Stormwater Management Plan
City of Mosinee, Wisconsin

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City of Mosinee

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TABLE OF CONTENTS

Page

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

Appendix

LIST OF ABBREVIATIONS

t_c	time of concentration
BMP	best management practice
EPA	United States Environmental Protection Agency
GIS	Geographic Information System
HSD	Hydrodynamic Separation Device
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
TSS	Total Suspended Solids
WDNR	Wisconsin Department of Natural Resources
WinSLAMM	Source Loading and Management Model for Windows
WNV	West Nile Virus
WPDES	Wisconsin Pollutant Discharge Elimination System

1.0 INTRODUCTION

The City of Mosinee contracted with AECOM in March of 2008 to assist in the development of a Stormwater Management Plan for the City. The City received a grant from the Wisconsin Department of Natural Resources (WDNR) to fund portions of this study. Because of the grant program's provisions, portions of the plan dealing with stormwater infrastructure capacity issues are funded solely through City revenue. The remainder of the project is funded at a ratio of 50 percent WDNR and 50 percent local funding with a maximum state assistance of $43,050.

The project goal is to provide a mechanism for Mosinee to comply with the City's General Wisconsin Pollutant Discharge Elimination System (WPDES) Municipal Separate Storm Sewer System (MS4) permit. The project scope included 12 tasks:

Task 1: Survey

Task 2: Development of a Storm Sewer System Map

Task 3: Establish a Public Involvement and Participation Program

Task 4: Develop a Public Education and Outreach Program

Task 5: Initiate Illicit Discharge Detection and Elimination Program

Task 6: Establish Ordinances in Compliance with WPDES Permit

Task 7: Assess No Controls and Existing Pollutant Loads (WinSLAMM)

Task 8: Determine Best Management Practices (BMPs) Needed to Reach Total Suspended Solids (TSS) Reduction Goals

Task 9: Compile a Stormwater Management Plan Document

Task 10: Development and Document Cities Stormwater Management Program Needs

Task 11: Estimate Alternative Funding Customer Base

Task 12: Prepare Rate Study Report and Presentation

Mosinee entered into a cooperative Memorandum of Understanding to pool resources with other area permitted municipalities and Marathon County. This stormwater group (North Central Wisconsin Storm Water Coalition) developed the ordinances and public communication programs contained in Tasks 3, 4, and 6. With approval of WDNR, AECOM, and Mosinee modified the project scope to replace these tasks with *in situ* measurement of infiltration rates for a sampling of swale areas and an update to the WinSLAMM modeling completed in Tasks 7 and 8.

The purpose of this report is to document the process and results of the project.

The plan includes a city-wide stormwater pollution analysis for three conditions:

1. A “no controls” condition which reflects the stormwater pollution generated from the City of Mosinee under the land use as of October 1, 2004, and **not** accounting for the pollution management measures that the City currently employs.

2. The existing condition which reflects the stormwater pollution produced under the “no controls” condition, while accounting for the stormwater pollution management activities currently employed by the City.

3. A future stormwater pollution condition accounting for management actions required to comply with the WPDES permit.

Additionally, the plan includes an education and outreach plan that addresses three local stormwater related ordinances also identified in the NR 216 requirements. Finally, there is a Plan Implementation chapter which provides an overview of the responsible parties, financing, and schedule for the proposed stormwater management practices.

2.0 PROJECT SETTING

2.1 OVERVIEW

The City of Mosinee is located in Marathon County in Central Wisconsin and is divided by the Wisconsin River. The Mosinee Flowage and Cemetery Slough border the City to the north. Mosinee's 2000 census population was 4,063. The Wausau metropolitan area has been identified as an "Urbanized Area" by the United States Census Bureau. As a result, the City of Wausau and neighboring municipalities, including the City of Mosinee, are subject to stormwater management regulations as defined in Chapter NR 216 of the Wisconsin Administrative Code.

2.2 WISCONSIN STORMWATER REGULATORY PROGRAM

The WDNR administers the state municipal stormwater management program under Chapter NR 216 of the State Administrative Code. WDNR issued the General WDPES Permit (included in Appendix A) for Municipal Separate Storm Sewer Systems on January 19, 2006. This General Permit applies to over 200 communities in Wisconsin; WDNR issued letters to each municipality authorizing them under the General Permit. Two groups of communities are covered by the permit program. One includes all municipal governments that are part of an Urbanized Area; these are identified by the US Census Bureau, and consist of contiguous areas with a population over 50,000 and a population density of at least 1,000 people per square mile. The second group of communities includes those with a population of at least 10,000 people. The Wausau metropolitan area has been identified by the Census Bureau as an Urbanized Area.

Seven minimum standards will be required of the City relative to stormwater management. To comply with the minimum standards, the City must develop and implement the following programs:

1. Public education and outreach program.

   Mosinee will be required to implement a public education and outreach program. The purpose of this program is to increase awareness of stormwater pollution impacts on waters of the state and to encourage changes in public behavior which will reduce these impacts.

2. Public involvement and participation program.

   The public involvement and participation component of the permit requirements includes a program to notify the public of activities required by the WPDES permit and compliance with applicable state and local public notice requirements.

3. Illicit discharge detection and elimination (program and ordinance).

   Mosinee will develop, implement, and enforce a program to prevent and eliminate illicit discharges and connections to the MS4. Requirements of this program include adoption of an ordinance, establishing an inspection and enforcement authority, and establishing a dry weather field screening program.

4. Construction site pollutant control (ordinance).

   This component of the WPDES permit requires Mosinee to adopt and enforce a construction site pollution control ordinance.

5. Post-construction site stormwater management (ordinance).

   An additional requirement of the WPDES permit is to develop, implement, and enforce a program to require control of the quality of stormwater discharges from areas of new development and redevelopment.

6. Pollution prevention (reduce stormwater pollution from municipal operations and the city-wide storm sewer system).

   Permitted communities are required to develop and implement a pollution prevention program for stormwater related municipal activities. This includes inspection and maintenance of municipally-owned or operated stormwater management facilities, street sweeping and catch basin cleaning, proper management of leaf and grass clippings, and other programs.

7. Stormwater quality management.

   Mosinee currently exceeds the 20 percent reduction in TSS loadings that was required by November of 2008, but still needs to meet the 40 percent reduction by March 10, 2013.

3.0 NONPOINT SOURCE POLLUTION ANALYSIS

Nonpoint source pollution is defined as the contamination of surface water and groundwater by sediment, nutrients, organic compounds, pathogens, and heavy metals found in the runoff from urban or rural areas. Nonpoint source pollution can have a significant negative impact on receiving waters, often exceeding the impact of point-source discharges (factories, wastewater treatment plants, etc.) typically associated with water pollution. Therefore, an assessment of nonpoint source pollution is an important part of watershed planning. In addition, the City of Mosinee WPDES permit requires nonpoint pollution analysis; this study provides information required to comply with that permit.

3.1 DEFINING THE PROJECT AREA

The project area, for purposes of the stormwater pollution computer modeling analysis, is based on the regulatory requirements of NR 216, and the policy memo developed by the WDNR (see Appendix B for the WDNR policy memo). The starting point for determining the area to be included in nonpoint source pollution analysis is the Mosinee municipal boundary. The project area for the nonpoint source pollution analysis includes:

1. Any developed area that was not subject to the post-construction performance standards of NR 151 that went into effect October 1, 2004, and that drains to the stormwater conveyance system. The conveyance system includes the City-owned or managed stormwater pipes, ditches, streets, gutters, stormwater ponds, detention areas, or other constructed systems for conveying stormwater runoff to a lake, river, or wetland.

2. Any area covered by a Notice of Intent (NOI) submitted prior to October 1, 2004, where development is still underway.

3. Undeveloped (in-fill) areas under 5 acres. These areas are required to be modeled as fully developed, with a land use similar to surrounding areas.

4. Non-manufacturing areas of industrial facilities covered under an NR 216 industrial permit.

5. Any industry that has certified a condition of “no exposure” in accordance with Section NR 216.21(3).

Within the City, certain lands were excluded from the stormwater pollution analysis because these areas are not regulated by NR 216, or these areas are regulated under their own individual NR 216 permit. The areas excluded from the pollution analysis include:

1. Riparian lands that discharge stormwater runoff to a river, lake, or wetland without entering into the City’s stormwater conveyance system.

2. Lands draining to Marathon County stormwater conveyance system prior to discharging to the City MS4.

3. Industrial areas already regulated under NR 216.

4. Undeveloped land parcels over 5 acres within the City.

5. Lands within the City zoned agriculture and under agricultural condition as of October 1, 2004.

Figure 3-1 depicts the project area for the stormwater pollution analysis purposes.

The project area was divided into 45 drainage basins by AECOM with assistance from City staff. Stormwater from the City discharges to the Big Rib and Wisconsin Rivers, wetlands, and WisDOT and Marathon County drainage systems.

3.2 LAND USE

3.2.1 General Background

The type and distribution of land use has a major impact on the hydrology and nonpoint source pollution within a watershed. The volume and rate of stormwater runoff increases with the percentage of impervious surfaces (streets, parking lots, roofs, etc.) in an area. As development occurs, the impervious area generally increases significantly. Land use also plays an important role in determining the types and amounts of pollutants that are contained within runoff.

Highly urbanized commercial and industrial areas usually contain a large percentage of impervious area, and also generate high amounts of a variety of nonpoint source pollutants, including sediment, nutrients, bacteria, metals, and toxic substances. Less intensive development, such as low to medium density residential development, contains a moderate amount of impervious area and generates lower levels of most pollutants. Agricultural areas may generate high amounts of sediment and nutrients, but usually generate very low levels of metals.

3.2.2 Data Sources and Methods

A map of existing land use, as of October 1, 2004, was developed from several sources. Marathon County land use data was used as a starting point. AECOM viewed this data, overlaid on an aerial photograph of the City, and adjusted the land use data to match the aerial photo where appropriate. City staff reviewed the land use prior to AECOM performing the WinSLAMM modeling. WinSLAMM land use codes have been developed specifically for modeling stormwater pollutant loadings. Therefore, they do not necessarily coincide with the zoning or other land use naming conventions developed by municipalities. The following is a description of land use codes utilized in modeling for this project:

1. Residential Land Uses

   - High Density Residential without Alleys (HDRNA): Urban single family housing at a density of greater than 6 units/acre. Includes house, driveway, yards, sidewalks, and streets.

   - High Density Residential with Alleys (HDRWA): Same as HDRNA, except alleys exist behind the houses.

- Medium Density Residential without Alleys (MDRNA): Same as HDRNA, except the density is from 2 to 6 units/acre.
- Medium Density Residential with Alleys (MDRWA): Same as HDRWA, except alleys exists behind the houses.
- Low Density Residential (LDR): Same as HDRNA, except the density is 0.7 to 2 units/acre.
- Duplexes (DUP): Housing having two separate units in a single building.
- Multiple Family Residential (MFRNA): Housing for three or more families, from 1 to 3 stories in height. Units may be adjoined up-and-down, side-by-side; or front-and-rear. Includes building, yard, parking lot, and driveways. Does not include alleys.
- Apartment Residential (APTS): Same as MFRNA, except buildings are High Rise Apartments; multiple family units 4 or more stories in height.
- Mobile Home Park (MOBH): A mobile home or trailer park, includes all vehicle homes, the yard, driveway, and office area.
- Suburban (SUB): Same as LDR, except the density is between 0.2 and 0.6 units/acre.
- Rural (RURL): Same as SUB, except the density is less than 0.2 units/acre.

