MS4, the municipality must select a model such as SLAMM, P8 or an equivalent method deemed acceptable by the Department. For the analysis to show compliance with the 40% developed urban area performance standard, SLAMM version 9.2 or P8 version 3.4 or a subsequent version of these models may be used. As part of the reporting process, the municipality must identify which model version is being used. The analysis must use the same version for both the "no controls" scenario and the "with controls" scenario unless it is verified that the "no controls" pollutant discharge load does not change between the model versions. If there is a change in the no controls pollutant discharge load then the new pollutant discharge load corresponding with the version of the model selected for the analysis needs to be utilized. An entire city-wide municipal "no controls" scenario does not need to be remodeled, only those areas being updated with the new version of the model.

"No control"
In SLAMM, the "no controls" condition generally will be based on the standard land use files for different land uses. This assumes certain default parameter files, an assumed level of disconnection and an assumed distribution of road smoothness. The "no controls" condition for each land use is based on this assumed percent of disconnected imperviousness. All land uses as modeled must be equal to the connected imperviousness values in the standard land use files unless site specific data is available. However under the "with controls" condition, land use that has a greater level of disconnection than the values in the standard land use files may take credit for volume and pollutant reduction. In P8, the help menu provides standard land use values that can be used for the percent directly connected versus indirectly connected impervious surfaces.

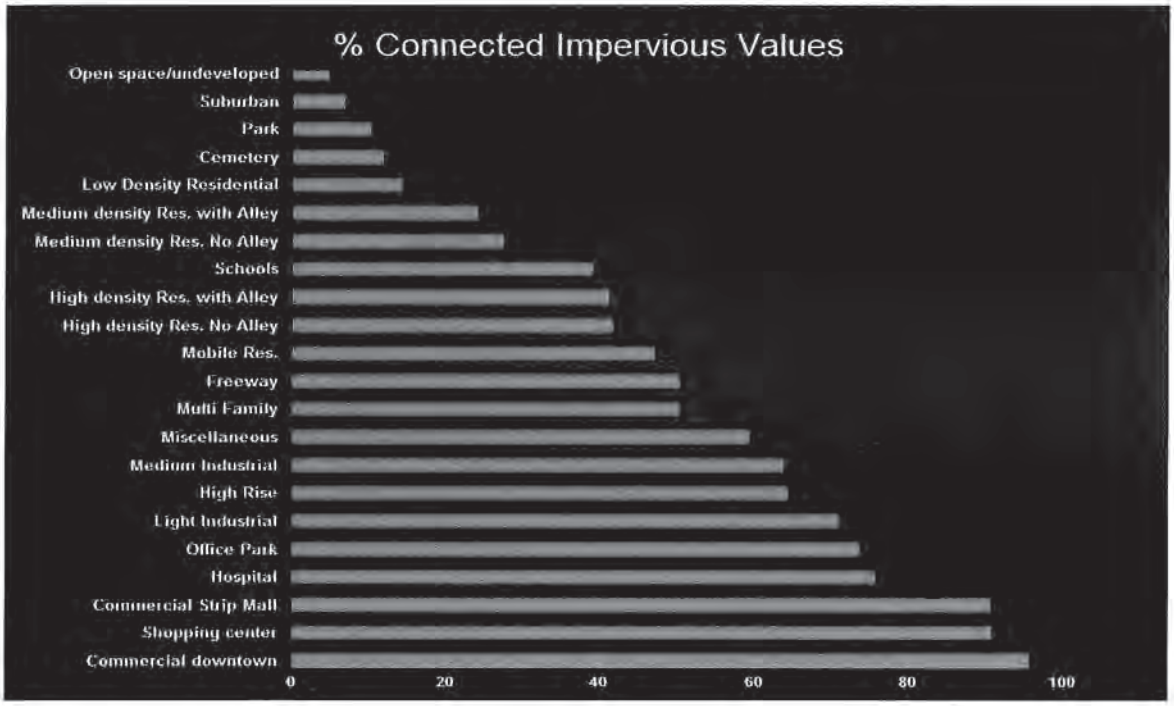
All roads within the urbanized area that are part of a county or town's MS4 are the responsibility of the county or town. To generate a load under "no controls", model the road based on the nearest urban land use, even if agricultural land use is on one or both sides of the road. Select the urban land use that will most likely typify the traffic that will be on that road (for example commercial or residential) and include that area in the corresponding standard land use file.

For the drainage system, the default will be curb and gutter (even if the drainage system is currently swale drainage), in fair condition. For "no controls" there will be no recognition of street sweeping, catch basin cleaning, swale drainage, or the existence of any engineered best management practices. These practices and facilities will be accounted for under the "with controls" condition.

A municipality is not required to use the standard land use files if it has surveyed the land uses in its developed urban area and has "real" source area data on which to base the input files. The percent connected imperviousness must be verified in the field. Disconnection may be assumed for residential rooftops where runoff has a flow path of 20 feet or greater over a pervious area in good condition. Disconnection for impervious surfaces other than residential rooftops may be assumed provided all of the following are met:

- The source area flow length does not exceed 75 feet,
- The pervious area is covered with a self-sustaining vegetation in "good" condition and at a slope not exceeding 8%,
- The pervious area flow length is at least as long as the contributing impervious area and there can be no additional runoff flowing into the pervious area other than that from the source area.
- The pervious area must receive runoff in a sheet flow manner across an impervious area with a pervious width at least as wide as the contributing impervious source area.

The table below shows the overall percent connected imperviousness that is associated with SLAMM standard land use files. The overall percent disconnection shown in this table is not input into SLAMM as the percent disconnection, rather the individual road, roof top, sidewalk, etc. areas have their own individual connectedness included in the standard land use files.



"With controls"

The "with controls" condition is applied to the developed urban area with the inclusion of the practices and facilities (existing and proposed). Modeling is a means to confirm a practice's efficiency for the conditions found in Wisconsin. If the model cannot predict efficiencies for certain practices that the municipality identifies as water quality practices, then a literature review must be conducted to estimate the reduction value. Proprietary stormwater practices that utilize settling as their means of solids reduction should be modeled in accordance with DNR Technical Standard 1006 (Method for Predicting the Efficiency of Proprietary Storm Water Sedimentation Devices).

When designing treatment practices, runoff draining to the practice from off-site must be taken into account in determining the treatment efficiency of the practice. Any impact on the efficiency must be compensated for by increasing the size of the practice accordingly.

Practices on private property that drain to an MS4 can be included in the "with controls" scenario for a municipality, provided the municipality enters into an agreement or equivalent enforceable mechanism with the stormwater treatment facility owner that will ensure the practice is properly maintained. An operation and maintenance plan, including a maintenance schedule, must be developed for the stormwater treatment facility in accordance with relevant DNR technical standards. The agreement or equivalent mechanism between the municipality and the private owner should include the following:

- A description of the stormwater treatment facility including dimensions and location.
- Identify the owner of the property on which the stormwater treatment facility is located.
- Identify who is responsible for implementing the operation and maintenance plan.
- Outline a means of terminating the agreement that includes notifying DNR.

The efficiency of the practice on private property must be modeled using the best information the municipality can obtain on the design of the practice. For example, permanent pool area is not sufficient information to know the pollutant reduction efficiency of a wet detention basin even if it matches the area requirements identified in Technical Standard 1001 Wet Detention Basin for an 80% reduction. Information on the depth of the wet pool and the outlet design are critical features that determine whether a detention pond is providing 80% TSS reduction.

Further clarifications

- If a portion of a municipality's MS4 drains to a stormwater treatment facility in an adjacent municipality, the municipality generating the load will not receive any treatment credit due to the downstream municipality's treatment facility unless there is an inter-municipal agreement where the downstream

municipality agrees to allow the upstream municipality to take credit for such treatment. DNR anticipates that such an agreement would have the upstream municipality assist with the construction and/or maintenance of the treatment facility. This contract must be in writing with signatures from both municipalities specifying how the treatment credit will be shared.

- The model results will be the basis for determining compliance with the permit for "no controls" and "with controls" TSS load.
- For reporting purposes, the pollutant load must be summarized as the cumulative total for the developed urban area served by the MS4. Additionally pollutant loads for grouped drainage areas as modeled shall also be reported. Drainage areas may be grouped at the discretion of the modeler for such reasons as to emphasize higher priority areas, balance model development with targeting or for cost-effectiveness.
- No credit should be taken for sweeping of non-curbed streets.
- The additional runoff volume from areas that are exempt or outside of the developed urban area to which the TSS standard applies needs to be accounted for when it drains into the treatment device. The pollutant load can be "turned off" but the runoff hydrology needs to be accounted for to properly calculate the treatment efficiency of the device.
- Due to concerns of sediment resuspension, basins with an outlet on the bottom are generally not eligible for pollutant removal based solely on settling. However, credit may be taken for treatment due to infiltration or filtration. Features to prevent scour should always be included for any practice where appropriate.
- When street cleaning is applied across a watershed with devices that serve only certain areas within the watershed, it is acceptable to first take credit for street cleaning across the entire watershed but then the treatment efficiency for devices must be reduced by the efficiency of the street cleaning to prevent double counting.
- To model a combination of mechanical broom and vacuum assisted street cleaning, it may require an analysis of several model runs depending on the timing of the mechanical and vacuum cleaning. If mechanical broom and vacuum cleaning occur at generally the same time (e.g. within two weeks of each other) then only the removal efficiency of the vacuum cleaning should be taken. If the municipality performs broom sweeping in the spring or fall and vacuum clean the remained of the year, calculate the combined cleaning efficiency using the following method:
  (A) Model the entire street cleaning program as if entire period is done by a mechanical broom cleaner.
  (B) Model just the period of time for vacuum cleaning (do not include the mechanical broom cleaning).
  (C) Model the same period as B) but with a mechanical broom.
  (D) The overall combined efficiency would be A + B – C.

WinSLAMM clarification:

- WinSLAMM 9.3.4 and earlier versions of WinSLAMM result in double counting of pollutant removal for most treatment practices modeled in series. WinSLAMM 9.2 and subsequent versions contain warnings to help alert modelers of this issue. The modeler will need to make adjustments to ensure that the results do not include double credit for removal of the same particle size. PV & Associates has created a document titled 'Modeling Practices in Series Using WinSLAMM' which helps to guide a user as to whether and or how certain practices can be modeled in series and this document is available at: http://winslamm.com/Select_documentation.html

P8 clarifications

- P8 does not account for scour and sediment resuspension. DNR requires that a wet basin with less than a 3-foot permanent pool have its treatment efficiency reduced. A basin with zero permanent pool depth should be considered to get zero credit for pollutant removal due to settling and a basin with 3 or more feet of permanent pool depth can be given the full pollutant removal efficiency credited by settling. The pollutant removal efficiency may be given straight-line depreciation such that a basin with a 1.5 foot-deep permanent pool would be eligible for 1/2 the pollutant removal efficiency that would be credited due to settling.
- A device that DNR gives no credit for pollutant removal may still be modeled if it is in series with other practices because of its benefit on runoff storage capacity that may enhance the treatment efficiency of downgradient treatment devices. To do so, turn the treatment efficiency off in P-8.

- P8 starts its model runs with no water in the basins. P8 should be started an extra year before the "keep dates", in order to allow the model to fill up ponds to the lowest outlet elevation.

Approved By:

Gordon Stevenson, Chief
Runoff Management Section

WISCONSIN
DEPT. OF NATURAL RESOURCES

BUREAU OF WATERSHED MANAGEMANT PROGRAM GUIDANCE

Storm Water Management Program

TMDL Guidance for MS4 Permits: Planning, Implementation, and Modeling Guidance

Effective: October 20, 2014
Guidance #: 3800-2014-04

Notice: 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. This guidance does not establish or affect legal rights or obligations, and is not finally determinative of any of the issues addressed. This guidance does not create any rights enforceable by any party in litigation with the State of Wisconsin or the Department of Natural Resources. 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:

Pam Biersach

Pam Biersach, Director
Bureau of Watershed Management

10/28/14
Date

A. Statement of Problem

The U.S. Environmental Protection Agency (EPA) requires the wasteload allocations (WLAs) developed as part of a Total Maximum Daily Load (TMDL) be reflected and implemented through permits. In Wisconsin, storm water discharge permits are issued pursuant to ch. NR 216, Wis. Adm. Code. As part of the TMDL process, permitted Municipal Separate Storm Sewer Systems (MS4s) are assigned individual TMDL WLAs. The placement of the WLA in a storm water permit can create numerous challenges including defining the municipal area encompassed by the WLA and modeling conditions to which the storm water WLA is to be applied. Department staff, municipal officials and storm water management plan developers need guidance to clarify how assessment of permit compliance with a WLA is to be demonstrated.