2. Commercial Land Uses

- Strip Commercial (SCOM): Those buildings for which the primary function involves the sale of goods or services. This category includes some institutional lands found in commercial strips, such as post offices, courthouses, and fire and police stations. This category does not include buildings used for the manufacture of goods or warehouses. This land use includes the buildings, parking lots, and streets. This land use does not include nursery, tree farms, vehicle service areas, or lumber yards.
- Shopping Centers (SHOP): Commercial areas where the related parking lot is at least 2.5 times the area of the building roof area. Parking areas usually surrounds the buildings in this land use. This land use includes the buildings, parking lot, and streets.
- Office Parks (OFPK): Land use where non-retail business takes place. The buildings are usually multi storied buildings surrounded by larger areas of lawn and other landscaping. This land use includes the buildings, lawn, and road areas. Types of establishments that may be in this category includes: insurance offices, government buildings, and company headquarters.

3. Industrial Land Uses

   - Medium Industrial (MI): This category includes businesses such as lumber yards, auto salvage yards, junk yards, grain elevators, agricultural coops, oil tank farms, coal and salt storage areas, slaughter houses, and areas for bulk storage of fertilizers.

   - Light Industrial (LI): Those buildings that are used for the storage and/or distribution of goods waiting further processing or sale to retailers. This category mostly includes warehouses and wholesalers where all operations are conducted indoors, but with truck loading and transfer operations conducted outside.

4. Institutional Land Uses

   - Education (SCH): Includes any public or private primary, secondary, or college educational institutional grounds. Includes buildings, playgrounds, athletic fields, roads, parking lots, and lawn areas.

   - Miscellaneous Institutional (INST): Churches and large areas of institutional property not part of CST and CDT.

5. Other Urban Land Uses

   - Parks (PARK): Outdoor recreational areas including municipal playgrounds, botanical gardens, arboretums, golf courses, and natural areas.

   - Undeveloped (OSUD): Lands that are private or publicly owned with no structures and have a complete vegetative cover. This includes vacant lots, urban fringe areas slated for development, greenways, and forest areas.

   - Cemetery (CEM): This land use file covers cemeteries, and includes road frontage along the cemetery, and paved areas and buildings within the cemetery.

6. Transportation Land Uses

   - Freeways (FREE): Limited access highways and the interchange areas, including any vegetated rights-of-ways.

   - Railroads (RAIL): Limited access railroad lines and railroad yards, including any vegetated right-of-ways.

Table 3-1 summarizes the existing land use used for pollution loading analysis.

Figure 3-2 depicts land use conditions used for the pollution loading analysis.

TABLE 3-1
EXISTING LAND USE SUMMARY
(Conditions as of October 1, 2004)

Land Use	Area (acres)	Percent of Total
Commercial	82.3	6.74%
Office Park	7.0	0.58%
Shopping Centers	26.8	2.21%
Strip Commercial	48.5	3.95%
Industrial	200.6	16.57%
Light Industrial	77.3	6.38%
Medium Industrial	123.4	10.19%
Institutional	91.8	7.58%
Education	70.3	5.81%
Miscellaneous Institutional	21.4	1.77%
Other	25.5	2.11%
Cemetery	6.9	0.57%
Open Space Undeveloped	13.1	1.08%
Parks	5.6	0.46%
Residential	810.2	66.90%
Apartments	6.3	0.52%
Duplex	9.9	0.82%
High Density Residential	77.4	6.39%
Low Density Residential	127.6	10.54%
Medium Density Residential	493.0	40.71%
Multi-Family Residential	14.3	1.18%
Rural	37.6	3.10%
Suburban Residential	43.4	3.58%
Transportation	1.3	0.11%
Freeways	1.1	0.09%
Railroads	0.2	0.02%
Total	1,211.67	100.00%

3.3 PRECIPITATION

When modeling nonpoint source pollutant loadings, cumulative amounts over a long period of time are more important than the pollutant amounts from individual or design rainfall storm events. Therefore, modeling simulations are performed with rainfall records of a longer duration. For this management plan, pollutant loads were estimated for a five-year period to determine an average annual load. The WDNR requires input rainfall files to be chosen from a collection of specific data sets; the set geographically closest to Mosinee and, therefore, the set used for this project, is from the City of Green Bay, Wisconsin. The rainfall data used is for the years 1968 through 1972.

3.4 SOILS

Soil properties influence the volume and rate of runoff generated from rainfall events, as well as the level of suspended solids pollution contained in the runoff. Soils that allow rainfall to freely drain into the ground will result in lower runoff rates and volumes. Soils that restrict the drainage of rainfall into the ground will cause higher runoff rates and volumes. The U.S. Department of Agriculture, Natural Resource Conservation Service (NRCS) classifies soils based on their runoff potential into hydrologic Groups A, B, C, or D.

Group A soils have low runoff potential and high infiltration rates even when thoroughly wetted. They consist chiefly of deep, well to excessively drained sand or gravel and have a high rate of water transmission (greater than 0.30 inches/hour).

Group B soils have moderate infiltration rates when thoroughly wetted and consist chiefly of moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission (0.15 to 0.30 inches/hour).

Group C soils have low infiltration rates when thoroughly wetted and consist chiefly of soils with a layer that impedes downward movement of water and soils with moderately fine to fine texture. These soils have a low rate of water transmission (0.05 to 0.15 inches/hour).

Group D soils have high runoff potential. They have very low infiltration rates when thoroughly wetted and consist chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material. These soils have a very low rate of water transmission (0 to 0.05 inches/hour).

According to the NRCS Soil Survey, the project area primarily consists of Group A and B soils. The NRCS Soil Surveys were developed to summarize soil characteristics; actual soils can vary depending upon location. Figure 3-3 displays the distribution of Hydrologic Soil Groups across the project area.

3.5 MODELING METHODOLOGY

To estimate surface water nonpoint source pollution loads for Mosinee, WinSLAMM, Version 9.3.1 was used. WinSLAMM is the most widely used model to assess urban nonpoint source pollution loads in Wisconsin.

The project area was determined based on WDNR guidelines. The project area began with all lands within the municipal boundary. Riparian properties and properties owned by other permitted entities were removed. Riparian areas were delineated by AECOM staff and then reviewed by City staff. Examples of other permitted properties include the WisDOT State Trunk Highway (see Appendix C), County of Marathon properties, Tier 1 Industries, and Tier 2 Industries. A list of Tier 1 and Tier 2 properties was obtained from the WDNR and referenced through the GIS database created for the project. The Marathon County properties were obtained from the assessor's database.

The GIS database created contains information for each subbasin delineated within the project area. This database includes data on land use, soil conditions, surface drainage conditions, and existing stormwater management practices.

WinSLAMM requires input files that describe characteristics of the project area. The model uses rainfall records to calculate runoff and pollution loads for selected parameters. Multiple rainfall files are available for the State of Wisconsin, and the WDNR requirement is to use the rainfall file from the location nearest the project area. The rainfall data for the City of Green Bay for the years 1968 through 1972 was used for this application. The years of rainfall have been determined by the WDNR and others to represent a "typical" series of rainfalls in the area and are generally used for WinSLAMM analysis in Eastern and Central Wisconsin.

WinSLAMM also requires support files containing data describing typical runoff volumes, solids concentrations from source areas, solids retainage in the drainage system, pollutant concentrations based on solids loads or runoff volumes, and typical particle size distributions. The United States Geological Survey (USGS) and WDNR have developed versions of these files for use in Wisconsin based on extensive data collection and calibration. The latest versions of these WinSLAMM files were obtained from the USGS and used for this project. The files used were:

- WISREG – GREEN BAY FIVE YEAR RAINFALL.RAN
- WI_GEO01.PPD
- WI_SL06 DEC06.RSV
- WI_AVG01.PSC
- WI_DLV01.PRR
- WI_RES and other urban DEC06.STD

WinSLAMM calculated loadings for each land use and subbasin. The pollutants analyzed for this project were suspended sediment, total phosphorus, and total lead.

3.6 BASE CONDITIONS

The WPDES permit requires Mosinee to reduce urban TSS loads by 20 percent by November 2008 and by 40 percent by the year 2013. These reductions are calculated against a

baseline condition, defined as the October 1, 2004, land use with no stormwater BMPs. The City's base load is 158.7 tons per year. Table 3-2 summarizes the City's no controls (or base) nonpoint-point source pollution load by land use. Figure 3-4 summarizes the areas of land use categories in the regulated area of the City. Figure 3-5 graphically presents the existing condition TSS loadings summarized by the same land use categories. Appendix D contains a list of the base pollution load for each subbasin.

TABLE 3-2
NO-CONTROLS AND EXISTING CONDITIONS TSS LOADINGS BY LAND USE

Land Use	No Controls		Existing Conditions	
	tons/TSS/yr	Percent	tons/TSS/yr	Percent
Commercial	18.6	11.7%	16.7	14.9%
Office Park	1.3	0.8%	1.3	1.2%
Shopping Centers	5.1	3.2%	4.8	4.3%
Strip Commercial	12.1	7.5%	11.6	9.5%
Industrial	48.4	30.5%	29.5	26.1%
Light Industrial	19.7	12.4%	14.3	12.8%
Medium Industrial	28.6	18.0%	15.2	13.4%
Institutional	15.1	9.5%	11.8	10.4%
Education	11.2	7.0%	8.4	7.5%
Miscellaneous Institutional	4.0	2.5%	3.4	3.0%
Other	0.9	0.5%	0.6	0.6%
Cemetery	0.3	0.2%	0.2	0.2%
Open Space Undeveloped	0.3	0.2%	0.2	0.2%
Parks	0.3	0.2%	0.2	0.2%
Residential	75.4	47.5%	54.2	47.9%
Apartments	0.8	0.5%	0.7	0.6%
Duplex	0.9	0.6%	0.8	0.7%
High Density Residential	10.4	6.6%	8.6	7.6%
Low Density Residential	8.6	5.4%	3.9	3.4%
Medium Density Residential	49.4	31.1%	38.6	34.1%
Multi-Family Residential	1.8	1.1%	1.3	1.2%
Rural	1.5	0.9%	0.04	0.0%
Suburban Residential	1.9	1.2%	0.3	0.2%
Transportation	0.4	0.3%	0.3	0.3%
Freeways	0.4	0.2%	0.3	0.3%
Railroads	0.1	0.1%	0.0	0.0%
Total	158.7	100%	113.1	100%

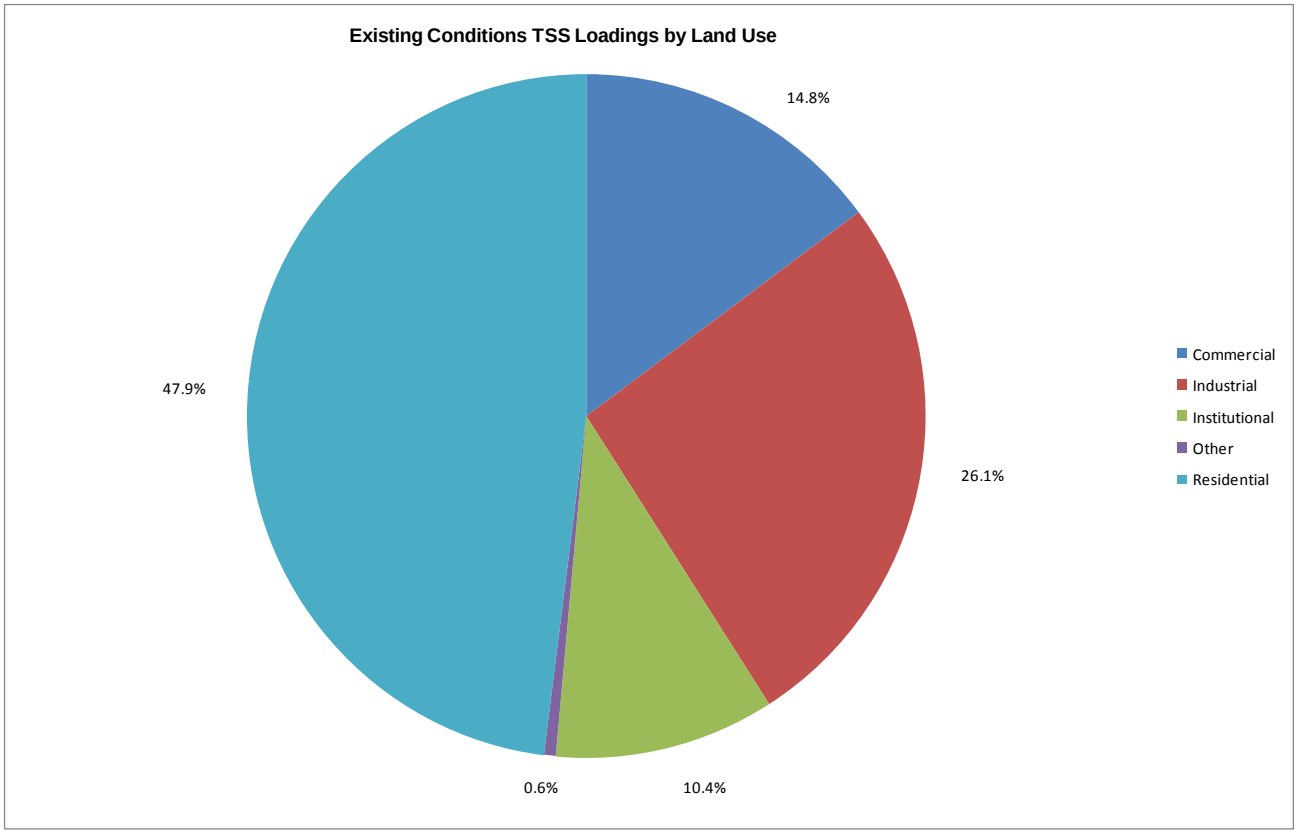


FIGURE 3-5 - POLLUTION LOAD BY LAND USE

3.7 EXISTING CONDITIONS

The next step following the calculation of the no controls conditions loadings is to insert existing management practices into the model and calculate the existing conditions loadings. This establishes whether a community is meeting WPDES permit requirements and provides a starting point for adding BMPs to meet these requirements, if necessary. Once the base load was established, the City's existing BMPs were evaluated. Existing practices include street sweeping, grass swale drainage, catch basin cleaning, and wet detention ponds.

3.7.1 Drainage-Related BMPs

The City's grass swales were evaluated using WinSLAMM, Version 9.3.1. WinSLAMM accounts for TSS reduction in swales through the runoff volume reduction associated with infiltration and the filtering process which also removes some TSS as water flows through vegetation. The TSS treatment achieved by drainage swales is quite sensitive to longitudinal slope. AECOM calculated the slope of a sampling of swales from the regulated area. As a result of these findings, swale slopes were assigned by drainage basin into two categories: steep and low-gradient. The steep slopes were assigned a gradient of 2.6 percent and low-gradient drainage swales were assigned a gradient of 1.9 percent.

The other swale parameters modeled were a 4:1 side slope, 2-foot bottom width, and 3-inch depth of grass. Figure 3-6 depicts regulated areas served by swales.

In August 2010, AECOM conducted infiltration testing of the existing road side grassed swales in the City. Before conducting the field infiltration testing, initial work was done to select suitable sites for testing that would best represent the various conditions of the City's roadside swale system. These initial steps included:

1. Using GIS data for land use and hydrologic soil groups, six proposed infiltration testing sites were chosen. The criteria for choosing the six sites were based on a proportional representation of the different land use and hydrologic soil groups present in the City.

2. Creating maps identifying the approximate locations of the six proposed sites relative to both land use coverage and soil mapping. The maps were submitted to WDNR for review along with a letter describing the proposed test sites and the infiltration testing procedures.

3. Upon approval from WDNR, the test sites were finalized.

The field infiltration testing occurred on August 20 and August 24, 2010. The field testing was conducted following the guidance provided by the WDNR, specifically:

1. WDNR memo dated 4/24/08: "Process to Assess and Model Grass Swales for ss.NR151.13(2) and NR 216.07(6), Wis. Adm. Code – Total Suspended Solids Reduction;" and

2. WDNR memo dated 8/02/08: Errata for Process to Assess and Model Existing Grass Swales (TSS Reduction) Modifications to Double-Ring Infiltrometer Test Procedures in Technical Standard 1002.

3. WDNR memo dated 1/8/10: Errata to Guidance on Process to Assess and Model Grass Swales for ss. NR 151.13(2) and NR 216.07(6), Wis. Adm. Code – Total Suspend Solids Reduction

Upon completion of the field infiltration testing, all results were tabulated and graphed to compare elapsed time with infiltration rate, measured in inches per hour. Figure 3-7 shows the approximate locations of the field tests. The tables and graphs detailing the raw field data for each test site are found in Appendix E, following this report. In order to arrive at a single value for the infiltration rate at a site, a "best fit curve" analysis was applied to the data. The equation from the curve was used to calculate the value for the infiltration rate at the end of two hours from the start of the test. The results tables and graphs for each site were sent to WNDR for review.

It was decided to use the geometric mean for each soil type, when using the measured infiltration rates for modeling the grass swales. The field measured rates represent the static infiltration rate. For modeling purposes in WinSLAMM, the dynamic infiltration rate is used in accordance with WDNR guidelines. The dynamic rate is calculated by dividing the static rate in half. The table below shows the infiltration rates for each test location in the City and the calculated geometric mean for each soil type. The grass swales in Mosinee were modeled using the dynamic infiltration rates shown below:

		Static Rate		Dynamic Rate
Test #	Soil Type	Infiltration Rate* (in/hr)	Geometric Mean (in/hr)	Geometric Mean** (in/hr)
1	Silt	3.15	6.11	3.05
2	Silt	11.85		
3	Clay	11.49	11.49	5.75
4	Sand	6.40	11.48	5.74
5	Sand	14.99		
6	Sand	15.77		

*This value is from the best fit curve at two hours, based on field measured rates.

**This value was used for the WinSLAMM analysis.

The pollution reduction efficiency of the swales ranges from less than 17 percent to over 90 percent, depending upon the slope, soil type, and land use. The City also cleans catch basins approximately every 3 years. Catch basin and swale load reductions are summarized in the following table:

BMP	TSS Removed (tons/yr)	City-Wide Percent Reduction
Catch Basin Cleaning	14.7	9.2%
Low-Gradient Swales	1.6	1.0%
Steeper Swales	20.8	13.1%
Total	37.1	23.3%

3.7.2 Street Cleaning

City staff provided AECOM with the City of Mosinee street sweeping and catch basin cleaning information. The City uses a 2002 Clean Earth Vac - All for street cleaning and sweeps City streets annually. Figure 3-8 depicts the City areas subject to street cleaning.

Although sweeping parking lots and streets without curb and gutter provide an aesthetic benefit and prevent some large particles from reaching stormwater, the lack of curb prevents effective TSS removal. Current WDNR policy is to exclude the sweeping of all parking lots and any streets without curb and gutter from TSS pollutant loading calculations. Street cleaning results are summarized below:

BMP	TSS Removed (tons/yr)	City-Wide Percent Reduction
Annual Street Cleaning	0.4	0.3%

3.7.3 Existing Wet Ponds

AECOM evaluated whether existing wet ponds conform to the surface area requirements of WDNR's Wet Detention Pond Code 1001. Also, as part of regular operations and maintenance, City staff should verify that wet ponds continue to have depths complying with the standard.

Table 3-3 summarizes the effectiveness of the existing wet detention basins.

TABLE 3-3
EXISTING WET DETENTION PONDS

Pond Name	No Controls TSS Loading (tons/yr)	Existing Conditions TSS Loading to Pond (tons/yr)	TSS Removed by Pond (tons/yr)
Golf Course 1	2.35	0.47	1.88
Golf Course 2	5.16	1.03	4.13
School	3.48	1.39	2.09
Total	10.99	2.89	8.10

Based on the analysis of existing practices, the City is reducing the total load by 45.6 tons, or 28.7 percent. Appendix F contains a list of the existing pollution load for each subbasin.

3.7.4 Results

AECOM plotted the resulting pollution loading density, measured in pounds per year per acre of TSS, as a color coded layer over the City's aerial photograph. Areas of low pollutant loading plot green and areas of high pollutant loading plot orange. This product facilitates selecting BMPs sites to treat areas of high pollutant loading. Figure 3-9 depicts the pollutant loading density for existing conditions in the City.

Currently, due to limitations of the approved TSS loading models, WDNR policy is that either catch basin cleaning or street cleaning is allowed as a practice, but both cannot be applied to the same area. AECOM calculated the efficiency of each available BMP for each polygon within the City and selected the most efficient. Under existing conditions, the treatment efficiency of the City's catch basin cleaning program exceeded the benefit of the street cleaning program for all areas.

3.8 CONCLUSIONS

The City of Mosinee is in compliance with the 20 percent TSS reduction required by the WPDES permit by the year 2008, but has not yet reached the 40 percent required by 2013. The City needs to remove an additional 17.9 tons of TSS per year in order to reach the 40 percent TSS reduction requirement.