B. Background

A TMDL quantifies the amount of pollution that a waterbody can assimilate and still meet water quality standards. EPA requires that waters listed as impaired on Wisconsin's 303-d list have TMDLs developed. At a minimum, TMDLs must allocate the assimilative capacity between the load allocation, the WLA, and a margin of safety. The WLA is the portion of the assimilative capacity that is allocated to point sources. Nonpoint sources receive load allocations (LAs). WLAs are established for continuous point source discharges and also intermittent pollutant releases such as permitted storm water discharges.

Establishing WLAs for storm water sources requires an understanding of under what flow conditions impairments occur, and how storm water discharges are contributing to the identified impairments. Establishing WLAs for storm water sources also requires an understanding of exactly where the discharges are occurring. In many cases, municipal separate storm sewer systems (MS4s) have multiple discharge points that can be located in more than one reachshed[1]. In a TMDL, WLAs are assigned for each pollutant of concern and by reach. In a TMDL a MS4 can have multiple and different pollutant reduction goals within its municipal jurisdiction.

C. Discussion

Once EPA has approved a TMDL that contains permitted MS4s, the next permit issued must contain an expression of the WLAs consistent with the assumptions and requirements contained in the TMDL. As part of the TMDL process EPA approves the WLAs and generally these WLAs are mirrored directly in the permit. While this seems like a relatively straight forward permit process, the direct application of the WLA can present certain challenges in implementation due to assumptions required during the development of the TMDL. These assumptions revolve around aerial extent of the MS4 and its boundary, incorporation of new areas and expansion of the municipal boundary, and modeling differences between the tools used to create the TMDL versus the compliance tools used by the MS4. In addition, permitted MS4s have already performed municipal wide analysis to comply with requirements stipulated in ch. NR 151.13, Wis. Adm. Code. These requirements expressed reduction goals as a percent reduction from a defined no controls scenario with defined climate records.

[1] Reachsheds are also referred to as subwatersheds or segment sheds in TMDL development. A reach is a stream segment or individual lake or reservoir that is artificially assigned a compliance point or "pour point" where the applicable in-stream water quality standards must be met. Breaks for stream reaches are made at changes in stream listing (each individually named 303(d) water must have their own set of TMDLs), changes in water quality criteria, and at pour points or compliance points just upstream of significant changes in flow/assimilative capacity.

To build on established methodologies contained in s. NR 151.13, DNR's preferred option for implementing TMDLs is using a percent reduction methodology similar to s. NR 151.13. The use of a percent reduction strategy will utilize reduction goals consistent with the TMDL and allow implementation to continue to build on the same percent reduction strategy employed in s. NR 151.13 using the same models and tools that MS4s have already been utilizing. Since EPA only approves the WLA and not the corresponding percent reduction it is important that the TMDL reports and permit fact sheets, as appropriate, highlight that the percent reductions being used for implementation are consistent with the approved WLAs in the TMDL.

The usage of a percent reduction framework for implementation allows both the MS4 and DNR the ability to implement the reductions without having to reallocate and track WLAs across reachsheds, MS4s, and other land uses. This will minimize the need to continually update the TMDL as municipal boundaries evolve and ease reporting requirements. In some rare cases allocations may need to be adjusted. This is discussed in Attachment A.

D. Guidance

This document divides DNR's guidance for implementing TMDL WLAs for permitted MS4s into three parts:

- **Part 1** – Expressing WLAs and Reduction Targets
- **Part 2** – Implementation and Compliance Benchmarks
- **Part 3** – Modeling

PART 1 – Expressing WLAs and Reduction Targets

An MS4 will have a WLA for each pollutant of concern addressed by the TMDL. Generally the pollutant of concern for TMDLs in Wisconsin include total suspended solids (TSS) and total phosphorus (TP); however, allocations for other pollutants such as bacteria or chlorides are possible depending on what pollutants are causing impairments to surface waters.

Unlike the requirements contained in s. NR 151.13, individual MS4s may be divided in multiple reachsheds. As such, MS4s may have multiple WLAs and percent reductions instead of the uniform municipal wide percent reduction employed in s. NR 151.13. Multiple WLAs and percent reductions are the result of needing to meet water quality requirements for all water bodies and account for changes in water body type, changes in water quality criteria or targets, changes in flow, changes in designated use, and other similar factors. Compliance with TMDL requirements will need to be achieved on a reach by reach basis.

Due to the complexity of natural systems, the WLAs identified in the TMDL are the best estimate for meeting water quality standards and are modeled or simulated predictions. Initial implementation of the TMDL will be in most cases by design using SLAMM, P-8, or equivalent methodologies to estimate and track pollutant reductions. The MS4 is typically not required to perform ambient monitoring to assess if water quality standards are being met, but MS4s do need to track implementation activities and reductions achieved, and report on TMDL implementation in MS4 annual reports. Once an adequate level of implementation has been achieved, ambient monitoring can be used to judge progress and monitoring will ultimately be needed to de-list impaired waters and show compliance with the TMDL.

During the first term of an MS4 permit, after EPA approval of a TMDL, DNR will request that each permitted MS4 report its actual MS4 area served within each reachshed. Existing MS4 permittees should already have

sewershed mapping completed to satisfy previous MS4 permit conditions and this should be used to verify the current MS4 area served within each reachshed. The Department will provide the GIS data sets used for the TMDL reachshed boundaries through its website. The main reasons for reporting this information are to determine if the MS4 area served by each permittee corresponds to each other and does not overlap or omit MS4 service areas and to provide a detailed accounting of MS4 areas and responsible parties.

In most TMDLs, non-traditional MS4s such as permitted universities and state and county highway facilities were not given unique WLAs and these areas will need to be identified. In addition, most TMDLs are not able to account for modifications in drainage due to manmade conveyance systems such as storm sewers. These modifications may require modification of reachshed boundaries. To account for this, the MS4 permit (MS4 General Permit see section 1.5.4.3) will require that permittees submit information to the DNR to verify appropriate boundaries and areas. To accomplish this DNR will require the following information:

- Updated storm sewer system map that identifies:
    - The current municipal boundary/permitted area. For city and village MS4s, identify the current municipal boundary. For MS4s that are not a city or village, identify its permitted area. The permitted area for towns, counties and non-traditional MS4s pertains to the area within the Urbanized Area of the 2010 Decennial Census.
    - The TMDL reachshed boundaries within the municipal boundary, and the area in acres of each TMDL reachshed within the municipal boundary.
    - The MS4 drainage area boundary associated with each TMDL reachshed, and the area in acres of the MS4 drainage area associated with each TMDL reachshed.
- Identification of areas on a map and the acreage of those areas within the municipal boundary that the permittee believes should be excluded from its analysis to show compliance with its WLA (see "WLA Analysis Area" in Part 3 of this document"). In addition, the permittee shall provide an explanation of why each area identified should not be its responsibility.
  Note: This information is to be acquired by the DNR through an MS4 annual report.

DNR will evaluate this information and consider whether modifications to the TMDL are warranted. It is common for TMDL derived MS4 areas and reachsheds to deviate from the actual MS4 drainage areas. Such deviations can have an impact on the TMDL; however in most cases, these deviations will not have a significant effect on the calculated percent reduction needed to meet the TMDL allocations.

To assist in understanding allocations the TMDLs developed in Wisconsin have in many cases expressed reduction goals in both a WLA format (a load expressed as a mass) and a percent reduction format. The percent reduction is calculated from the baseline condition used in the TMDL to quantify what is needed to meet water quality standards. During the development of the TMDLs, the percent reduction is calculated using the following equation:

Percent Reduction (from baseline) = 100 * (1 – (WLA Loading Condition / Baseline Loading Condition))

The baseline loading condition should be described in the TMDL. While there is some variation across TMDLs in Wisconsin, the baseline loading condition should reflect the regulatory conditions stipulated in s. NR 151.13 and utilize either the 20% TSS control requirement or the 40% TSS control requirement as the starting point for TMDL allocations. This is because TMDLs are required, at a minimum, to meet existing regulatory requirements.

In 2011, the Wisconsin Legislature approved Act 32 which prohibited the Department from enforcing the 40% TSS reduction contained in s. NR 151.13, Wis. Adm. Code. As such, TMDLs under development and approved by EPA prior to January 1, 2012 used the 40% reduction as the baseline loading condition. For TMDLs approved by EPA after January 1, 2012, the 20% reduction serves as the baseline loading condition. The 20% reduction required under s. NR 151.13, Wis. Adm. Code, was to have been achieved by 2008.

For consistency with existing s. NR 151.13 guidance and requirements, the permittee's MS4 permit (MS4 General Permit - see section 1.5.4.4.1) will be requiring that the no-controls modeling condition be used such that the TMDL percent reduction goals will be measured from the no controls modeling condition. Since TMDL development uses the 20% or 40% TSS reduction baseline loading condition, implementation planning will necessitate converting the TMDL stipulated percent reduction back to a no-controls percent reduction for pollutants of concern such as TSS and Total Phosphorus (TP). As identified in the approved Rock River TMDL, a 40% TSS reduction corresponds with a 27% Total Phosphorus (TP) reduction. Based on loading data from the WinSLAMM model, a 20% TSS reduction for MS4s from the no-controls condition corresponds with a 15% TP reduction. This can be done using a mathematical conversion:

For a TMDL that uses 20% TSS reduction as the baseline loading condition (TMDLs approved after January 1, 2012) the conversion to the no-controls modeling condition is:

TSS Percent Reduction (no-controls) = 20 + (0.80 * % control from baseline in TMDL)
TP Percent Reduction (no-controls) = 15 + (0.85 * % control from baseline in TMDL)

For a TMDL that uses 40% reduction as the baseline loading condition (TMDLs approved prior to January 1, 2012) the conversion to the no-controls modeling condition is:

TSS Percent Reduction (no-controls) = 40 + (0.60 * % control from baseline in TMDL)
TP Percent Reduction (no-controls) = 27 + (0.73 * % control from baseline in TMDL)

The above calculated reductions correspond to the percent reduction measured from no-controls as required by the permittee's MS4 permit (MS4 General Permit - see section 1.5.4.4.1). These percent reductions can be compared to the reduction already achieved with existing management practices as required under the permittee's MS4 permit (MS4 General Permit - see section 1.5.4.4.4). This comparison, needed for each reachshed, will determine if additional reductions are needed to meet the TMDL requirements. The MS4 percent reductions from the no-controls condition for the Rock River TMDL and Lower Fox River TMDL are given in Attachments C and D.

For the MS4 area contained in each reachshed, the no controls load is calculated using SLAMM, P-8, or equivalent. The MS4 area includes the entire acreage that the MS4 is responsible for excluding areas not under the jurisdiction of the permittee. As new MS4 area is added or subtracted, the TMDL percent reduction applied to these areas remains the same. The percent reduction from no controls to meet the TMDL is applied to the MS4's modeled no-controls load to obtain the necessary load reduction to meet the TMDL. This load reduction may be different from that needed to meet the stipulated TMDL WLA; however, MS4 implementation of the TMDL is driven by the percent reduction and its corresponding load reduction.

For permittees that elect to use water quality trading or where adaptive management may lead to water quality trading, the load reduction calculated from the no-controls percent reduction should be used when evaluating the necessary mass.

TMDLs do not negate requirements stipulated in s. NR 151.13, Wis. Adm. Code. Therefore, both TMDL percent reductions and s. NR 151.13 requirements must be met. Once an MS4 meets the s. NR 151.13 requirement of 20% TSS control, an MS4 does not need to continue to update their s. NR 151.13 development urban area modeling. This is because s. 281.16 (2)(am)3., Wis. Stats., requires a municipality to maintain storm water treatment practices that are already in place prior to July 1, 2011.

TMDL reports may include both an average annual WLA and a percent reduction for MS4s. For implementation, MS4s should use the percent reduction. The average annual allocations represent the sum of allocations over the year and do not account for the monthly variations in the loading capacity of the receiving water. The percent reductions provided in the TMDL are based on monthly reductions and better reflect the reductions required to meet the water quality standards.

> Example: Appendix V in the Rock River TMDL lists annual mass allocations for Reach 81. The City of Beloit has a baseline loading for TSS of 181.75 tons and a WLA of 259.62 tons (a net increase). However, Appendix I identifies that Beloit needs a 7% reduction in TSS for Reach 81 from the 40% TSS baseline condition. This is because on an overall annual basis Beloit meets its allocation but in certain individual months it does not. The percent reduction is calculated based on the average of the monthly allocations used to determine compliance with the water quality standards.

PART 2 – Implementation and Compliance Benchmarks

Storm Water Management Planning (SWMP)

As described in the permittee's MS4 permit (MS4 General Permit - see sections 1.5.4.4 and 1.5.4.5), DNR will be requiring a TMDL implementation analysis and plan be completed by MS4 permittees subject to TMDL WLAs. This analysis and plan should be incorporated in the SWMP as required by the permittee's MS4 permit (MS4 General Permit - see section 1.5.4). Each MS4 permittee should evaluate all potentially cost-effective alternatives to reduce its discharge of pollutants of concern so that its discharge is comparable to the percent reductions stipulated in the TMDL. MS4 permittees may work together with other MS4s that reside in the same reachshed.

A focus of the SWMP should be on improving storm water treatment for areas of existing development during times of redevelopment. Older, urban development patterns typically did not include the same level of stormwater management controls that new development does. Reductions achieved through redevelopment can be counted towards compliance with WLAs. Each municipality should estimate the pollutant reductions that are expected to be achieved over time through redevelopment of both public and private facilities, including roadway reconstruction. The rate of redevelopment should be estimated in order to provide a gauge as to how long it would take to improve storm water management in areas of redevelopment.

When developing components of a TMDL implementation plan, municipalities should, at a minimum, consider the following implementation methods:

- **Ordinance Review and Updates** – A municipality may elect to revise its current post-construction storm water management ordinance to require greater levels of pollutant control for redevelopment and highway reconstruction that are above the minimum performance standards of ch. NR 151, Wis. Adm. Code and are consistent with the reduction requirements contained in the TMDL.

  Current ch. NR 151 post-construction performance standards for areas of new development include an 80% TSS control level and maintaining 60 - 90% of predevelopment infiltration (with certain exemptions

and exclusions). Areas that have stormwater management practices designed and maintained to meet these performance standards should already be controlling TSS and total phosphorus to levels comparable to TMDL water quality targets.

In addition, core provisions in the municipality's SWMP could be strengthened. For example, if bacteria are a pollutant of concern the MS4 may want to place greater emphasis on detecting and eliminating cross-connections between wastewater pipes and storm sewers or stronger pet waste programs.

- **Quantifiable Management Practices** – These practices include, but are not limited to, structural controls such as wet detention ponds, infiltration basin, bioretention, sump cleaning, low impact development (LID), street cleaning and vegetated swales where reductions can be quantified through water quality modeling such as WinSLAMM and P-8.

- **Non-Quantifiable Management Practices –** Quantifiable pollutant reductions may be difficult to determine for some practices such as residential leaf and yard debris management programs, lawn fertilizer bans and information and education outreach activities. This could also include strengthened provisions of the core SWMP. For example, if bacteria is a pollutant of concern the MS4 may place greater emphasis on detecting and eliminating cross connections, stronger pet waste programs and greater focus on elimination of leaching from dumpsters. As data becomes available to quantify reductions the appropriate credit will be given toward meeting the TMDL reduction requirements. In the interim, DNR and the permittee should be able to come to an agreement as to whether the measure is beneficial. In cases where quantifiable reductions are not possible, the use of a non-quantifiable but beneficial practice shall be deemed as making progress toward compliance with the TMDL reductions. The DNR, in consultation with stakeholders, will evaluate these practices as new science and data becomes available.

- **Stabilization of MS4** – Stabilization of eroding streambanks are eligible for a 50% cost share match through DNR's Runoff Management Grant Program. DNR considers streambank stabilization activities an important step in reducing the discharge of sediment. However, TMDL baseline modeling already assumes that drainage systems are stable; therefore, it is not appropriate to take credit against the WLA or percent reduction in the TMDL for stabilization of a drainage ditch or channel of the MS4. However stabilization projects should be identified in the TMDL implementation plan and can serve as a compliance benchmark toward meeting overall TMDL goals.

- **Streambank Stabilization Outside of the Permitted MS4** – Permitted MS4s may take credit through pollutant trading for stabilization of channels and streambanks which are outside of the area served by their MS4. Applicable credit thresholds and trade ratios would apply.

- **Water Quality Trading and Adaptive Management -** If economically beneficial, a MS4 may wish to participate in one of these programs. MS4s are eligible to participate in water quality trading to help meet WLAs. MS4 permittees with areas in the same reachshed can share load reduction credits for practices within those reachsheds using a 1:1 trade ratio. Also a MS4 may be invited by a Waste Water Treatment Facility (WWTF) to participate in an adaptive management program pursuant to s. NR 217.18, Wis. Adm. Code, to reduce phosphorus. Water quality trading and adaptive management guidance are covered under separate DNR guidance documents available on the DNR website.

- **Constructed Wetland Treatment –** Wetlands constructed for the purpose of providing storm water treatment are eligible for treatment credit provided that a long-term maintenance plan is implemented. Wetlands that receive runoff pollutants are expected to, at some point, reach a certain equilibrium point

where they would provide minimal pollutant removal or even act as a pollutant source unless they are maintained by harvesting vegetation and/or have accumulated sediment removed from them. Additionally, constructed wetlands installed need to be maintained as stormwater treatment areas in order to maintain their "non-waters-of-the-state" status. Per federal regulations, wetlands constructed as part of wetland mitigation cannot be used for treatment credit.

- **Storm Water Practices and Existing Wetlands** - Wetlands are waters of the state and wetland water quality standards under ch. NR 103, Wis. Adm. Code apply. Additionally, the U.S. Army Corps of Engineers has authority to protect wetlands as well. As such, existing wetlands cannot be used for treatment, however, in limited circumstances storm water practices can be installed in a wetland provided all applicable state and federal wetland permits are obtained. It is often difficult to obtain state and federal permits to construct a storm water treatment facility in a wetland. Contact the local DNR water management specialist to discuss whether this project might be permissible and the associated written justification needed to support a wetland permit application.

As discussed, SWMPs for municipalities with approved TMDLs should identify what pollutant reduction measures will be employed and over what time frame reductions will occur (i.e. 20 tons/yr TSS for redevelopment sites over the next 20 years).

Compliance Schedule and Benchmarks

Once a TMDL is approved, affected MS4 permittees will receive a TMDL implementation planning requirement within their next (or potentially initial) permit term. TMDL implementation planning will include determining storm water management treatment and other measures needed and their associated implementation costs and timelines to achieve TMDL reductions consistent with the TMDL WLAs. It is expected that the following MS4 permit term will include a compliance schedule to implement pollutant reduction measures in accordance with a storm water management plan to meet applicable TMDL reductions.

The compliance schedule will require that the permittee be able to show continual progress by meeting 'benchmarks' of performance within each permit term. In this case, a 'benchmark' means a progress increment – a level of pollutant reduction or an application of a pollutant reduction measure, which is part of a larger TMDL implementation plan designed to bring the overall MS4 discharge of pollutants of concern down to a level which is comparable to the MS4's TMDL WLA. It is possible that certain benchmarks will not be easily quantifiable but there needs to be evidence that such benchmarks will provide a legitimate step toward reducing the discharge of pollutants of concern.

DNR may elect to place specific benchmarks in an MS4 permit. However, it is expected that MS4 permittees will have the primary role in establishing their own benchmarks for each 5-year permit term. Benchmarks should be reevaluated at least once every 5 years and are interim steps/goals of compliance. Where substantial reductions are required multiple benchmarks of compliance will be needed and likely implemented over more than one permit cycle. However, the schedule should lead to meeting the TMDL WLA as quickly as is feasible.

Redevelopment ordinances designed to implement stormwater management controls to achieve compliance with the TMDL requirements are an excellent tool to show progress in meeting the WLA with smart growth and development patterns. Management practices should be installed as infrastructure is replaced. For example, it may be most cost-effective for municipalities to install storm water treatment and infiltration practices as other street or sewer projects are scheduled.

Under a TMDL, EPA does not acknowledge the concept of maximum extent practicable as defined in s. NR 151.006, Wis. Adm. Code, but rather compliance schedules can be structured in SWMPs and permits to allow MS4s the flexibility needed to meet TMDL goals. Any storm water control measures employed by the MS4 permittee to reduce its pollutant discharge to comply with the TMDL reductions will need to be maintained or replaced with comparable stormwater control measures to ensure that load reductions will be maintained into the future.

Runoff Treatment Outside of the MS4's Jurisdiction
In order for an MS4 to take credit for the control of pollutants by another municipality or private property owner (i.e. industry or riparian property owner), the MS4 must have an agreement with the entity with control over such treatment measure. This agreement must specify how the pollutant reduction credit will be shared or otherwise granted to an MS4. Responsibilities for maintenance of the BMPs and preservation of the BMPs over time should also be addressed in any such agreement.

Tracking
The permittee will need to track and show progress in reducing discharges of pollutants of concern. This tracking should assist in showing that MS4 permit compliance benchmarks have been achieved in accordance with an overall storm water management plan to achieve compliance with the TMDL percent reduction targets.

A tabular TMDL compliance summary of pollutant loading per reach will be required to be submitted to DNR with the MS4 report at least once every MS4 permit term. The summary should identify the following: reach name and number (consistent with the name and number in the TMDL report), the MS4 outfall numbers, named/labeled drainage areas, the applicable TMDL percent reduction target(s), pollutant reduction benchmarks, storm water management control measures implemented, and pollutant reduction achieved as compared to no controls. Attachment B is an example of a tabular TMDL MS4 compliance summary.

PART 3 – Modeling

Discussion

The following discussion highlights the main compatibility challenges between TMDL development and MS4 implementation and how they will be addressed.

TMDL waste load allocations are by definition expressed as daily loads. There is flexibility, however, to implement the loads using monthly, seasonal, or annual load allocations. Due to the variability of storm water events and associated pollutant loadings, MS4's have historically used modeling to estimate flows and pollutant loadings using a percent reduction format for the purpose of s. NR151.13 compliance. As part of TMDL implementation, average percent reductions have been developed for MS4s for each reach. These percent reductions generally reflect an average of monthly reductions needed to meet allocations because waters are evaluated against the phosphorus criteria based on monthly sampling protocols. This will allow MS4s to continue using water quality models such as WinSLAMM and P-8 for demonstrating compliance with TMDL allocations. As with s. NR 151.13, TMDL compliance for MS4s will be by design.

Since the modeling tools used to demonstrate compliance with s. NR151.13 pollutant loadings are the same tools used to demonstrate compliance with TMDL pollutant load allocations, much of the existing mapping, water quality modeling, and planning methodologies used for s. NR151.13 compliance can be used or adjusted for TMDL compliance planning.

Generally, the modeling completed as part of TMDL development is at a less detailed scale than the modeling completed by individual MS4s. Due to the scale at which the respective models are completed, it is not unusual to have differences in the drainage areas and the pollutant mass loadings associated with them. Because of the scale at which they are developed, allocations from a TMDL have generally been applied across the entire urban area that is served by the permitted MS4. It is important to note that while many components of existing planning efforts and modeling results can be used for TMDL implementation, adjustments will likely be necessary to account for a TMDL focus on compliance by reachshed.

There may be inconsistencies between the TMDL modeled drainage areas to the actual MS4 drainage areas. Actual MS4 drainage areas may not follow the surface drainage areas and MS4 drainage areas commonly expand due to urban development. For example, the modeled versus actual MS4 drainage areas commonly deviated by 30% and by as much as 60% in the Rock River TMDL. Although these deviations may have a significant effect on a mass wasteload allocation, its affects are greatly moderated on a percent reduction basis across the reachshed. Area deviations commonly affect the MS4 percent reductions by only a few percent. Given the modeling assumptions that have gone into TMDL modeling, deviations by even 10% are within the expected error range of TMDL modeling. Modeling is not an exact science and the TMDL MS4 percent reductions are still considered valid implementation targets to work toward achieving in-stream water quality.