3.8.1 Proposed Wet Ponds

In order to remove an additional 17.9 tons of TSS per year and reach the 40 percent TSS reduction goal, AECOM recommends the design and construction of wet detention ponds as structural BMPs. Wet detention ponds offer the most effective method of reducing TSS in stormwater for large watersheds. If the wet detention ponds are designed and built to WDNR Technical Standard 1001, they can remove up to 80 percent of incoming TSS. AECOM has indentified four locations throughout the City that would be best suited for a wet detention pond to serve the nearby drainage basin. The criterion for choosing the four potential locations was:

1. Parcel is currently owned by the City
2. Parcel is near a gravity storm sewer outfall
3. Parcel is large enough to build a pond that would treat the drainage basin to 80 percent TSS reduction

Table 3-4 summarizes the potential wet detention pond locations:

TABLE 3-4
PROPOSED WET PONDS

Pond Number	Location	Drainage Basin Name	Basin Area (ac)	Proposed Efficiency	Basin Base TSS Load (tons/yr)	Basin Existing TSS Load (tons/yr)	Pond TSS Removal (tons/yr)	Net Regulated Area TSS Removed (tons/yr)
1	Riverside Park	WR-1.1	109.5	80%	14.4	12.2	11.5	9.3
2	E. Edgewood St.	WR-10.1	131.5	80%	13.5	11.4	10.8	8.7
3	Landfried St. & Wisconsin St.	WR-8.1	46.8	80%	5.4	4.6	4.3	3.5
4	Northview St. & Indianhead St.	BJC-7.1	73.2	80%	17.2	15.0	13.8	11.5
				Total	50.6	43.1	40.5	33.0

Based on the information shown above, the construction of proposed Pond 1 and 2 would provide enough TSS control for the City to reach the 40 percent goal. This calculation is based on the "net regulated area TSS removed" per year. These values are lower than the "pond TSS removal" because these ponds are proposed to be built in drainage basins which already have TSS control practices in place, such as: street sweeping, catch basins, or grassed swales. The City cannot double count for drainage basins with more than one type of TSS control practice. The City can chose to build any combination of the listed ponds or other BMPs that will provide enough net TSS control to meet the 40 percent goal. The table below shows a cost estimate for each of the proposed ponds.

Pond Number	Location	Parcel Size (ac)	Required Permanent Pool Size* (ac)	Approx. Construction Area (ac)	Average Excavation Depth (ft)	Total Cost Estimate**
1	Riverside Park	23.6	1.44	2.88	10	$445,000
2	E. Edgewood St.	16.6	1.38	2.76	10	$430,000
3	Landfried St. & Wisconsin St.	0.9	0.45	0.9	10	$175,000
4	Northview St. & Indianhead St.	32.0	2.1	4.2	10	$640,000

*Calculation based on WDNR Technical Standard 1001, Appendix A for 80% TSS removal.
**Calculation based on average engineering and construction costs, compiled by AECOM.

4.0 STORMWATER MANAGEMENT PROGRAM REVIEW

As part of the preparation for the City of Mosinee's WPDES permit, AECOM reviewed the City's municipal operations related to stormwater management. This involved a site visit to review conditions at the Municipal Garage and interviews with City staff of programs covered under the WPDES permit.

4.1 MUNICIPAL GARAGE SITE EVALUATION

Accompanied by City staff, AECOM visited the Municipal Garage facility and reviewed it for compliance with NR 216 requirements. The site is used to store municipal public works vehicles, equipment, salt, and sand. The vehicles are stored under a roof. Sand is stored in a pile outdoors; a grass buffer exists between the sand pile and edge of the property. The city salt pile is kept in an enclosed shed on the site; salt is swept from the asphalt in front of the shed daily when in use. Field notes from this visit are contained in Appendix G.

4.2 MUNICIPAL POLLUTION PREVENTION PROGRAMS

4.2.1 Roadway Maintenance

Mosinee currently conducts annual street sweeping with a vacuum sweeper. Streets are salted based on snow and temperature conditions. The City uses approximately 400 tons of salt per year.

4.2.2 Collection of Grass Clippings and Leaves

The City encourages people to compost or mulch their own clippings, but also accepts leaves and brush. Brush pickup is the third Monday of each month, leaf pickup is from mid-October through mid-November.

4.2.3 Nutrient Management

AECOM recommends Mosinee apply nutrients in accordance with Conservation Practice Standard 1100, Turf Nutrient Management. The Mosinee School District is the only municipal entity managing parcels addressed by NR 151.13(b)3.

5.0 RECOMMENDATIONS FOR PERMIT COMPLIANCE

5.1 BACKGROUND

The overall focus of this stormwater plan is for Mosinee to comply with the WPDES permit and to identify methods to reduce stormwater pollution. The result from Chapter 4 show that the City does not yet comply with the 40 percent TSS reduction required by the WPDES permit, but does meet the 20 percent standard.

Stormwater quality management measures can be categorized as non-structural and structural measures. Non-structural measures include activities such as street sweeping, ordinance enforcement, leaf pickup, and education programs. These measures are generally less costly than structural measures, but have limited pollution control capabilities. Examples of stormwater management structural measures include wet detention basins, commercially available products, and infiltration basins.

This chapter describes non-structural and structural measures that have not been previously described in this document.

5.2 NON-STRUCTURAL STORMWATER QUALITY MANAGEMENT MEASURES

5.2.1 Education and Outreach Program

Mosinee is working cooperatively with Marathon County, and other permitted municipalities within the urbanized area, to develop an education and outreach program. The County is leading this effort. Participation in this group provides several benefits; the message relayed to the public is consistent across municipal boundaries, and the participating communities realize a cost savings compared to making the effort individually. The County Education and Outreach Plan document was not available at the time of this report.

5.2.2 Enforce the Stormwater Management Ordinance for New Development

Adopting and implementing a stormwater management ordinance in March 2009 brought Mosinee into compliance with another requirement of the NR 216 permit. Incorporating stormwater management measures to reduce off-site impacts from new land development is most economically accomplished during the site development process. Measures to reduce flow, pollution, and runoff volumes can be incorporated into the site's design.

Enforcing this ordinance will continue to protect Mosinee's water resources and maintain permit compliance. The ordinance is in Appendix H.

5.2.3 Enforce the Construction Site Erosion Control Ordinance

Another requirement of the City's NR 216 permit is to implement a construction erosion control ordinance. This was completed in March 2009. Construction site erosion can be a major input of sediment to local rivers, wetlands, and lakes. On a per acre basis, sediment from construction sites can exceed urban or agricultural runoff sources.

Enforcing the ordinance will protect the City's water resources and maintain permit compliance. The ordinance is in Appendix H.

5.2.4 Enforce the Illicit Discharge Detection and Elimination Ordinance

A third important ordinance for the municipal stormwater management program is the prohibition of illegal discharges in the storm sewer system such as sanitary waste, dumping of solid waste, or dumping of other material that may be harmful to receiving waters. Mosinee adopted this ordinance in March 2009. A copy of the ordinance is included in Appendix H.

5.2.5 Maintain Street Sweeping Schedule

The City currently sweeps its streets annually with a mechanical broom sweeper. AECOM recommends continuing with the practice for aesthetics and to keep debris from reaching waters of the state.

5.2.6 Illicit Discharge Detection and Elimination

Section 2.3 of the WPDES permit requires the City to develop a dry weather monitoring program to detect potential illicit discharges. The program involves an initial dry weather screening and annual follow-up screening. The intent of the initial screening is to identify outfalls which convey allowable flows such as surface water base flow or groundwater. The annual follow-up screenings are intended to detect illegal cross connections, spills, or other illicit discharges. Appendix I contains the Illicit Discharge Detection and Elimination Program.

5.2.7 Public Involvement and Participation

The WPDES permit contains public involvement and participation requirements in Section 2.2. The permit requirements are intended to encourage the public to provide municipalities input on stormwater related activities and to participate in these activities. The permit requires compliance with state and local public notice requirements. Mosinee currently public notices stormwater related agenda items for Board of Public Works and Common Council meetings.

5.2.8 Maintain a Storm Sewer System Map

The WPDES permit also requires the City to maintain a storm sewer system map that includes the municipal drainage system, publicly maintenance facilities, parks, and other lands. This storm sewer system map is included in Appendix J.

5.3 STRUCTURAL STORMWATER QUALITY MANAGEMENT MEASURES

5.3.1 Introduction

This section describes BMPs that are currently being used by municipalities in Wisconsin for stormwater pollution reduction. The first part of this section presents information on wet detention basins. This type of practice is one of the most commonly used BMPs for pollution control. It has been shown to be very effective when site conditions are favorable. However, there are locations where wet detention basins are not feasible, especially in fully developed

urban areas (such as downtown Mosinee). The second part of the section discusses alternative BMPs that could be used in the City of Mosinee.

5.3.2 Wet Detention Basins

5.3.2.1 Overview

A wet detention basin is an area that is naturally depressed or has been graded to hold runoff. The outlet is constructed so that there is a permanent pool of water. This settling basin causes particles of sediment to be removed from the water column through quiescent settling. When correctly designed and built, wet detention basins remove 80 percent of TSS from incoming pollutant loads.

Wet detention basins have some concerns associated with them. These include safety, mosquito habitat, and aesthetics. Various design options are available that can be incorporated into a wet detention basin to reduce or eliminate most concerns. For example, a safety shelf (grading the perimeter of the basin at a shallow slope) reduces the risk of drowning. The design and grading of the basin perimeter, and selection of appropriate vegetation, can enhance aesthetics of wet detention basins.

Since the 1999 emergence of West Nile Virus (WNV) in the United States, the public is more attentive to perceived potential mosquito breeding sites. According to the Center for Disease Control (CDC), the most prevalent carriers of WNV in the Midwest are selected *Culex* species. These species utilize shallow, stagnant water for breeding sites and are sometimes referred to as “container mosquitoes” due to their preference for flower pots, tires, and other small water pockets. As a result of this habitat preference, wet detention ponds are not preferred breeding grounds for the primary WNV vector mosquitoes in Wisconsin.

5.4 ALTERNATIVE BMPS

5.4.1 Overview

Alternative BMPs can focus on smaller structures to treat smaller drainage areas of intensive urban land use. Alternative BMPs include infiltration practices (infiltration basins, rain gardens), commercial in-line devices, constructed wetlands, and biofilters. The following discussion describes some of the alternative BMPs available.

5.4.2 Hydrodynamic Separation Devices (HSDs)

HSDs, also known as Inline BMPs, manufactured BMPs, or proprietary devices, are generally commercially made underground devices designed to treat pollutant loads. Inline refers to the device being installed along the storm sewer pipe network below ground. These devices usually do not protrude above the ground elevation, allowing them to be installed in densely developed areas without occupying valuable land.

These devices employ various techniques to separate oil from stormwater and trap sediment within a sub-surface chamber. They are designed to treat small, frequent storm events and the initial runoff from larger events. The structures have a mechanism to bypass excess flows from larger rain events.

Vendors claim pollutant (sediment) reduction obtained from different devices ranges between 30 percent to 80 percent. These devices treat stormwater utilizing various techniques such as settling, filtering, screening, adsorption, and separation. When reviewing these claims, it is important to take note of the size of the storm being treated, the particle size distribution evaluated, and the area treated by each device. WDNR policy is to model these devices as catch basin sumps until verified data support the vendor efficiency claims.

The WDNR issued Conservation Practice Standard 1006, Method of Predicting the Efficiency of Proprietary Stormwater Sedimentation Devices, in May 2008. This document establishes a uniform process for predicting the site specific efficiency of proprietary sedimentation devices. The technical standard includes modeling and reporting requirements for predicting device efficiency using either Stokes Law settling or device-specific efficiency data. It also establishes criteria for acceptable models and laboratory testing criteria for defining device-specific efficiency curves. Ultimately, manufactures desiring to assign treatment efficiencies for their products in WinSLAMM will need to submit data to WDNR in accordance with this standard. As the WDNR approves data submitted by the manufacturers of proprietary devices, WinSLAMM will be updated to reflect data specific to the approved proprietary devices.

Until this data becomes available and the WDNR policy towards modeling of HSDs changes, it is more cost effective to simply install oversized catch basins than to purchase more expensive proprietary devices.

5.4.3 Biofilters

A biofilter is a device that can be constructed to filter the sediment, oil, grease, and heavy metals in runoff. Biofilters have been shown to achieve 90 percent pollution reduction. A biofilter consists of a top layer of mulch, an engineered soil filter bed beneath, and a soil drainage layer with an underdrain at the bottom of the device. The underdrain is connected to the municipal storm sewer system.

Maintenance includes yearly replacement of the top layer of mulch, which traps most of the oil and grease. The engineered soil filter bed should be replaced every 10 to 15 years. Plants, trees, and shrubs can be planted in the biofilters to increase aesthetics. Vegetation selection should take into account the 10- to 15-year replacement cycle of the filter bed.

BIOFILTER IN PARKING LOT

Biofilters can be a relatively inexpensive way to control stormwater pollution from parking lots. Commercial and industrial areas can especially achieve significant pollution reduction if biofilters are constructed in all or most parking lots. Because the maximum area treated by a biofiltration unit is 2 acres, as established by the WDNR's Conservation Practice Standard 1004, Bioretention for Infiltration, a large number of biofilters may be necessary to treat a subbasin.

5.4.4 Constructed Wetlands

Constructed wetlands are areas engineered to mimic natural wetlands. Constructed wetlands can be aesthetically pleasing, provide stormwater storage, and provide stormwater pollution reduction. The cost of constructed wetlands is dependent on the site and the vegetation selected. They can be constructed either "off-line" or parallel to a main drainage way. When a constructed wetland is located off-line, it can be designed to treat the smaller rain events, and thus increase stormwater pollution reduction. The actual pollution reduction that constructed wetlands achieve has not been researched as extensively as other BMPs; therefore, dialogue with the WDNR will be required to determine the amount of pollution reduction credited.

5.4.5 Rain Gardens

Rain gardens are landscaped areas planted with wild flowers or other native vegetation and designed to infiltrate stormwater runoff. Buildings, driveways, and sidewalks can be graded to drain to a rain garden. Rain gardens fill with a few inches of stormwater, which slowly filters into the ground rather than entering storm drains. Rain gardens infiltrate approximately 30 percent more stormwater than conventional lawns.

Rain gardens can be integrated into residential land uses with little difficulty. The cost of a residential rain garden can range from $3 to $12 per square foot depending upon the size of the rain garden, and if the work is done by the homeowner or a professional landscaper. Rain gardens can also be used in other types of land uses. It is generally not recommended to use a rain garden to treat a parking lot as the oil and grease from the parking lot may damage the plants in the rain garden. Rain gardens work well if they are placed to treat rooftop runoff and lawn runoff. Information on how to construct and maintain a rain garden can be found at http://clean-water.uwex.edu/pubs/raingarden.

EXAMPLE OF A RESIDENTIAL RAIN GARDEN

5.4.6 Infiltration Basins

Infiltration basins are larger areas designed to infiltrate stormwater and provide pollutant removal. They are similar to rain gardens in that vegetation is chosen to encourage infiltration. Infiltration basins can be designed to treat an entire subbasin and can control a large stormwater volume. Pollutants contained in the infiltrated runoff are removed within the soil.

Infiltration basins also provide for some groundwater recharge if the soil conditions permit. Infiltration basins should include provisions for pretreating stormwater to prevent premature clogging of the basin. A pretreatment device must be used to filter the grease, oil, and heavy metals from parking lot and street runoff. The combination of pretreatment and infiltration removes the greatest amount of pollutants from stormwater. A unique feature of infiltration basins is the ability to reduce runoff *volume* as well as decrease peak flow and pollution.

Accumulated sediment must be removed periodically to avoid resuspension and the resulting release of pollutants back into the stormwater. Infiltration basins can be cost effective in highly urban areas as a single basin can treat a large area where using source controls are difficult or impossible. The primary costs of infiltration basins are construction and land acquisition. Maintenance costs vary depending on the extent of landscaping and frequency of sediment removal. A guideline for sediment removal is for five-year intervals, but this will vary depending on the contributing land use and prevalent soil types in the watershed.

Special precautions are required when planning and designing infiltration basins to prevent groundwater contamination. Information on infiltration basin design requirements can be found in NR 151.12 (5) (c) 4.

5.4.7 Traditional Swales

Conventional grassed swales are gently sloped (generally less than 2 percent), vegetated conveyance ditches in which pollutants are removed from stormwater by filtration through grass and infiltration into the soil.

Compared to storm sewer systems, grass swales have both water quality and quantity benefits in lower density residential areas. The infiltration occurring in the swale reduces the volume delivered to the system outfall; the TSS loadings are also reduced due to the solids contained in the infiltrated water volume. Biofilters can also be constructed in the swales to increase runoff and pollutant removal.

Grass swales also provide a place for snow storage in winter months. An added benefit is that as the snow melts, the pollutants and salt carried from the street are contained in the ditches rather than going directly into the storm sewer. An adverse effect is that the chloride in road salt moves through the soil fairly rapidly and plants in the swale can be damaged by salt. Salt use should be judicious in areas of swale drainage.

Grass swales may not be feasible in densely developed areas. These areas tend to have closely spaced driveways, which would require closely spaced culverts. In addition, there may not be enough space to construct swales in these areas without encroaching on buildings or parking lots.

One concern about the use of grass swales is that roads are more difficult to plow, and the streets can look less clean if the grass swales are damaged by traffic driving on the shoulder. Some municipalities have installed swales in conjunction with curb and gutter. The streets have inlets that carry the runoff to the swale. This combination allows for an easily maintained street and pollution reduction.

EXAMPLE OF GRASS SWALE WITH CURB AND GUTTER STREET DRAINAGE

5.4.8 Engineered Grass Swales

Grass swales can also be engineered to achieve a higher pollution reduction. In an area where soils have poor infiltration characteristics, it may be advantageous to construct an engineered swale. An engineered swale is a grass swale where the top 2 to 5 feet have been excavated and replaced with an engineered soil. The soil is made up of different components that will enhance the infiltration capacity of the swale. Additionally, some engineered swales have under-drain systems to convey treated water to the storm sewer system. Engineered swales can also be referred to as infiltration swales.

Maintenance for an engineered swale is similar to biofilter maintenance. Although there is no mulch to replace, the grass will need to be mowed to maintain conveyance, and the upper portion of the engineered soil will need to be replaced when it gets clogged. This is usually required at intervals of approximately 10 to 15 years.

6.0 IMPLEMENTATION

This chapter discusses implementation of Mosinee's Stormwater Management Plan.

6.1 RESPONSIBLE PARTIES

The City of Mosinee has the primary responsibility for implementing this plan. The City will ultimately be responsible for ensuring that it is carried out within the City's municipal boundaries. Developers are required to enter into maintenance agreements with the City which include a deed restriction requiring owners to maintain BMPs following construction and provide the City with an easement to ensure maintenance is completed. If maintenance of BMPs is not performed by owners, the City is allowed to perform the maintenance and assess the expense back to the owner.

Oversight of BMP maintenance will be performed by the Director of Public Works or by a designated representative.

6.2 PLAN FINANCING

Although the WDNR Urban Nonpoint Source and Stormwater Grant program does fund the design and construction of BMPs, the vast majority of the expenses associated with permit compliance will need to be funded by the City. Mosinee's stormwater program is currently funded via property taxes by the City's general revenue fund. This project includes preparation of a Rate Study report, which AECOM will document a potential Stormwater Utility Rate Structure.

6.3 SCHEDULE

The schedule for implementing this plan is designed to meet the WPDES permit requirements. Table 6-1 depicts the recommended implementation schedule.

TABLE 6-1
IMPLEMENTATION SCHEDULE

Plan Element	2009	2010	2011	2012	2013
Non-Structural					
Public Education and Outreach per Marathon County Plan	X	X	X	X	X
Public Involvement and Participation per Marathon County Plan	X	X	X	X	X
Adopt and Enforce Stormwater Management Ordinance	X	X	X	X	X
Adopt and Enforce Construction Erosion Control Ordinance	X	X	X	X	X
Adopt and Enforce Illicit Discharge Detection and Elimination Ordinance	X	X	X	X	X
Implement Dry Weather Screening	X				
Maintain Street Sweeping Schedule	X	X	X	X	X

As of December 2010, NR 151 and the WPDES MS4 permit issued to Mosinee require the City to attain 40 percent TSS reduction by March 2013. However, WDNR modified NR151 during 2010 and added language giving municipalities additional 10 years to reach the 40 percent threshold if they can demonstrate that the 2013 deadline is not attainable. This modification to the administrative code does not become law until officially promulgated by the state, which

could potentially be delayed during the transition in the Governor's office. The current WPDES MS4 General Permit expires on December 31, 2010, and a new permit has not yet been issued.

AECOM recommends Mosinee choose which combination of ponds is best suited to reach the 40 percent threshold and prepare plans and specifications for construction of one of them in 2011. This would put the City in a position to construct one pond in 2012 if the regulatory changes moving the 2013 deadline are not implemented. Should the modified NR151 be adopted, design of the second pond, and construction of both, could be delayed for a few years while the City raises the requisite capital improvement funds.

STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES

GENERAL PERMIT TO DISCHARGE UNDER THE WISCONSIN POLLUTANT DISCHARGE ELIMINATION SYSTEM WPDES PERMIT NO. WI-S050075-1

In compliance with the provisions of ch. 283, Wis. Stats., and chs. NR 151 and 216, Wis. Adm. Code, owners and operators of municipal separate storm sewer systems are permitted to discharge storm water from all portions of the

MUNICIPAL SEPARATE STORM SEWER SYSTEM

owned or operated by the municipality to waters of the state in accordance with the conditions set forth in this permit.

The **Start Date** of coverage under this permit shall be included in the Department letter sent to the municipality authorizing coverage under this general permit. The Department is required to charge an annual permit fee to owners and operators authorized to discharge under this permit in accordance with s. NR 216.08, Wis. Adm. Code.

State of Wisconsin Department of Natural Resources
For the Secretary

By Russell A. Rasmussen
Russell A. Rasmussen, Director
Bureau of Watershed Management
Division of Water

January 19, 2006
Date Permit Signed/Issued

PERMIT EFFECTIVE DATE: Jan. 19, 2006 **EXPIRATION DATE: Dec. 31, 2010**

TABLE OF CONTENTS

1. APPLICABILITY CRITERIA

1.1 Permitted Area

This permit covers all areas under the ownership, control or jurisdiction of the permittee that contribute to discharges from a "municipal separate storm sewer system" or "MS4" that receives runoff from any of the following:

1.1.1 An "urbanized area", adjacent developing areas and areas whose runoff will connect to a municipal separate storm sewer regulated under subch. I of NR 216; or

1.1.2 An area associated with a municipal population of 10,000 or more and a population density of 1,000 or more per square mile, adjacent developing areas and areas whose runoff will connect to a MS4 regulated under subch. I of NR 216; or

1.1.3 An area that drains to a MS4 that is designated for permit coverage pursuant to s. NR 216.02(2) or 216.025, Wis. Adm. Code.