As noted above, MS4s subject to a TMDL should perform analyses and planning to identify cost-effective approaches for reducing discharges of pollutants of concern. To cost-effectively achieve pollutant reductions, MS4s should look for opportunities such as site redevelopment and road reconstruction projects, implementation of streambank stabilization and wetland restoration projects, implementation of traditional BMPs, and possibly water quality trading and adaptive management[2]. Each of these elements can be considered for implementation to meet the requirements of a TMDL. It is likely that existing MS4 water quality modeling and mapping can be used and adjusted as necessary for SWM planning needs for TMDL implementation.

Guidance

TMDL-established WLAs and LAs are 'targets' of treatment performance and/or pollutant control for point and non-point sources. The WLAs and LAs are TMDL modeled estimates of the level of pollutants that can be discharged and still meet in-stream standards. The ultimate goal of a TMDL is for continual reduction of pollutants discharged so that both the listed impaired waters and other waters meet in-stream water quality standards, which would then allow for removal of waters from the 303-d impaired waters list. Municipalities should consider the drainage area served by their MS4 and look for the most cost-effective means to reduce discharges of pollutants of concern until their discharge is comparable with its TMDL requirements.

TMDL Analysis Area

An MS4 is to include all areas within its corporate boundary unless it is listed as optional. Although the MS4 permit focuses on current areas served by an MS4, it may be appropriate to include future land use planning areas.

Incorporation of rural areas: A city or village may have incorporated the entire township or a large portion of the rural township in which it resides. In this situation, the city or village needs to include all areas within the most

2 The Department has prepared separate guidance documents on water quality trading and adaptive management. MS4s are considered non-point sources for the purposes of adaptive management. This does not preclude them from participating in an adaptive management program if approached by a traditional point source such as a municipal or industrial wastewater treatment facility. The "Adaptive Management Technical Handbook" is available for download at http://dnr.wi.gov/topic/surfacewater/adaptivemanagement.html

recent urbanized area, adjacent developed and developing areas whose runoff is connected or will connect to their MS4.

Highways: A permitted MS4 owner/operator of a highway needs to account for the pollutants generated within the Right-Of-Way (ROW). An exception would be a roadway crossing over a highway where the owner of the roadway crossing structure is responsible for the pollutants associated with their bridge and approach structure within the lower highway's ROW. WisDOT is responsible for state highways that are not connected highways. A county is responsible for county highways that it maintains. Cities and villages need to include connecting highways as identified and listed in the Official Highway State Truck Highway System Maps at: http://www.dot.wisconsin.gov/localgov/highways/connecting.htm

Optional: The pollutant loads associated with the following areas are optional for an MS4 to include:

1. Area that never passes through a permittee's MS4 such as a riparian area.
2. Land zoned for agricultural use and operating as such.
3. Manufacturing, outside storage and vehicle maintenance areas of industrial facilities permitted under subch. II of ch. NR 216, Wis. Adm. Code, are optional to include. This does not include any industrial facilities that have certified a condition of "no exposure" pursuant to s. NR 216.21(3), Wis. Adm. Code. *Note: DNR recommends that municipalities include all industrial facility areas within their WLA analysis area instead of creating 'holes' within its area of analysis.*
4. Any area that discharges to an adjacent municipality's MS4 (Municipality B) without passing through the jurisdictional municipality's MS4 (Municipality A). Municipality B that receives the discharge into their MS4 may choose to be responsible for this area from Municipality A. If Municipality B has a stormwater treatment practice that serves a portion of A as well as a portion of B, then the practice must be modeled as receiving loads from both areas, independent of who carries the responsibility for the area. However, if runoff from an area within Municipality A's jurisdiction drains into Municipality B's MS4 but then drains back into Municipality A's MS4 farther downgradient, then Municipality B does not have the option of including the load from Municipality A in their analysis and the load from that area is Municipality A's responsibility.
5. For county and towns, the area outside of the most recent urbanized area as defined by the US Census Bureau. This area is classified as non-permitted urban and part of the non-point source load allocation (NPS LA).

MS4 Water Quality Models and Related Information

To model pollutants such as TSS and total phosphorus in the area served by the MS4, the municipality must select a model such as SLAMM, P8 or an equivalent method deemed acceptable by the Department. For the analysis to show compliance, SLAMM version 9.2 or P8 version 3.4 or a subsequent version of these models may be used.

All roadway right-of-ways within the urbanized area that are part of a county or town's MS4 are the responsibility of the county or town. Model the road based on the urban land use that will most typify the traffic, even if agricultural land use is on one or both sides of the road (for example commercial or residential) and include that area in the corresponding standard land use file.

A municipality is not required to use the standard land use files if it has surveyed the land uses in its developed urban area and has "real" source area data on which to base the input files. The percent connected imperviousness beyond the standard land use files must be verified in the field. Disconnection may be assumed for residential rooftops where runoff has a flow path of 20 feet or greater over a pervious area in good condition. Disconnection for impervious surfaces other than residential rooftops may be assumed provided all of the following are met:

- The source area flow length does not exceed 75 feet,

- The pervious area is covered with a self-sustaining vegetation in "good" condition and at a slope not exceeding 8%,
- The pervious area flow length is at least as long as the contributing impervious area and there can be no additional runoff flowing into the pervious area other than that from the source area.
- The pervious area must receive runoff in a sheet flow manner across an impervious area with a pervious width at least as wide as the contributing impervious source area.

Water quality modeling is a means to determine a storm water management control practice's treatment efficiency. If the model cannot predict efficiencies for certain storm water management control measures that a municipality identifies as a water quality management practice, then a literature review should be conducted to estimate the reduction value. Proprietary stormwater management control measures that utilize settling as their means of TSS reduction should be modeled in accordance with DNR Technical Standard 1006 (Method for Predicting the Efficiency of Proprietary Storm Water Sedimentation Devices).

When designing storm water management practices, runoff draining to a management practice from off-site must be taken into account in determining the treatment efficiency of the measure. Any impact on the efficiency must be compensated for by increasing the size of the measure accordingly.

Storm water management practices on private property that drain to an MS4 can be given treatment credit, provided the municipality enters into an agreement or has an equivalent enforceable mechanism with the facility/land owner that will ensure the management practice is properly maintained. The municipality will need a tracking system that includes maintenance of treatment practices. An operation and maintenance plan, including a maintenance schedule, must be developed for the stormwater management practice in accordance with relevant DNR technical standards. The agreement or equivalent mechanism between the municipality and the private owner should include the following:

- A description of the stormwater management practice including dimensions and location.
- Identify the owner of the property on which the stormwater management practice is located.
- Identify who is responsible for implementing the operation and maintenance plan.
- Outline a means of terminating the agreement that includes notifying DNR.

The efficiency of a storm water management practice on both public and private property must be modeled using the best information the municipality can obtain on the design of the practice. For example, permanent pool area is not sufficient information to know the pollutant reduction efficiency of a wet detention basin even if it matches the area requirements identified in Technical Standard 1001 Wet Detention Basin for an 80% reduction. Information on the depth of the wet pool and the outlet design are critical features that determine the level of control a detention pond is providing.

Modeling Clarifications

- A TMDL might remove certain internally drained areas from its analysis. If an internally drained area is removed from the TMDL analysis, the MS4 permittee shall not include such area in its MS4 analysis to show compliance with its TMDL requirements. Under this scenario if stormwater is pumped from inside the internally drained area to an external drainage area, then this additional pollutant discharge needs to be accounted for in the MS4 analysis to show compliance with its TMDL requirements.
- Where an internally drained area is included in the TMDL analysis, an MS4 permittee has the option of including this area in its TMDL analysis to show compliance with its TMDL requirements. However, credit for pollutant removal in internally drained areas may only be taken provided the April 6, 2009 DNR Internally Drained Area guidance memo is met with respect to taking pollutant reduction credit within internally drained areas.

- When water is pumped rather than gravity drained from an internally drained area of many acres in area, the MS4 will be expected to use monitoring data to determine the annual average mass of pollutants discharged to the surface water to which the TMDL applies. This does not apply to dewatering covered under a DNR storm water construction site general permit.
- If a portion of a municipality's MS4 drains to a stormwater treatment facility in an adjacent municipality, the municipality generating the load will not receive any treatment credit due to the downstream municipality's treatment facility unless there is an inter-municipal agreement where the downstream municipality agrees to allow the upstream municipality to take credit for such treatment. DNR anticipates that such an agreement would have the upstream municipality assist with the construction and/or maintenance of the treatment facility. This contract must be in writing with signatures from both municipalities specifying how the treatment credit will be shared.
- For reporting purposes, the pollutant reductions must be summarized by TMDL reachshed. Additionally, pollutant loads for grouped drainage areas as modeled shall also be reported. Drainage areas may be grouped at the discretion of the modeler for such reasons as to emphasize higher priority areas, balance model development with targeting or for cost-effectiveness.
- The additional runoff volume from areas that are outside of the analysis area needs to be accounted for when it drains into treatment devices. The pollutant load can be "turned off" but the runoff hydrology needs to be accounted for to properly calculate the treatment efficiency of the device.
- Due to concerns of sediment resuspension, basins with an outlet on the bottom are generally not eligible for pollutant removal based solely on settling. However, credit may be taken for treatment due to infiltration or filtration. Filtration might occur through engineered soil or proprietary filters. Features to prevent scour should always be included for any practice where appropriate.
- Credit should not be taken for street cleaning unless a curb or equivalent barrier is present which leads to sediment buildup on the street.
- To model a combination of mechanical broom and vacuum assisted street cleaning, it may require an analysis of several model runs depending on the timing of the mechanical and vacuum cleaning. If mechanical broom and vacuum cleaning occur at generally the same time (e.g. within two weeks of each other) then only the removal efficiency of the vacuum cleaning should be taken. If the municipality performs broom sweeping in the spring or fall and vacuum clean the remained of the year, calculate the combined cleaning efficiency using the following method:
  (A) Model the entire street cleaning program as if entire period is done by a mechanical broom cleaner.
  (B) Model just the period of time for vacuum cleaning (do not include the mechanical broom cleaning).
  (C) Model the same period as B) but with a mechanical broom.
  (D) The overall combined efficiency would be A + B – C.

WinSLAMM clarification

- WinSLAMM 9.4 and earlier versions of WinSLAMM result in double counting of pollutant removal for most treatment practices modeled in series. WinSLAMM 9.2 and subsequent versions contain warnings to help alert modelers of this issue. The modeler will need to make adjustments to ensure that the results do not include double credit for removal of the same particle size. PV & Associates has created a document titled 'Modeling Practices in Series Using WinSLAMM' which helps to guide a user as to whether and or how certain practices can be modeled in series and this document is available at: http://winslamm.com/Select_documentation.html
- In WinSLAMM 9.4 and earlier versions, when street cleaning is applied across a larger modeled area with devices that serve only a certain area within the larger modeled area, it is acceptable to first take credit for street cleaning across the entire larger area but then the treatment efficiency for other devices must be reduced by the efficiency of the street cleaning to prevent double counting.

P8 clarifications

- P8 does not account for scour and sediment resuspension. DNR requires that a wet basin with less than a 3-foot permanent pool have its treatment efficiency reduced. A basin with zero permanent pool depth should be considered to get zero credit for pollutant removal due to settling and a basin with 3 or more feet of permanent pool depth can be given the full pollutant removal efficiency credited by settling. The pollutant removal efficiency may be given straight-line depreciation such that a basin with a 1.5 foot-deep permanent pool would be eligible for 1/2 the pollutant removal efficiency that would be credited due to settling.
- A device that DNR gives no credit for pollutant removal may still be modeled if it is in series with other practices because of its benefit on runoff storage capacity that may enhance the treatment efficiency of downgradient treatment devices. To do so, turn the treatment efficiency off in P-8.
- P8 should be started an extra year or at least several months before the "keep dates", in order to allow the model to build up representative pollutant concentrations in wet basins.

CREATED:

Eric S. Rortvedt, Water Resource Engineer — Date 10/20/14
On behalf of the Storm Water Liaison Team

Kevin Kirsch, Water Resource Engineer — Date 10/20/14
TMDL Development Coordinator

APPROVED:

Mary Anne Lowndes, Chief — Date 10/21/14
Runoff Management Section

Runoff Management Policy Management Team approved on 9/30/14 (date).

Attachment A: Technical Notes

Establishing relationships between multiple point and nonpoint pollutant sources and their influences on stream flow and water quality is complex. This process is often further complicated by the spatial scale under which TMDLs are developed. In order to help make TMDL development manageable, TMDLs are often developed using large scale modeling approaches that can be difficult to translate to the smaller scale often needed for implementation. For instance, loadings from "non-traditional" permitted MS4s (WDOT and county highways and UW campus systems) are often aggregated with the loadings of traditional MS4s (cities, villages and towns). This loss in resolution can result in inconsistencies in the WLA assignment necessitating a more thorough examination and possible reallocation of a portion of the WLA to non-traditional MS4 permittees.

In many cases where there is an existing TMDL that aggregated WLAs, the Wisconsin Department of Natural Resources (DNR) will need to review, and may need to reallocate WLAs to MS4 permittees. MS4 permittees will then need to conduct storm water management planning to evaluate their current pollutant loads relative to the TMDL reduction goals and create and implement a plan to meet the TMDL reductions.

Whether or not a municipality changes in size or land use, the allowable pollutant load that the receiving water can handle does not change. In the TMDL, the total allowable permitted MS4 load was determined by reach and typically was distributed uniformly across permitted MS4s on a unit area load basis. Since the permitted MS4 allowable unit area load is the same across a reachshed, MS4 WLAs can be reallocated between each other based on area. However, this reallocation must occur at the same time step that was used in the TMDL development process.

> Example: the Rock River TMDL generated allocations on a monthly basis so any reallocation of the WLA between sources must also proceed on a monthly basis. Simply adding the monthly allocations into an annual load and reallocating using an average annual unit load approach will result in a misrepresentation of the TMDL allocations. Analysis must be conducted on a monthly basis.

It is expected that the extent area that will need to be modeled for the MS4 WLA will be larger than that modeled under the s. NR 151.13 (developed urbanized area modeling analysis). This is because the s. NR 151.13 modeling area has many optional and excluded areas, whereas, the TMDL WLA analysis generally lumps all of these areas into the WLA. Also, s. NR 151.13 modeling was based on year 2004 developed area condition versus a TMDL which generally considers most recent development information.

In municipalities that have recently experienced significant growth, there may be a significant increase in urban area. In addition, in some instances the total actual permitted MS4 area within a reachshed is different than that used in the TMDL development process. Initially DNR believed that it would be easy to reallocate a portion of the non-point source LA to the permitted MS4s based on a unit load approach; however, the task can be more difficult than it initially appears. As explained above, the reallocation needs to be conducted using the same time step used in the development of the TMDL and at the same critical flow period used to develop the TMDL. In many cases, this critical flow period used in the development of the TMDL may not correspond with an average annual unit load.

Reallocation Option: In some cases, where TMDL analysis was conducted on an average annual basis it may be appropriate to adjust WLAs based on the acreage associated with each MS4 by reachshed. If reallocating WLAs and LAs within the same reach will still not be adequate to address significant area differences between actual and TMDL modeled reachsheds, DNR will consider on a case-by-case basis as to whether a reallocation between reaches is warranted. For example, an MS4 may collect runoff from a substantial amount of area from one reachshed and discharge it directly into another reachshed.

DNR would include reallocated WLAs in the next reissued permit of affected MS4s. MS4s would have the opportunity to comment and/or adjudicate reallocated WLAs when the permit is public noticed.

Attachment B: TMDL Compliance Summary

TMDL Reach Number & Name: 64 (Yahara River, Lake Mendota & Lake Monona)
MS4 TMDL Percent Reductions needed (no controls): 73% (TSS) & 68% (TP)*
MS4 Existing Controls Percent Reduction (year 2014): 32% (TSS) & 24% (TP)
Modeled MS4 Annual Average Pollutant Load (no controls): 433 tons/yr (TSS) & 124 lb/yr
Modeled MS4 Annual Average Pollutant Load (existing controls): 294 tons/yr (TSS) & 94 lb/yr

Benchmark (BM)	Description of BM Measure	Outfalls Affected by BM control	Affected Drainage Areas (as modeled)	Implementation Date	Measure Treatment Performance	BM % Reduction toward TMDL Reduction	MS4 Cumulative % Control (from no controls)
N/A	Existing control measures	All	All	Ongoing	TSS: 32% TP: 24%	TSS: 32% TP: 24%	TSS: 32% TP: 24%
1	Increased SWM control for Roadway Reconstruction	All	All	1/1/2020	TSS: 60% TP: 40% to MEP	TSS: 0.6% (annually) TP: 0.4% (annually) (30% TSS reduction over 50 years)	TSS: 35% TP: 26% (Accounts for 5 years of reduction)
2	Implement Enhanced Street Cleaning Program	001 003 004 008	1A - 1D 3A – 3K 4C – 4F 8D	1/1/2020	TSS: 12% TP: 8% (no redundant controls)	TSS: 9% TP: 6% (eff. reduced for redundant measures)	TSS: 44% TP: 32%
3	Implement Enhanced Yard Waste Collection Program	All	All	1/1/2021	TSS: 2% TP: 6% (no redundant controls)	TSS: 1.6% TP: 5% (eff. reduced for redundant measures)	TSS: 46% TP: 37%
4	Ordinance Revised – Higher Redevelopment Standard	All	All	1/1/2022	TSS: 60% TP: 40% to MEP	TSS: 0.6% (annually) TP: 0.4% (annually) (30% of TSS reduction over 50 years)	TSS: 49% TP: 39% (Accounts for 5 years of reduction)
5	Retrofit 2nd St. Basin into wet basin	002	B4	1/1/2023	TSS: 60% TP: 40%	TSS: 2% TP: 1% (only serves part of MS4)	TSS: 51% TP: 40%
6	New Wet Basin B15	005	5B - 5H	1/1/2023	TSS: 60% TP: 40% to MEP	TSS: 3% TP: 2% (only serves part of MS4)	TSS: 54% TP: 42%
7	Stabilize MS4 Drainage Ways between X and Y streets	003	3D and 3E	1/1/2024	20 tons/year sediment reduction	N/A Streambank & MS4 stabilization does not count against TMDL reduction requirement	TSS: 54% TP: 42%

* The TSS and TP percent reductions were taken from the Rock River Report's Appendix H and I. All other mass and percent reductions listed are fictitious and shown for example purposes only.

Attachment C: Rock River TMDL MS4 Annual Average Percent Reductions

Reach	Appendix H TP reduction from baseline of 27%	Appendix I TSS reduction from baseline of 40%	Calculated TP reduction from no-controls	Calculated TSS reduction from no-controls
2	29%	1%	48%	41%
3	82%	26%	87%	56%
20	14%	0%	37%	40%
21	10%	0%	34%	40%
23	12%	11%	36%	47%
24	11%	12%	35%	47%
25	64%	32%	74%	59%
26	35%	29%	53%	57%
27	0%	0%	27%	40%
28	1%	0%	28%	40%
29	51%	7%	64%	44%
30	0%	0%	27%	40%
33	29%	9%	48%	45%
34	81%	31%	86%	59%
37	66%	54%	75%	72%
39	0%	0%	27%	40%
45	13%	8%	36%	45%
51	14%	0%	37%	40%
54	61%	6%	72%	44%
55	68%	43%	77%	66%
56	19%	0%	41%	40%
59	54%	15%	66%	49%
60	29%	1%	48%	41%
61	6%	2%	31%	41%
62	70%	70%	78%	82%
63	14%	11%	37%	47%
64	47%	55%	61%	73%
65	49%	46%	63%	68%
66	37%	37%	54%	62%
67	0%	0%	27%	40%
68	52%	18%	65%	51%
69	72%	21%	80%	53%
70	1%	1%	28%	41%
71	29%	31%	48%	59%
72	0%	0%	27%	40%
73	51%	49%	64%	69%
74	17%	20%	39%	52%
75	15%	19%	38%	51%
76	75%	29%	82%	57%
78	4%	0%	30%	40%
79	54%	37%	66%	62%
81	20%	7%	42%	44%
83	37%	25%	54%	55%

Baseline reductions of TP = 27% & TSS = 40% were identified in the RR TMDL report on pages 25 & 27.
% TP reduction from no-controls = 27 + [0.73 x (% TP control in Appendix H)]
% TSS reduction from no-controls = 40 + [0.60 x (% TSS control in Appendix I)]
Reaches that are not listed above did not have a permitted MS4 within the reach.

Table developed by: Eric Rortvedt, DNR Stormwater Engineer
Dated: 9/16/2014

Attachment D: Lower Fox River Basin TMDL MS4 Annual Average Percent Reductions

Sub-Basin	TMDL Report TP reduction from baseline of 15%	TMDL Report TSS reduction from baseline of 20%	Calculated TP reduction from no-controls	Calculated TSS reduction from no-controls
East River	30.0%	40.0%	41%	52%
Baird Creek	30.0%	40.0%	41%	52%
Bower Creek	30.0%	40.0%	41%	52%
Apple Creek	30.0%	40.0%	41%	52%
Ashwaubenon Creek	30.0%	40.0%	41%	52%
Dutchman Creek	30.0%	40.0%	41%	52%
Plum Creek	30.0%	40.0%	41%	52%
Kankapot Creek	30.0%	40.0%	41%	52%
Garners Creek	63.1%	49.9%	69%	60%
Mud Creek	39.0%	28.5%	48%	43%
Duck Creek	30.0%	40.0%	41%	52%
Trout Creek	30.0%	40.0%	41%	52%
Neenah Slough	30.0%	40.0%	41%	52%
Lower Fox River Main Stem	30.0%	65.2%	41%	72%
Lower Green Bay	30.0%	40.0%	41%	52%

Baseline reductions of TP = 15% & TSS = 20%.
% TP reduction from no-controls = 15 + [0.85 x (% TP control in Lower Fox TMDL Report)]
% TSS reduction from no-controls = 20 + [0.80 x (% TSS control Lower Fox TMDL Report)]

Table checked by : Eric Rortvedt and Amy Minser, DNR Stormwater Engineers
Dated: 9/16/2014

BUREAU OF WATERSHED MANAGEMENT
PROGRAM GUIDANCE

RUNOFF MANAGEMENT POLICY AND MANAGEMENT TEAM
Storm Water Management Program

Wisconsin Department of Natural Resources
101 S. Webster Street, P.O. Box 7921
Madison, WI 53707-7921

Interim Municipal Phosphorus Reduction Credit for Leaf Management Programs

03-08-18
EGAD Number: 3800-2018-01

Notice: 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. This guidance does not establish or affect legal rights or obligations, and is not finally determinative of any of the issues addressed. This guidance does not create any rights enforceable by any party in litigation with the State of Wisconsin or the Department of Natural Resources. 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:

Pam Biersach

Pam Biersach, Director
Bureau of Watershed Management

March 8, 2018
Date

A. Introduction/Statement of Problem Being Addressed

Permitted Municipal Separate Storm Sewer Systems (MS4s) will be subject to an annual average reduction for the discharge of a pollutant of concern to a surface water that has an approved TMDL. Recent studies indicate that phosphorus loads in stormwater in the fall of the year may be reduced by frequent leaf collection followed by street cleaning. Many municipalities are currently developing plans to meet TMDL limits and wish to include fall leaf management efforts in their plans.

While additional research is needed on a broader range of conditions and management methods, sufficient data is available to determine a preliminary phosphorus reduction credit for the most common municipal land use type. This credit is limited to the specific conditions and methods for which data is available. No credit has been quantified for other land uses, tree canopies, or collection programs but it is the Department's intent to expand the applicability of the guidance to more conditions and programs as additional studies are completed. This expansion is dependent on availability of funding for further data collection and evaluation.

B. Objectives

This guidance identifies a percent phosphorus reduction credit which may be taken by municipalities as part of TMDL planning and the conditions required to take that credit.