Note: "MS4" and "urbanized area" are defined in section 5 of this permit.

1.2 Authorized Discharges

This permit authorizes storm water point source discharges from the MS4 to waters of the state in the permitted area. This permit also authorizes the discharge of storm water co-mingled with flows contributed by process wastewater, non-process wastewater, and storm water associated with industrial activity, provided the discharges are regulated by other WPDES permits or are discharges which are not considered illicit discharges.

1.3 Water Quality Standards

1.3.1 This permit specifies the conditions under which storm water may be discharged to waters of the state for the purpose of achieving water quality standards contained in chs. NR 102 through 105 and NR 140, Wis. Adm. Code. For the term of this permit, compliance with water quality standards will be addressed by adherence to general narrative-type storm water discharge limitations and implementation of storm water management programs and practices.

1.3.2 This permit does not authorize water discharges that the Department, prior to authorization of coverage under this permit, determines will cause or have reasonable potential to cause or contribute to an excursion above any applicable water quality standards. Where such determinations have been made prior to authorization, the Department may notify the municipality that an individual permit application is necessary. However, the Department may authorize coverage under this permit where the storm water management programs required under this permit will include appropriate controls and implementation procedures designed to bring the storm water discharge into compliance with water quality standards.

1.4 Outstanding and Exceptional Resource Waters

1.4.1 The permittee shall determine whether any part of its MS4 discharges to an outstanding resource water (ORW) or exceptional resource water (ERW). ORWs and ERWs are listed in ss. NR 102.10 and 102.11, Wis. Adm. Code. An unofficial list of ORWs and ERWs may be found on the Department's Internet site at: http://dnr.wi.gov/org/water/wm/wqs/.

1.4.2 The permittee may not establish a new MS4 discharge of pollutants to an outstanding resource water (ORW) or an exceptional resource water (ERW) unless the storm water management programs required under this permit are designed to ensure that any new MS4 discharge of pollutants to an ORW or ERW will not exceed background levels within the ORW or ERW.

1.4.2.1 "New MS4 discharge of pollutants" means an MS4 discharge that would first occur after the permittee's start date of coverage under this permit to a surface water to which the MS4 did not previously discharge storm water, and does not include an increase in an MS4's discharge to a surface water to which the MS4 discharged on or before coverage under this permit.

1.4.3 If the permittee has an existing MS4 discharge to an ERW, it may increase the discharge of pollutants if the increased discharge would not result in a violation of water quality standards.

1.4.4 If the permittee has an existing MS4 discharge to an ORW, it may increase the discharge of pollutants provided all of the following are met:

1.4.4.1 The pollutant concentration within the receiving water and under the influence of the existing discharge would not increase as compared to the level that existed prior to coverage under this permit.

1.4.4.2 The increased discharge would not result in a violation of water quality standards.

1.5 Impaired Water Bodies and Total Maximum Daily Load Requirements

1.5.1 The permittee shall determine whether any part of its MS4 discharges to an impaired water body listed in accordance with section 303(d)(1) of the federal Clean Water Act, 33 USC §1313(d)(1)(C), and the implementing regulation of the US Environmental Protection Agency, 40 CFR §130.7(c)(1). Impaired waters are those that are not meeting applicable water quality standards. A list of Wisconsin impaired water bodies may be found on the Department's Internet site at: http://dnr.wi.gov/org/water/wm/wqs/303d/303d.html.

1.5.2 If the permittee's MS4 discharges to an impaired water body, the permittee shall include a written section in its storm water management program that discusses the management practices and control measures it will implement as part of its program to reduce, with the goal of eliminating, the discharge of pollutant(s) of concern that contribute to the impairment of the water body. This section of the permittee's program shall specifically identify control measures and practices that will collectively be used to try to eliminate the MS4's discharge of pollutant(s) of concern that contribute to the impairment of the water body and explain why these control measures and practices were chosen as opposed to other alternatives. Pollutant(s) of concern means a pollutant that is causing impairment of a water body.

1.5.3 After the permittee's start date of coverage under this permit, the permittee may not establish a new MS4 discharge of a pollutant of concern to an impaired water body or increase the discharge of a pollutant of concern to an impaired water body unless the new or increased discharge causes the receiving water to meet applicable water quality standards, or the Department has approved a total maximum daily load (TMDL) for the impaired water body.

1.5.4 The permittee shall determine whether its MS4 discharges to an impaired water body for which the Department has approved a TMDL. If so, the permittee shall assess whether the TMDL wasteload allocation for the MS4 is being met through the existing storm water management controls or whether additional control measures are necessary. The permittee's assessment of whether the TMDL wasteload allocation is being met shall focus on the adequacy of the permittee's storm water controls (implementation and maintenance). Approved TMDLs are listed on the Department Internet site at: http://dnr.wi.gov/org/water/wm/wqs/303d/index.html.

1.5.5 The storm water management program developed under section 2 of this permit shall be revised as necessary to achieve and maintain compliance with any Department approved-TMDL wasteload allocation for an impaired water to which the MS4 discharges. The redesigned storm water management programs shall be implemented as soon as possible.

1.6 Wetlands

The permittee's MS4 discharge shall comply with the wetland water quality standards provisions in ch. NR 103, Wis. Adm. Code.

1.7 Endangered and Threatened Resources

The permittee's MS4 discharge shall comply with the endangered and threatened resource protection requirements of s. 29.604, Wis. Stats., and ch. NR 27, Wis. Adm. Code.

1.8 Historic Property

The permittee's MS4 discharge may not affect any historic property that is listed property, or on the inventory or on the list of locally designated historic places under s. 44.45, Wis. Stats., unless the Department determines that the MS4 discharge will not have an adverse effect on any historic property pursuant to s. 44.40 (3), Wis. Stats.

1.9 General Storm Water Discharge Limitations

The permittee may not discharge the following substances from the MS4 in amounts that have an unreasonable effect on receiving water quality or aquatic life:

1. Solids that may settle to form putrescence or otherwise objectionable sludge deposits.
2. Oil, grease, and other floating material that form noticeable accumulations of debris, scum, foam, or sheen.
3. Color or odor that is unnatural and to such a degree as to create a nuisance.
4. Toxic substances in amounts harmful to aquatic life, wildlife, or humans.
5. Nutrients conducive to the excessive growth of aquatic plants and algae to the extent that such growth is detrimental to desirable forms of aquatic life, creates conditions that are unsightly, or is a nuisance.
6. Any other substances that may impair, or threaten to impair, beneficial uses of the receiving water.

1.10 Obtaining Permit Coverage

1.10.1 In order to obtain coverage under this permit, the owner or operator of an MS4 shall submit a complete Notice of Intent (NOI) to the Department. The Department will make an NOI form available on its Internet site or a copy may be obtained by contacting the storm water

program at (608) 267-7694. The NOI shall be mailed to Wisconsin DNR, Storm Water Program – WT/2, PO Box 7921, Madison, WI 53707-7921 or as otherwise directed by the Department.

1.10.2 Coverage under this permit does not become effective until the Department sends the owner or operator a letter expressly authorizing coverage under this permit.

1.11 Public Access to Information including Notices of Intent

The Department will list on its storm water Internet site, for a period of at least 30 days, the NOIs that are received by the Department requesting coverage under this permit. This list will be accessible via: http://dnr.wi.gov/org/water/wm/nps/stormwater/muni.htm. Official Department records for individual municipalities are typically maintained in the office of the Department's regional storm water contact. To gain access to facility records, you should contact the appropriate regional contact, who is listed at: http://dnr.wi.gov/org/water/wm/nps/stormwater/contact. Or you may contact the Department's storm water program coordinator for assistance at (608) 267-7694.

1.12 Public Comment and Request for Public Hearing on Notices of Intent

All written comments received by the Department within 30 days of the NOI being initially listed on the Internet site will be considered along with the NOI and any other information on file to determine if coverage under this permit is appropriate. A public informational hearing may also be held if significant public interest is expressed. Requests for a public informational hearing must be filed within 30 days of the NOI being initially listed on the Department's Internet site, and must indicate the interest of the party filing the request and the reasons why a hearing is warranted. Comments and requests for public hearing must be mailed to: Wisconsin DNR, Storm Water Program – WT/2, P.O. Box 7921, Madison, WI 53707. The Department will evaluate comments and requests for public hearing to determine is there is sufficient interest to hold a public hearing prior to authorizing coverage under this permit.

1.13 Transfers

Coverage under this permit is not transferable to another municipality without the express written approval of the Department. If the permittee's MS4 is annexed into another municipality, the permittee shall immediately notify the Department by letter of such change. If the permittee ceases to own or operate any MS4 regulated under this permit, the Department may terminate its coverage under this permit.

1.14 Exclusions

The following are excluded from coverage (i.e. are not authorized) under this permit:

1.14.1 Combined Sewer and Sanitary Sewer Systems

Discharges of water from a sanitary sewer or a combined sewer system conveying both sanitary and storm water. These discharges are regulated under s. 283.31, Wis. Stats, and require an individual permit.

1.14.2 Agricultural Facilities and Practices

Discharges from "agricultural facilities" and "agricultural practices". "Agricultural facility" means a structure associated with an agricultural practice. "Agricultural practice" means beekeeping; commercial feedlots; dairying; egg production; floriculture; fish or fur farming; grazing; livestock raising; orchards; poultry raising; raising of grain, grass, mint and seed crops; raising of fruits, nuts and berries; sod farming; placing land in federal programs in return for payments in kind; owning land, at least 35 acres of which is enrolled in the conservation reserve

program under 16 USC 3831 to 3836; and vegetable raising.

1.14.3 Other Excluded Discharges
Storm water discharges from industrial operations or land disturbing construction activities that require separate coverage under a WPDES permit pursuant to subchs. II or III of ch. NR 216, Wis. Adm. Code. For example, while storm water from industrial or construction activity may discharge from an MS4, this permit does not satisfy the need to obtain any other permits for those discharges. This exclusion does not apply to the permittee's responsibility to regulate construction sites within its jurisdiction in accordance with sections 2.4 and 2.5 of this permit.

1.14.4 Indian Country
Storm water discharges within Indian Country. The federal Clean Water Act requires that owners and operators of storm water discharges within Indian Country in Wisconsin to obtain permit coverage directly from the United States Environmental Protection Agency.

1.14.5 Non-MS4 Discharge
Storm water discharges that do not enter an MS4.

2. PERMIT CONDITIONS

The permittee shall establish written, measurable goals for achieving compliance with the programs developed under sections 2.1 through 2.6 in accordance with the compliance schedule contained in section 3 of this permit. The following permit conditions apply to the permittee, unless the Department issues a written determination that a condition is not appropriate under the circumstances. For example, where the permittee owns all of the land that drains to its MS4, it may be unnecessary to develop erosion control and storm water management ordinances since they are used to enforce against other landowners of construction and post-construction sites.