C. Background and Definitions

Urban trees provide a host of benefits to the residents and workers within a community, such as energy savings, aesthetics, airborne pollutant reduction, noise reduction, and providing bird habitat. Trees are also an important part of the hydrologic cycle. However, without adequate management of leaf litter, they also contribute to the nutrient loading in urban stormwater. Each tree species contributes a different amount of phosphorus to the stormwater, but since a diverse set of tree species is beneficial to long-term maintenance of a healthy canopy this effect is not being addressed at this time.

While there are many sources of phosphorus in urban stormwater, a primary contributor is organic detritus, especially in areas with dense overhead tree canopy (Duan et al, 2014; Hobbie et al, 2014; and Kalinosky et al, 2014). Measurement of end-of-pipe phosphorus concentrations has demonstrated that phosphorus loads in urban stormwater vary seasonally in certain medium density residential areas, with higher concentrations coinciding with leaf accumulation on streets (Selbig, 2016). As phosphorus discharges in stormwater can vary from year to year depending on timing of rainfall events, seasonal phosphorus loads were modeled over a twenty-year period with WinSLAMM to determine the average proportion that is discharged in the fall. From this information, it is estimated that on average 43% of the annual phosphorus load is discharged in the fall.

A variety of public works programs are already in place to collect leaves from the streets and properties in the fall, but until recently, little was known about the phosphorus reduction potential of different leaf collection programs. Over the last four years, the United States Geological Survey (USGS) conducted a study to characterize reductions of total and dissolved forms of phosphorus in stormwater through a municipal leaf collection and street cleaning programs in Madison, Wisconsin, USA. Some credit for phosphorus reduction is warranted based on the information.

To estimate the efficiency of leaf collection, leaves were collected three to four times at the test site and collected only once at the end of the fall at the control site. A small vehicle was used to push the leaves from the terrace into the street and then the leaves were pushed into garbage trucks. Within 24 hours of leaf collection, remaining leaf litter in the street was collected using mechanical street cleaners. Eight end-of-pipe phosphorus concentration measurements were compared at the test and control sites during the fall of 2016. Water quality data collected indicate that the collection and transfer method resulted in a 40% reduction of total phosphorus discharge in the fall at the test site versus the control site.

D. Guidance Content

A municipality may assume the specified reduction from no controls phosphorus loads provided all of the conditions are met. Further evaluation is required to determine how leaf collection methods may reduce loading to structural best management practices (BMPs) such as ponds. Therefore, this credit may not be taken in addition to phosphorus reductions from other BMPs in the drainage area at this time.

Transfer Plus Street Cleaning Method of Leaf Collection

Municipalities may assume 17% (40% reduction due to collection efforts x 43% of annual phosphorus load occurring in fall) Total Phosphorus annual load reduction for the leaf collection effort in the Medium Density Residential No Alleys (MDRNA) land use for this option. If the credit is desired for an area containing MDRNA and other land uses, the annual load reduction must be modified by the percent of the total phosphorus load from the area that is from the MDRNA. For example, the phosphorus load from a MDRNA might represent 60% of the load from the entire area. The new annual percent reduction for the area would be 10% (17% X 60%). Municipalities may apply the leaf credit to a subset of their MDRNA area if other BMPs are providing more phosphorus reduction for the remaining area. At this time credit for leaf collection is not available for other land uses or lower-density tree canopies. The Total Phosphorus annual load reduction for this option may be assumed if the following conditions are met:

1. Medium Density (2-6 units/acre) Residential (Single-family) land use without alleys. Medium Density Residential with alleys land use may be included if the alleys receive the same level of leaf collection and street cleaning as the streets.

2. Curb and gutter with storm sewer drainage systems and light parking densities during street cleaning activities.
3. An average of one or more mature trees located between the sidewalk and the curb for every 80 linear feet of curb. Where sidewalk is not present, trees within 15 feet of the curb may be counted toward tree cover. Generally, this equates to a tree canopy over the street (pavement only) of 17% or greater. Field investigations or aerial photography may be used to document the tree cover.
4. The municipality has an ordinance prohibiting residents from placement of leaves in the street and a policy stating that residents may place leaves on the terrace in bags or piles for collection.
5. Municipal leaf collection provided at least 4 times spaced throughout the months of October and November. Leaves may be pushed, vacuumed, or manually loaded into a fully enclosed vehicle, such as a garbage truck or covered dump truck. No leaf piles are left in the street overnight.
6. Within 24 hours of leaf collection, remaining leaf litter in the street must be collected using street cleaning machines, such as a mechanical broom or vacuum assisted street cleaner. A brush attachment on a skid steer is not an acceptable equivalent.

It is anticipated that additional scenarios will be added as research is completed.

E. References

Duan, S., Delaney-Newcomb, K., Kaushal, S.S., Findlay, S.E.G., Belt, K.T., 2014. Potential effects of leaf litter on water quality in urban watersheds. Biogeochemistry 121, 61–80. http://dx.doi.org/10.1007/s10533-014-0016-9.

Hobbie, S.E., Baker, L.A., Buyarski, C., Nidzgorski, D., Finlay, J.C., 2014. Decomposition of tree leaf litter on pavement: implications for urban water quality. Urban Ecosyst. 17 (2), 369–385. http://dx.doi.org/10.1007/s11252-013-0329-9.

Kalinosky, P., Baker, L.A., Hobbie, S., Bintner, R., Buyarksi, C., 2014. User support manual: estimating nutrient removal by enhanced street sweeping. Report to the Minnesota Pollution Control Agency (available at: http://larrybakerlab.cfans.umn.edu/files/2011/07/Kalinosky-et-al.-2014.-Street-Sweeping-Guidance-Manual-final-9-24-2014.docx, (accessed April 11th, 2016)).

Selbig, W.R., 2016, Evaluation of leaf removal as a means to reduce nutrient concentrations and loads in urban stormwater, Science of the Total Environment, 571, pp. 124 – 133. http://dx.doi.org/10.1016/j.scitotenv.2016.07.003

CREATED:

Amy Minser, Stormwater Engineer — 3/8/18 Date
On behalf of the Storm Water Liaison Team

APPROVED:

Mary Anne Lowndes, Chief — 3/9/18 Date
Runoff Management Section

Runoff Management Policy Management Team approved on February 1, 2018.
Division Administrator approved March 6, 2018.

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Steven B. Danner-Rivers

December 19, 2019
1:00 PM

City Engineering Offices
210 Martin Luther King Jr Blvd
Room 115
Madison, WI 53575

MEETING MINUTES – CITY OF MADISON/WDNR MS4 MEETING

Topics

1. Delineating riparian areas

The currently identified streams are acceptable; the streams that were identified are considered perennial, navigable streams.

The City may choose to add non-perennial, navigable streams. However, these streams cannot be identified upstream of an existing, online, stormwater control measure.

The City may also choose to identify internal drained areas with no discharge below the 10-year TMDL record of rain utilized for the TMDL.

The City will review the non-perennial, navigable streams and the internally drained areas within the City. Based on the results of the review, the City may revise the figure. The finalized figure will be provided to the WDNR for concurrence.

2. City of Madison custom Standard Land Use files – for MS4/TMDL modeling

The City provided an overview of the calculations to create standard land uses where streets are their own standard land use and the non-street areas are in a separate standard land use. A sensitivity analysis was conducted to determine the difference in results between the custom files and the original standard land uses that come with the WinSLAMM program. The differences in runoff volume are essentially negligible. The differences in pollutant loading are expected based on the way the street standard land uses were created.

The discussion resulted in Eric being comfortable with the approach. The City will draft a document describing the approach and results and send to the WDNR for concurrence.

3. City of Madison private practices maintenance ordinance

The City of Madison is updating its stormwater ordinance. The City asked for review of the section regarding maintenance of private practices for purposes of adding needed revisions to the current

ordinance update.

Eric did a cursory review of the current language and thought it was acceptable.

Following the meeting, Eric provided potential revisions to the ordinance. The City will review the revisions and incorporate where appropriate.

4. MS4 vs. TMDL modeling

A discussion was held regarding where the City could put its efforts for purposes of the stormwater modeling update due March 2021. The City's current model for MS4 permit compliance with the Developed Urban Area Standard indicates the City is above 20% reduction of TSS on a city-wide basis (the documented results indicate the City is achieving 35.9% TSS reduction as of December 2017).

Current legislation requires permitted municipalities achieve 20% reduction; the provision for achieving 40% TSS reduction is not currently enforceable by the WDNR and is not expected to become enforceable in the foreseeable future.

The conclusion of the discussion is that because the City is above 20% TSS reduction, and very close to 40% TSS reduction, the City should keep the current modeling showing the results of the Developed Urban Area Standard, but not spend its effort to update it. Effort should be focused on updating the modeling for compliance with the TMDL.

Greg asked a question regarding if credits can be purchased for the portion of the loading reduction deficit below 40% TSS reduction. Eric confirmed, via email after that meeting, that the City may not purchase its required TSS control credit for the amount short of the 40% goal via adaptive management. Only the credit for pollution reduction above the 40% required by the TMDL may be purchased via adaptive management. Adaptive management is managed by pounds of TP, not TSS, and the TMDL for both criteria is "accepted" as being met provided the targeted pounds of TP are purchased.

Burger, Caroline

From: Fries, Gregory
Sent: Friday, February 29, 2008 2:47 PM
To: Eric Rortvedt
Cc: Nelson, Larry; Dailey, Mike; Peterson, Cami L - DNR; Lowndes, MaryAnne - DNR
Subject: RE: DNR Comments on City of Madison MS4 Treatment Analysis

Eric,

See my notes below (CAPS FOR CLAIRITY ONLY):

Thanks for taking the time to discuss this with me.

Greg

-----Original Message-----
From: Rortvedt, Eric - DNR [mailto:Eric.Rortvedt@Wisconsin.gov]
Sent: Friday, February 29, 2008 1:57 PM
To: Fries, Greg
Cc: Nelson, Larry; Dailey, Mike; Peterson, Cami L - DNR; Lowndes, MaryAnne - DNR
Subject: DNR Comments on City of Madison MS4 Treatment Analysis

Hello Greg,

I have reviewed the City of Madison MS4 treatment analysis to demonstrate that the MS4 provides a 20% reduction in TSS discharged to surface waters of the state as compared to no controls. Based on my review of the September 19, 2007 letter, supporting information and my discussions with you, I have the following comments:

1. Treatment Basin Efficiency - I agree that the submitted analysis is adequate to demonstrate that greater than 20% TSS control is being achieved by the City of Madison's MS4. However, a refined modeling analysis to determine wet pond TSS control will be needed to demonstrate compliance with the existing urban area TSS standard of 40% control (year 2013). The simplified methodology that was used to credit wet pond performance for ponds that existed prior to about year 2000 is not acceptable for the 40% control analysis. It is my understanding that the City will be compiling existing data and gathering additional survey information in order to appropriately model each wet basin where credit will be taken.

AS I DISCUSSED WITH YOU YESTERDAY - THIS IS NOT A PROBLEM WE ANTICIPATED COMPLETING SLAMM ANALYSIS FOR EACH OF OUR 550+ WATERSHEDS AND THIS SHOULD ADDRESS THIS ISSUE.

2. Credit for stormwater treatment within waters of the state - The City has identified the need to establish whether credit for stormwater treatment may be taken within certain waters of the state. In particular, it was indicated that the City has documentation that the Vilas Lagoons, Acewood Pond and Odana Pond were excavated and/or modified to provide stormwater management. Section NR 151.003, Wis. Adm. Code, acknowledges that storm water practices that serve existing developed areas may be located within navigable surface waters and wetlands, provided that construction of such practices is (or was at the time) allowed under all applicable federal, state and local regulations, such as ch NR 103, Wis. Adm. Code and ch. 30, Stats. Please provide me with documentation that shows when these ponds were constructed and or modified to provide stormwater management benefits. Also, please explain and or provide documentation as to whether any maintenance of these ponds as stormwater treatment practices has occurred in the past or is anticipated in the future.

I WILL RESEARCH AND PROVIDED YOU THE DOCUMENTATION I HAVE AVAILABLE.