2.1 Public Education and Outreach

The permittee shall implement a public education and outreach program to increase the awareness of storm water pollution impacts on waters of the state to encourage changes in public behavior to reduce such impacts. The program shall establish measurable goals and, at a minimum, include the following elements:

2.1.1 Promote detection and elimination of illicit discharges and water quality impacts associated with such discharges from municipal separate storm sewer systems.

2.1.2 Inform and educate the public about the proper management of materials that may cause storm water pollution from sources including automobiles, pet waste, household hazardous waste and household practices.

2.1.3 Promote beneficial onsite reuse of leaves and grass clippings and proper use of lawn and garden fertilizers and pesticides.

2.1.4 Promote the management of streambanks and shorelines by riparian landowners to minimize erosion and restore and enhance the ecological value of waterways.

2.1.5 Promote infiltration of residential storm water runoff from rooftop downspouts, driveways and sidewalks.

2.1.6 Inform and where appropriate educate those responsible for the design, installation, and maintenance of construction site erosion control practices and storm water management facilities on how to design, install and maintain the practices.

2.1.7 Identify businesses and activities that may pose a storm water contamination concern, and where appropriate, educate specific audiences on methods of storm water pollution prevention.

2.1.8 Promote environmentally sensitive land development designs by developers and designers.

2.2 Public Involvement and Participation

The permittee shall implement a program to notify the public of activities required by this permit and to encourage input and participation from the public regarding these activities. This program shall include measurable goals for public involvement and participation and comply with applicable state and local public notice requirements.

2.3 Illicit Discharge Detection and Elimination

The permittee shall develop, implement and enforce a program to detect and remove illicit connections and discharges to the MS4. The program shall include measurable goals and include all of the following:

2.3.1 An ordinance or other regulatory mechanism to prevent and eliminate illicit discharges and connections to the MS4. At a minimum, the ordinance or other regulatory mechanism shall:

2.3.1.1 Prohibit the discharge, spilling or dumping of non-storm water substances or materials into waters of the state or the MS4.

2.3.1.2 Identify non-storm water discharges or flows that are not considered illicit discharges. Non-storm water discharges that are not considered illicit discharges include water line flushing, landscape irrigation, diverted stream flows, uncontaminated groundwater infiltration, uncontaminated pumped groundwater, discharges from potable water sources, foundation drains, air conditioning condensation, irrigation water, lawn watering, individual residential car washing, flows from riparian habitats and wetlands, fire fighting and discharges authorized under a WPDES permit unless identified by the permittee as significant source of pollutants to waters of the state.

2.3.1.3 Establish inspection and enforcement authority.

Note: Chapter NR 815, Wis. Adm. Code, regulates injection wells including storm water injection wells. Construction or use of a well to dispose of storm water directly into groundwater is prohibited under s. NR 815.11(5), Wis. Adm. Code.

2.3.2 Initial field screening at all major outfalls during dry weather periods. At a minimum, field screening shall be documented and include:

2.3.2.1 Visual Observation - A narrative description of visual observations including color, odor, turbidity, oil sheen or surface scum, flow rate and any other relevant observations

regarding the potential presence of non-storm water discharges or illicit dumping.

2.3.2.2 Field Analysis - If flow is observed, a field analysis shall be conducted to determine the presence of illicit non-storm water discharges or illicit dumping. The field analysis shall include sampling for pH, total chlorine, total copper, total phenol and detergents, unless the permittee elects instead to use detergent, ammonia, potassium and fluoride as the indicator parameters. Other alternative indicator parameters may be authorized by the Department in writing.

Note: Detergent, ammonia, potassium and fluoride indicator parameters provide a better screening tool to identify whether the flow is contaminated with sanitary or wastewater, and also whether the source is a tap water or a natural source of water. The Center for Watershed Protection (CWP) has illicit discharge identification and elimination guidance available at http://www.cwp.org/idde_verify.htm. The CWP guidance includes illicit discharge field sampling guidance developed by Robert Pitt from the University of Alabama on how best to detect illicit discharges including recommended indicator parameters and associated levels of detection.

2.3.2.2.1 Field screening points shall, where possible, be located downstream of any source of suspected illicit activity.

2.3.2.2.2 Field screening points shall be located where practicable at the farthest manhole or other accessible location downstream in the system. Safety of personnel and accessibility of the location shall be considered in making this determination.

2.3.3 On-going dry weather field screening of outfalls during the term of the permit. Outfalls that will be evaluated on an on-going basis and the field screening frequency shall be identified. Consideration shall be given to hydrological conditions, total drainage area of the site, population density of the site, traffic density, age of the structures or buildings in the area, history of the area and land use types. A description of this on-going field screening program shall be submitted to the Department in accordance with section 3.3.4.

2.3.4 Procedures for responding to known or suspected illicit discharges. At a minimum, procedures shall be established for:

2.3.4.1 As soon as possible, investigating portions of the MS4 that, based on the results of field screening or other information, indicate a reasonable potential for containing illicit discharges or other sources of non-storm water discharges.

2.3.4.2 Responding to spills that discharge into and/or from the MS4 including tracking and locating the source of the spill if unknown.

2.3.4.3 Preventing and containing spills that may discharge into or are already within the MS4.

2.3.4.4 Notifying the Department immediately in accordance with ch. NR 706, Wis. Adm. Code, in the event that the permittee identifies a spill or release of a hazardous substance, which has resulted or may result in the discharge of pollutants into waters of the state. The Department shall be notified via the 24-hour toll free spill hotline at 1-800-943-0003. The

permittee shall cooperate with the Department in efforts to investigate and prevent such discharges from polluting waters of the state.

2.3.4.5 To the maximum extent practicable, eliminating leakage from sanitary conveyance systems into the MS4.

2.3.4.6 Providing the Department with advance notice of the time and location of dye testing within a MS4. (Because the dye may get reported to the Department as an illicit discharge or spill, the Department requires prior notification of dye testing.)

2.3.5 The permittee shall take appropriate action to remove illicit discharges from its MS4 system as soon as possible. If it will take more than 30 days to remove an illicit connection, the Department shall be contacted to discuss an appropriate action and/or timeframe for removal.

2.3.6 In the case of an illicit discharge that originates from the permittee's permitted area and that discharges directly to a municipal separate storm sewer or property under the jurisdiction of another municipality, the permittee shall notify the affected municipality within one working day.

2.3.7 The name, title and phone number of the individual(s) responsible for responding to reports of illicit discharges and spills shall be included in the illicit discharge response procedure and submitted to the Department in accordance with section 3.3.2.

2.4 Construction Site Pollutant Control

Each permittee shall develop, implement and enforce a program to reduce the discharge of sediment and construction materials from construction sites. The program shall establish measurable goals and include:

2.4.1 An ordinance or other regulatory mechanism to require erosion and sediment control at construction sites and establish sanctions to ensure compliance. Note that Appendix A of ch. NR 152, Wis. Adm. Code, contains a construction site model ordinance. At a minimum, the ordinance or other regulatory mechanism shall establish or include:

2.4.1.1 Applicability and jurisdiction.

2.4.1.1.1 It shall apply to all construction sites with one acre or more of land disturbance, and to sites of less than one acre if they are part of a larger common plan of development or sale under the jurisdiction of the permittee.

2.4.1.1.2 It does not have to apply to construction sites that are listed under s. NR 216.42(2) to (11), Wis. Adm. Code, except that it shall apply to construction sites listed under s. NR 216.42 (4) and (9) where erosion control authority has been delegated to the permittee by the Wisconsin Department of Commerce.

2.4.1.1.3 If the permittee is a city, village, county or town and does not have authority from the Wisconsin Department of Commerce (Commerce) to regulate erosion control at public buildings and places of employment, the permittee shall request such authority from Commerce pursuant to s. 101.1205(4), Wis. Stats., **within 18 months after the start date.** If Commerce delegates to the permittee the authority to regulate erosion control at public buildings and places of employment, the permittee shall exercise such

authority as soon as possible.

2.4.1.2 Erosion and sediment control criteria, standards and specifications equivalent to those approved by the Department. Department erosion and sediment control standards are available through the Department's storm water Internet site at: http://dnr.wi.gov/org/water/wm/nps/stormwater.htm.

2.4.1.3 Construction site performance standards equivalent to or more restrictive than those in ss. NR 151.11 and 151.23, Wis. Adm. Code.

2.4.1.4 Erosion and sediment control plan requirements for landowners of construction sites equivalent to those contained in s. NR 216.46, Wis. Adm. Code.

2.4.1.5 Inspection and enforcement authority.

2.4.1.6 Requirements for construction site operators to manage waste such as discarded building materials, concrete truck washout, chemicals, litter and sanitary waste at the construction site so as to reduce adverse impacts to waters of the state.

2.4.2 Procedures for construction site inspection and enforcement of erosion and sediment control measures. At a minimum, the procedures shall establish:

2.4.2.1 Municipal departments or staff responsible for construction site inspections and enforcement.

2.4.2.2 Construction site inspection frequency.

2.4.2.3 Construction site inspection documentation.

2.4.2.4 Enforcement mechanisms that will be used to obtain compliance.

2.4.3 Procedures for receipt and consideration of information submitted by the public.

Note: A town may demonstrate to the Department that an adequate county ordinance that meets the requirements of this permit is administered and enforced within its town and then the town could be excused from having to adopt its own ordinance.

2.5 Post-Construction Storm Water Management

The permittee shall develop, implement and enforce a program to require control of the quality of discharges from areas of new development and redevelopment, after construction is completed. The program shall establish measurable goals and include:

2.5.1 An ordinance or other regulatory mechanism to regulate post-construction storm water discharges from new development and redevelopment. Note that Appendix B of ch. NR 152, Wis. Adm. Code, contains a post-construction site model ordinance. At a minimum, the ordinance or other regulatory mechanism shall establish or include:

2.5.1.1 Applicability and jurisdiction that shall apply to construction sites with one acre or more of land disturbance, and sites of less than one acre if they are part of a larger common

plan of development or sale under the jurisdiction of the permittee.

2.5.1.2 Design criteria, standards and specifications equivalent to technical standards or the Wisconsin Storm Water Manual approved by the Department. The Department-approved technical standards shall take precedence over the Wisconsin Storm Water Manual. The Department-approved technical standards and the Wisconsin Storm Water Manual are available at http://dnr.wi.gov/org/water/wm/nps/stormwater/techstds.htm.

2.5.1.3 Post-construction performance standards equivalent to or more restrictive than those in ss. NR 151.12 and 151.24, Wis. Adm. Code.

2.5.1.4 Storm water plan requirements for landowners of construction sites equivalent to those contained in s. NR 216.47, Wis. Adm. Code.

2.5.1.5 Long-term maintenance requirements for landowners and other persons responsible for long-term maintenance of post-construction storm water control measures.