3. Minor correction - I happen to notice that the street texture between the existing and proposed model runs for the Apts_07_***.dat files changed. Since the other files kept the same texture between conditions, I assume that this was a typo. You do not need to send me any correction for this. Please adjust accordingly for future modeling.

NO PROBLEM - THIS WILL BE ADDRESSSED

4. Suggestion - The spreadsheet summarizing the results is very well organized and already displays a lot of information. However, I would find it helpful to also have a column for percent TSS control for the treatment system used as part of the overall summary. Please consider adding this for future submittals.

NO PROBLEM - THIS WILL BE ADDRESSED

Please send me the information requested under item 2 in order to determine whether any of these ponds can be credited as a stormwater treatment practice.

Thank you for your cooperation. If you have any questions, feel free to contact me.

P Eric S. Rortvedt, P.E.
Water Resources Engineer
South Central Region
Wisconsin Department of Natural Resources
(*) phone: (608) 273-5612
(*) fax: (608) 275-3338
(*) e-mail: Eric.Rortvedt@wisconsin.gov

Burger, Caroline

From: Rortvedt, Eric - DNR <Eric.Rortvedt@wisconsin.gov>
Sent: Friday, January 10, 2020 2:59 PM
To: Burger, Caroline
Cc: Striegl, Lauren; Schmidt, Janet; Fries, Gregory; OBrien, Joanna; Breidenbach, Richie; Bannerman, Roger T - DNR
Subject: RE: December 19, 2019 City of Madison MS4 Modeling Discussion - Meeting Minutes

Caroline,

I read through the meeting minutes and they look fine to me.

Thanks

Eric Rortvedt, P.E.
Phone: (608) 273-5612
Eric.Rortvedt@Wisconsin.gov

From: Burger, Caroline <CBurger@cityofmadison.com>
Sent: Tuesday, January 07, 2020 3:15 PM
To: Rortvedt, Eric - DNR <Eric.Rortvedt@wisconsin.gov>
Cc: Striegl, Lauren <LStriegl@cityofmadison.com>; Schmidt, Janet <jschmidt@cityofmadison.com>; Fries, Greg <gfries@cityofmadison.com>; OBrien, Joanna <jobrien@cityofmadison.com>; Breidenbach, Richie <RBreidenbach@cityofmadison.com>; Bannerman, Roger T - DNR <Roger.Bannerman@wisconsin.gov>
Subject: December 19, 2019 City of Madison MS4 Modeling Discussion - Meeting Minutes

Hi Eric,

Attached are the meeting minutes from our meeting on December 19, 2019.

Please review and let me know if there are needed revisions.

Thank you,

Caroline Burger, PE, ENV SP
Engineer 3
Engineering Division
City-County Building, Room 115
210 Martin Luther King, Jr. Blvd.
Madison, WI 53703
Desk: 608-266-4913
cburger@cityofmadison.com

-----Original Appointment-----
From: Striegl, Lauren <LStriegl@cityofmadison.com>
Sent: Tuesday, December 3, 2019 8:50 AM
To: Striegl, Lauren; Eric Rortvedt - WDNR (eric.rortvedt@wisconsin.gov); Fries, Gregory; Schmidt, Janet; OBrien, Joanna; Breidenbach, Richie; Burger, Caroline; 'Bannerman, Roger T - DNR'
Subject: City of Madison MS4 Modeling Discussion
When: Thursday, December 19, 2019 1:00 PM-3:00 PM (UTC-06:00) Central Time (US & Canada).
Where: Conf Rm CCB 115 - Engineering Staff Only

Please see the attached agenda for tomorrow's meeting. I will more than likely be home with a sick kid, so Caroline has awesomely volunteered to MC tomorrow!

This meeting is scheduled to occur at City of Madison Engineering offices (210 MLK Jr Blvd), although it can be changed if desired ☺. We will cover Madison SLU modifications, as well as Madison's streams and rivers network. Our team is working on a map of lakes, rivers and streams within the City's MS4. **We will provide this map to Eric prior to the meeting for his review.**

Burger, Caroline

From: Eric Rortvedt
Sent: Tuesday, August 4, 2020 1:24 PM
To: Burger, Caroline
Cc: Striegl, Lauren; Fries, Gregory; Schmidt, Janet; Gaebler, Phil
Subject: RE: City of Madison - TMDL Modeling - Citywide Land Use Approach - Asking for Concurrence

Caroline,

I have reviewed the proposed strategy and justification you have outlined below and I agree that it seems to be an appropriate strategy. You have may concurrence.

Sorry my review took as long as it did. It's been a busy year.

Eric Rortvedt, P.E.
Phone: (608) 273-5612 (voice mail only)
Eric.Rortvedt@Wisconsin.gov

From: Burger, Caroline <CBurger@cityofmadison.com>
Sent: Tuesday, July 07, 2020 1:15 PM
To: Rortvedt, Eric - DNR <Eric.Rortvedt@wisconsin.gov>
Cc: Striegl, Lauren <LStriegl@cityofmadison.com>; Fries, Greg <gfries@cityofmadison.com>; Schmidt, Janet <jschmidt@cityofmadison.com>; Gaebler, Phil <PGaebler@cityofmadison.com>
Subject: City of Madison - TMDL Modeling - Citywide Land Use Approach - Asking for Concurrence

Hi Eric,

How are you?

As you are aware, the City of Madison is currently updating its TMDL modeling using WinSLAMM. We met in December to discuss a few items. One of those items was how the City is going to approach delineating the WinsLAMM standard land use City-wide. At the meeting, we discussed creating some Madison-specific standard land uses – ones that are only streets and ones that exclude streets. The purpose was to take advantage of our parcel-based standard land use designations and also appropriately account for the streets. The attached is a summary of that discussion and your response.

As we started creating the final set of Madison-specific standard land use files, we found we had to make numerous assumptions. The parcel land use is only for the parcel – the remainder is the right-of-way. The right-of-way includes more than just streets; it also includes sidewalks, terraces, and driveways. The assumptions we needed to create seemed to compound themselves in such a manner that we were not confident the resulting Madison-specific standard land uses would be reasonable for the right-of-way.

Therefore, we tried a second approach. This is the approach we'd like to use for this round of TMDL modeling.

The City has attributed all the parcels in the City with the WinSLAMM specific standard land use. The City has also categorized all right-of-way as Commercial, Residential, Industrial, Institutional, and Other Urban – the WinSLAMM major land uses. To categorize the streets in this manner, they were split down the centerline and, if necessary, split along parcel lines and categorized based on the land use of the adjacent parcel(s). This resulted in a full coverage of polygons in a GIS feature class for the entire City.

This next step is the one we'd like your thoughts on. The final step we took was to then assign the right-of-way the standard land use category for the adjacent parcel. So, for example, if the right-of-way is categorized as Commercial, and the parcel adjacent to the right-of-way is Strip Mall Commercial, then that right-of-way was categorized Strip Mall commercial.

Where there were numerous types of standard land uses adjacent to a right-of-way polygon with the same WinSLAMM major land use, that right-of-way polygon was assigned the parcel standard land use with the largest coverage. For example, in a residential neighborhood, you may have parcels categorized as Low Density Residential, Medium Density Residential No Alleys, and High Density Residential No Alleys all adjacent to the same Residential right-of-way polygon. If the Medium Density Residential No Alleys parcels had the largest percentage of coverage adjacent to that Residential right-of-way polygon, the Residential right-of-way polygon was assigned as Medium Density Residential No Alleys.

We feel comfortable with this assignment for three reasons:

1) We did a check to compare the standard land use breakdown of the area of only the parcels against the standard land use breakdown of the area of the entire City with the newly-assigned right-of-way. For all land uses, except MDRNA, Park, and Open Space, the breakdown was essentially the same. MDRNA, Park, and Open Space were off by a couple percentages. Given the accuracy of the model, we thought this deviation was acceptable.
2) In talking with Dr. Pitt, right-of-way loading doesn't distinguish between individual standard land uses; it takes on the predominant standard land use loading as traffic and people move through it.
3) The City is currently under contract with the University of Northern Iowa to delineate the impervious area within the City and then categorize all areas of the City with its WinSLAMM source area – ie roof, sidewalk, landscaped, etc. That work will not be finished until this fall/winter – not in time for this round of TMDL modeling. BUT, we will be using it for the next TMDL modeling update.

Please let us know your thoughts on this and if it is an acceptable way to proceed.

Thank you,

Caroline Burger, PE, ENV SP
Engineer 3
Engineering Division
City-County Building, Room 115
210 Martin Luther King, Jr. Blvd.
Madison, WI 53703
☎ Desk: 608-266-4913
✉ cburger@cityofmadison.com

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https://www.cityofmadison.com/health-safety/coronavirus/service-updates

Striegl, Lauren

From: Eric Rortvedt
Sent: Sunday, August 9, 2020 7:20 PM
To: Striegl, Lauren
Subject: RE: City of Madison TMDL/MS4 - Navigable Water Riparian Areas
Attachments: CityofMadison_LakesRiversStreams.pdf

Lauren,

I have reviewed the attached map and I agree that all the blue stream sections are navigable waters and that any runoff draining directly to them without passing through a City of Madison storm sewer may be removed from the MS4 TMDL analysis. If there was a City of Madison owned or operated storm water treatment facility within a blue stream section, then the drainage area above that treatment facility should be included in the City of Madison MS4 TMDL analysis.

Note: The Starkweather Creek section that is along the western side of the Dane County airport appears to have been relocated between 2005 and 2010 based on aerials. The current stream location is somewhat to the west of the blue line which was the prior location of the stream.

If you have any other questions, please let me know. I promise, I will be much quicker to respond to follow up questions. I also can be reached at home via cell at [redacted].

Eric Rortvedt, P.E.
Phone: (608) 273-5612 (voice mail only)
Eric.Rortvedt@Wisconsin.gov

From: Striegl, Lauren <LStriegl@cityofmadison.com>
Sent: Thursday, July 02, 2020 9:44 AM
To: Rortvedt, Eric - DNR <Eric.Rortvedt@wisconsin.gov>
Subject: City of Madison TMDL/MS4 - Navigable Water Riparian Areas

Hi Eric,

I hope that you're navigating (and surviving!) this pandemic well, or at least as well as possible. I wanted to follow-up on a remaining item from Madison's TMDL/MS4 modeling meeting with you from last December. If you recall, we had left it that Madison would develop and provide a figure showing the navigable waters associated with riparian areas that we intended to remove from the TMDL modeling area within City boundaries. Attached please find the figure that we created – we hoped that you would be willing to look it over and confirm that this looks acceptable to you.

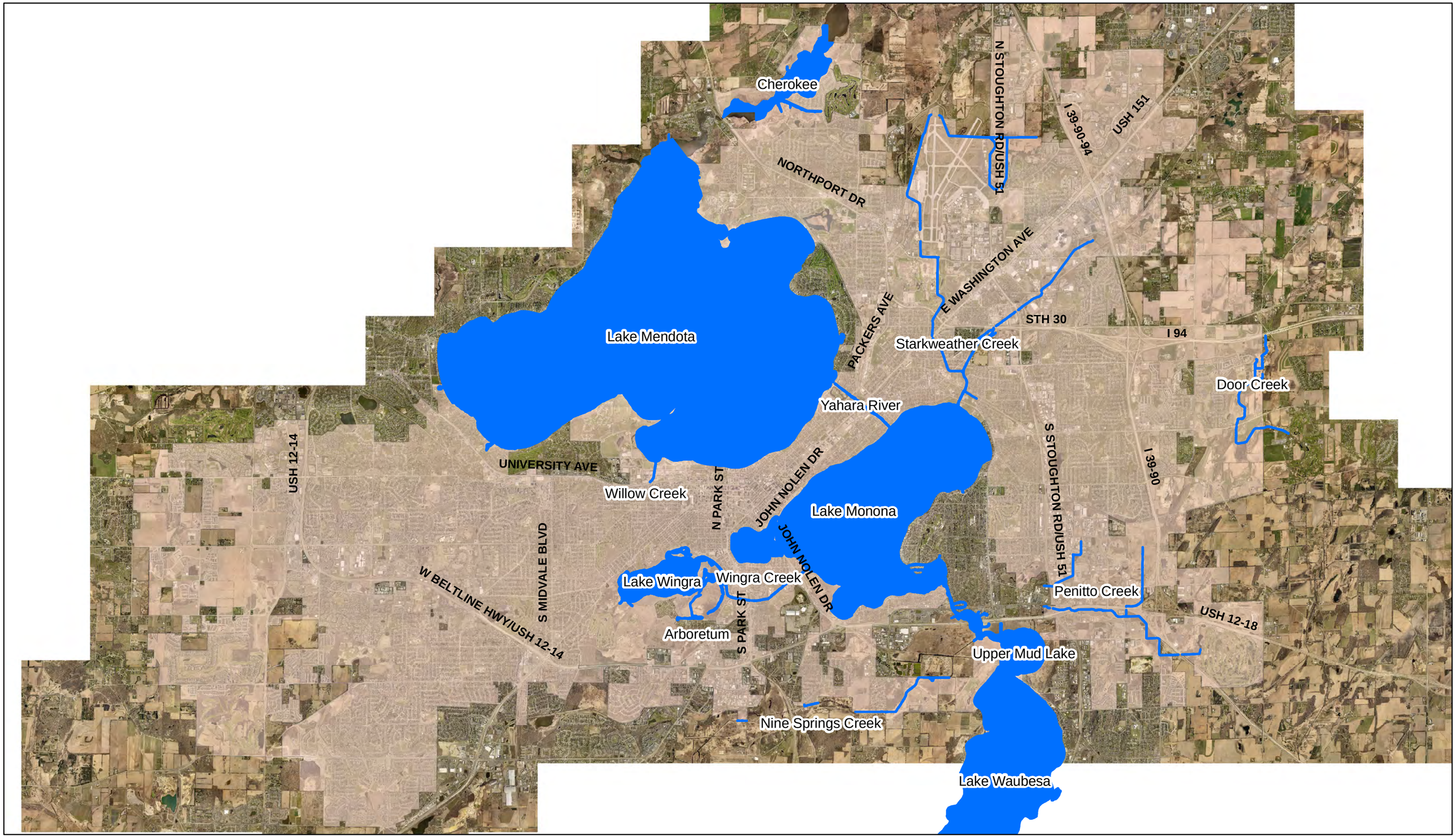
Thanks much, and stay healthy! Also, because I'm curious – I've been semi-following the drama encompassing the MLB season this year. Is your son still in the minors? If so, I'm guessing he won't be playing this year ☹. I'm sure he's disappointed, but it certainly seems better to err on the side of safety this year. What a mess 2020 has been ☹.

Lauren

Lauren Striegl, PE
(she/her/hers)
Engineer
City of Madison Engineering Division

210 Martin Luther King Jr. Blvd, Room 115
Madison, WI 53703

Navigable Waters Associated with Riparian Areas to Be Removed from TMDL Area
City of Madison, WI
May 13, 2020



Burger, Caroline

From: Eric Rortvedt
Sent: Thursday, September 3, 2020 12:19 PM
To: Fries, Gregory; Burger, Caroline
Cc: Schmidt, Janet; Striegl, Lauren
Subject: RE: Confirmation to use SCMs in Waters of the State for credit towards the TMDL?
Attachments: RE: DNR Comments on City of Madison MS4 Treatment Analysis

Hi all,

Item 2 in the attached email is somewhat related to this issue.

Section NR 151.003(2)(d), Wis. Adm. Code, specifies that storm water treatment credit may be taken for existing development, infill and redevelopment areas provided *"The BMP was constructed, contracts were signed or bids advertised and all applicable permits were received prior to January 1, 2011."*
Any BMP placed within a navigable water of the state that do not meet one of the conditions under s. NR 151.003(2)(d), are not allowed to be used for generating storm water treatment credit under NR 151. However, this section pertains to treatment credit under NR 151 and not necessarily for storm water TMDL compliance. NR 151: http://docs.legis.wisconsin.gov/code/admin_code/nr/100/151.pdf

Storm water treatment credit may be taken for a storm water facility under NR 151 and for TMDL compliance that meets either of the following:

a) In a wetland where proper wetland permits have been obtained.
b) In an artificial waterbody, whether navigable or non-navigable, where all proper permits have been obtained. See s. 281.16(2)(c) stats.,

I need to get internally DNR concurrence on taking TMDL credit for a legally permitted storm water facility, such as the Willow Creek facility, that was installed after 2011 in a non-artificial water of the state. I will get back to you on this issue.

Eric Rortvedt, P.E.
Phone: (608) 273-5612 (voice mail only)
Eric.Rortvedt@Wisconsin.gov

From: Fries, Gregory <GFries@cityofmadison.com>
Sent: Friday, August 28, 2020 8:29 AM
To: Burger, Caroline <CBurger@cityofmadison.com>; Rortvedt, Eric - DNR <Eric.Rortvedt@wisconsin.gov>
Cc: Schmidt, Janet <jschmidt@cityofmadison.com>; Striegl, Lauren <LStriegl@cityofmadison.com>
Subject: RE: Confirmation to use SCMs in Waters of the State for credit towards the TMDL?

Thanks Caroline.

Eric – the context of our discussion was for the Willow Creek Project and that because it was in a water of the state as an online system we could not take credit under NR-151 but could take credit for the TMDL (at least that is how I remember it ☺).

Thanks

Greg

From: Burger, Caroline <CBurger@cityofmadison.com>
Sent: Friday, August 28, 2020 8:25 AM
To: Eric Rortvedt <eric.rortvedt@wisconsin.gov>
Cc: Fries, Gregory <GFries@cityofmadison.com>; Schmidt, Janet <jschmidt@cityofmadison.com>; Striegl, Lauren <LStriegl@cityofmadison.com>
Subject: Confirmation to use SCMs in Waters of the State for credit towards the TMDL?

Hi Eric,

The City of Madison is looking for confirmation on an approach. Greg indicates that in one of your many conversations, you wrote in an email that water bodies that are considered Waters of the State – such as Odana Golf Course Ponds – could be used towards credit for the TMDL, but not for NR151. He searched for the famous email and could not find it. Therefore, I am reaching out to you to confirm that.

We are finalizing the water bodies/ponds we are using for our TMDL analysis.

Can you please confirm?

Thank you,

Caroline Burger, PE, ENV SP
Engineer 4
Engineering Division
City-County Building, Room 115
210 Martin Luther King, Jr. Blvd.
Madison, WI 53703
☎ Desk: 608-266-4913
✉ cburger@cityofmadison.com

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https://www.cityofmadison.com/health-safety/coronavirus/service-updates

Burger, Caroline

From: Eric Rortvedt
Sent: Monday, December 14, 2020 4:38 PM
To: Burger, Caroline
Cc: Striegl, Lauren; Gaebler, Phil; Fries, Gregory; Schmidt, Janet; Breidenbach, Richie; Jorgensen, Emily
Subject: RE: Street Cleaning

Caroline,

Your summary does correctly capture the approach we discussed. I look forward to reviewing the results of the 1- and 5-year model runs to help determine a relationship to apply to the other watersheds with out-of-memory errors.

Warm regards,

Eric Rortvedt, P.E.
Cell: (608) 438-9087
Phone: (608) 273-5612 (voice mail only)
Eric.Rortvedt@Wisconsin.gov

From: Burger, Caroline <CBurger@cityofmadison.com>
Sent: Monday, December 14, 2020 2:56 PM
To: Rortvedt, Eric - DNR <Eric.Rortvedt@wisconsin.gov>
Cc: Striegl, Lauren <LStriegl@cityofmadison.com>; Gaebler, Phil <PGaebler@cityofmadison.com>; Fries, Greg <gfries@cityofmadison.com>; Schmidt, Janet <jschmidt@cityofmadison.com>; Breidenbach, Richie <RBreidenbach@cityofmadison.com>; Jorgensen, Emily <EJorgensen@cityofmadison.com>
Subject: Street Cleaning

Hi Eric,

Thank you for taking the time to talk today. This email summarizes our discussion. Please let me know if you agree that it reflects what we spoke about, or, if you have modifications.

The City is building WinSLAMM models to calculate its existing pollution reduction for purposes of compliance with its MS4 permit. The City is broken up into approximately 50 sub-watersheds with a WinSLAMM model being created for each sub-watershed.

Due to the size of some of the models (the combination of land uses, control practices, rainfall, and pollutants), we are getting out-of-memory errors. This occurs when the processing required for the models is overwhelmed by the amount of data in the model. PVA is working on addressing this issue separately, but will not be done with the solution until after the modeling is due.

To help alleviate this error, the City also contracted with PVA to create a component in the model that would allow linking the output of one model to the input of another. This new component will help with most of the errors.

However, we believe we may have a couple sub-watersheds where the model is still too large. We have found that when we remove street cleaning, the model errors no longer exist. Therefore, we would like to develop an approach that accounts for street cleaning for the large areas while keeping the models small enough that we do not get out of memory errors. The following is the approach we discussed:

1. Run all the models that do not get the out-of-memory error for both the 1-year rainfall file and the 5-year rainfall file, with and without street cleaning.
2. Plot the relationship between the 1-year and 5-year pollution reduction.
3. Develop a relationship between the 1-year and 5-year pollution reduction, with and without street cleaning.
4. For the models where the out-of-memory error occurs for the 5-year rainfall file, apply the developed relationship.

Once we have developed the relationship, we will provide it to you for your review before we apply it to the models in question.

Thank you,

Caroline Burger, PE, ENV SP
(she/her/hers)
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https://www.cityofmadison.com/health-safety/coronavirus/service-updates

Striegl, Lauren

From: Rortvedt, Eric - DNR <Eric.Rortvedt@wisconsin.gov>
Sent: Wednesday, January 3, 2018 11:01 AM
To: Striegl, Lauren
Cc: Fries, Gregory; Gaebler, Phil; OBrien, Joanna
Subject: RE: City of Madison MS4 Modeling - Private Practice Guidance

Lauren,

Your proposed approach described below to take an additional TSS reduction credit as the difference is acceptable. I believe that this approach should work for TP as well.

Note: If one of the treatment practices were a device that is modeled to infiltrate then we should evaluate whether this approach is still valid/reasonable.

Eric S. Rortvedt, P.E.
Phone: (608) 273-5612

From: Striegl, Lauren [mailto:LStriegl@cityofmadison.com]
Sent: Wednesday, January 03, 2018 10:49 AM
To: Rortvedt, Eric - DNR
Cc: Fries, Gregory ; Gaebler, Phil ; OBrien, Joanna
Subject: City of Madison MS4 Modeling - Private Practice Guidance

Hi Eric,

Thanks again for looking over my drawing yesterday and talking this morning with me about how to deal with private practices. As discussed, I wanted to follow up with a synopsis email so that everyone is on the same page (and so I don't forget).

To recap, the City of Madison is hoping to avoid putting private stormwater treatment practices into our WinSLAMM models due to their relatively small size as well as WinSLAMM's instability with large models. To that end, the City is looking for guidance on how to account for these practices "on the back end," preferably in a spreadsheet, after modeling the larger treatment practices and overall watersheds in WinSLAMM.

The primary concern that we discussed in our phone call was the tracking of particle sizes – we don't want to "double-count" larger particles. Therefore, we agreed on a fairly straightforward approach. Let's say a particular private practice (PP) obtains 80% TSS removal, but the parcel (Shopping Mall) that it treats is located in a watershed that drains to a large pond (MegaPond). MegaPond provides 40% TSS control to the whole contributing watershed. Instead of the City of Madison taking credit for 80% of PP's incoming TSS load, we would take 80% - 40% = **40%** credit of the load from Shopping Mall in addition to the reductions calculated by WinSLAMM for MegaPond.

In the rare event that a private practice has calculated TP load reductions, the City would use the same approach to calculate TP load reductions in PP. If PP reduces the TP load from Shopping Mall by 67%, and MegaPond provides 27% TP reduction, then in addition to the reductions from MegaPond, the City of Madison would claim credit for 67% - 27% = **40%** TP. I understand that the TP situation is more complex than the TSS situation, so I'm certainly open to revisiting this particular calc.

If you could confirm the methodology proposed for TSS, and offer your thoughts on the methodology proposed for TP, that would be awesome. Thanks so much for your time on this!

Lauren Striegl
City of Madison - Engineering Division
210 Martin Luther King Jr. Blvd.
Madison, WI 53703
608-266-4094