2.5.1.6 Inspection and enforcement authority.

2.5.2 Procedures that will be used by the permittee to ensure the long-term maintenance of storm water management facilities.

Note: A town may demonstrate to the Department that an adequate county ordinance that meets the requirements of this permit is administered and enforced within its town and then the town could be excused from having to adopt its own ordinance.

2.6 Pollution Prevention

Each permittee shall develop and implement a pollution prevention program that establishes measurable goals for pollution prevention. The program shall include:

2.6.1 Routine inspection and maintenance of municipally owned or operated structural storm water management facilities to maintain their pollutant removal operating efficiency.

2.6.2 Routine street sweeping and cleaning of catch basins with sumps where appropriate.

2.6.3 Proper disposal of street sweeping and catch basin cleaning waste.

2.6.4 If road salt or other deicers are applied by the permittee, no more shall be applied than necessary to maintain public safety.

Note: The DOT "Highway Maintenance Manual", chapter 35, contains guidance on application of road salt and other deicers that can be used to determine whether not application is necessary and what application rate is appropriate for deicing and ice prevention. This information is held on a secured server and users must first register with the state of Wisconsin to obtain an ID and password. You can learn more about getting connected to this secured server at: http://www.dot.wisconsin.gov/business/extranet/. The Wisconsin Department of Transportation (DOT) highway salt storage requirements are contained in ch. Trans 277, Wis. Adm. Code.

2.6.5 Proper management of leaves and grass clippings, which may include on-site beneficial

reuse as opposed to collection.

2.6.6 Storm water pollution prevention planning for municipal garages, storage areas and other sources of storm water pollution from municipal facilities.

2.6.7 Application of lawn and garden fertilizers on municipally controlled properties, with pervious surfaces over 5 acres each, in accordance with a site-specific nutrient application schedule based on appropriate soil tests.

2.6.8 Education of appropriate municipal and other personnel involved in implementing this program.

2.6.9 Measures to reduce municipal sources of storm water contamination within source water protection areas. Wisconsin's source water assessment program information is available at: http://www.dnr.state.wi.us/org/water/dwg/swap/index.htm.

2.7 Storm Water Quality Management

The permittee shall develop and implement a municipal storm water management program. This program shall achieve compliance with the developed urban area performance standards of s. NR 151.13(2), Wis. Adm. Code, for those areas of the municipality that were not subject to the post-construction performance standards of s. NR 151.12 or 151.24. The program shall include:

2.7.1 To the maximum extent practicable, implementation of storm water management practices necessary to achieve a 20% reduction in the annual average mass of total suspended solids discharging from the MS4 to surface waters of the state as compared to implementing no storm water management controls, by March 10, 2008. The permittee may elect to meet the 20% total suspended solids standard on a watershed or regional basis by working with other permittee(s) to provide regional treatment that collectively meets the standard.

Note: Pursuant to s. NR 151.13(2), Wis. Adm. Code, the total suspended solids reduction requirement increases to 40% by March 10, 2013. The 20% and 40% total suspended solids reduction requirements are applied to runoff from areas of urban land use and are not applicable to agricultural or rural land uses and associated roads. Additional MS4 modeling guidance for modeling the total suspended solids control is given on the Department's Internet site at: http://dnr.wi.gov/org/water/wm/nps/stormwater/techstds.htm.

2.7.2 Evaluation of all municipal owned or operated structural flood control facilities to determine the feasibility of retrofitting to increase total suspended solids removal from runoff.

2.7.3 Assessment of compliance with s. NR 151.13(2), Wis. Adm. Code, by conducting a pollutant-loading analysis using a model such as SLAMM, P8 or equivalent methodology approved by the Department. At a minimum, the average annual total suspended solids and phosphorus loads to the MS4 shall be determined for the cumulative discharge from all outfalls for the controls and no controls conditions. For purposes of evaluating the modeling, pollutant loads from grouped drainage areas as modeled shall be reported. The modeling shall calculate the theoretical annual average mass of total suspended solids generated for the entire area served by a MS4 within the permittee's jurisdiction with no controls or BMPs applied. Modeling to reflect the current state of controls and BMPs shall be judged against the no controls condition to determine the percent of reduction. A storm water infiltration system is considered to be a

control or BMP. Controls and BMPs that exist at the time of permit issuance may be used to achieve this reduction. This pollutant level reduction applies to total suspended solids only.

Note: It is recommended that the pollutant-loading analysis be conducted as soon as possible. This analysis is needed to provide the permittee with information on which BMPs are needed to meet the implementation date of March 10, 2008.

2.8 Storm Sewer System Map

The permittee shall develop and maintain a MS4 map. The municipal storm sewer system map shall include:

2.8.1 Identification of waters of the state, name and classification of receiving water(s), identification of whether the receiving water is an ORW, ERW or listed as an impaired water under s. 303(d) of the Clean Water Act, storm water drainage basin boundaries for each MS4 outfall and municipal separate storm sewer conveyance systems.

2.8.2 Identification of any known threatened or endangered resources, historical property and wetlands, as defined in sections 1.6 through 1.8 of this permit, which might be affected.

2.8.3 Identification of all known MS4 outfalls discharging to waters of the state and other MS4s. Major outfalls shall be uniquely identified.

2.8.4 Location of any known discharge to the MS4 that has been issued WPDES permit coverage by the Department. A list of WPDES permit holders in the permittee's area may be obtained from the Department.

2.8.5 Location of municipally owned or operated structural storm water management facilities including detention basins, infiltration basins, and manufactured treatment devices. If the permittee will be taking credit for pollutant removal from privately-owned facilities, they must be identified.

2.8.6 Identification of publicly owned parks, recreational areas and other open lands.

2.8.7 Location of municipal garages, storage areas and other public works facilities.

2.8.8 Identification of streets.

2.9 Annual Report

The permittee shall submit an annual report to the Department in accordance with section 3.10 of this permit. The permittee shall invite the municipal governing body, interest groups and the general public to review and comment on the annual report. The annual report shall include:

2.9.1 The status of implementing the permit requirements, status of meeting measurable program goals and compliance with permit schedules.

2.9.2 A fiscal analysis which includes the annual expenditures and budget for the reporting year, and the budget for the next year.

2.9.3 A summary of the number and nature of inspections and enforcement actions conducted

to ensure compliance with the required ordinances.

2.9.4 Identification of any known water quality improvements or degradation in the receiving water to which the permittee's MS4 discharges. Where degradation is identified, identify why and what actions are being taken to improve the water quality of the receiving water.

2.9.5 A duly authorized representative of the permittee shall sign and certify the annual report and include a statement or resolution that the permittee's governing body or delegated representatives have reviewed or been apprised of the content of the annual report. A signed copy of the annual report and other required reports shall be submitted to the appropriate Department regional storm water contact or to the Wisconsin DNR, Storm Water Program – WT/2, PO Box 7921, Madison, WI 53707-7921. Section 3.10 of this permit contains the date by which annual reports shall be submitted to the Department.

2.10 Cooperation

The permittee may, by written agreement, implement this permit with another municipality or contract with another entity to perform one or more of the conditions of this permit. For example, if a county is implementing and enforcing an adequate storm water ordinance(s) within a town, the town would then not have to adopt its own ordinance. However, the permittee is ultimately responsible for compliance with the conditions of this permit.

3. COMPLIANCE SCHEDULE

The permittee's programs under section 2 shall be submitted to the Department for review. The Department intends to review the program within the 6-month period prior to implementation to verify compliance with the requirements of this permit. The permittee shall comply with the specific permit conditions contained in section 2 according to following schedule:

3.1 Public Outreach and Education

The permittee shall submit the proposed public education and outreach program to the Department within **18 months of the start date** of permit coverage. The permittee shall implement the public education and outreach program **within 24 months of the start date.**

3.2 Public Involvement and Participation

The permittee shall submit the proposed public involvement and participation program to the Department within **18 months of the start date** of permit coverage. The permittee shall implement the public involvement and participation program **within 24 months of the start date.**

3.3 Illicit Discharge Detection and Elimination

3.3.1 The permittee shall submit the proposed illicit discharge and elimination ordinance to the Department **within 24 months of the start date** of permit coverage. The permittee shall adopt the illicit discharge and elimination ordinance **within 30 months of the start date.**

3.3.2 The permittee shall submit the proposed illicit discharge response procedures to the Department **within 24 months of the start date** of permit coverage. The permittee shall implement the illicit discharge response procedures **within 30 months of the start date.**

3.3.3 The permittee shall complete initial field screening **within 36 months of the start date**

of permit coverage.

3.3.4 The permittee shall submit the proposed on-going field screening program to the Department **within 36 months of the start date** of permit coverage. The permittee shall implement the on-going field screening program **within 48 months of the start date.**

3.4 Construction Site Pollutant Control

3.4.1 The permittee shall submit the proposed construction site pollutant control ordinance to the Department **within 18 months of the start date** of permit coverage. The permittee shall adopt the construction site pollutant control ordinance within **24 months of the start date.** If revision to any existing construction site pollutant control ordinance is necessary, the existing ordinances shall continue to be enforced until the revised ordinance becomes effective.

3.4.2 The permittee shall submit the proposed construction site inspection and enforcement procedures to the Department **within 18 months of the start date** of permit coverage. The permittee shall implement the construction site inspection and enforcement procedures **within 24 months of the start date.**

3.5 Post-Construction Storm Water Management

3.5.1 The permittee shall submit the proposed post-construction storm water management ordinance to the Department **within 18 months of the start date** of permit coverage. The permittee shall adopt the post-construction storm water management ordinance within **24 months of the start date.** If revision to any existing post-construction storm water management ordinance is necessary, the existing ordinances shall continue to be enforced until the revised ordinance becomes effective.

3.5.2 The permittee shall submit the proposed long-term maintenance procedures to the Department **within 18 months of the start date** of permit coverage. The permittee shall implement the long-term maintenance procedures **within 24 months of the start date.**

3.6 Pollution Prevention

The permittee shall submit the proposed pollution prevention program to the Department **within 24 months of the start date** of permit coverage. The pollution prevention program shall be implemented **within 30 months of the start date.**

3.7 Storm Water Quality Management

The permittee shall complete the evaluation of flood control structures and assessment of compliance and submit the results to the Department **by March 10, 2008 or within 24 months of the start date** of permit coverage.

3.8 Storm Sewer System Map

The permittee shall submit the MS4 map to the Department within **24 months of the start date** of permit coverage.

3.9 Amendments

The permittee shall amend a program required under this permit as soon as possible if the permittee becomes aware that it does not meet a requirement of this permit. The permittee shall amend its

program if notified by the Department that a program or procedure is insufficient or ineffective in meeting a requirement of this permit. The Department notice to the permittee may include a deadline for amending and implementing the amendment.

3.10 Annual Report

The permittee shall submit an annual report for each calendar year by **March 31st of the following year**. However, an annual report does not have to be submitted after the initial calendar year of permit coverage. The first annual report sent to the Department shall report on the previous 2 calendar years of permit coverage.

3.11 Reapplication for Permit Coverage

To retain authorization to discharge after the expiration date of this permit, the permittee shall apply for reissuance of this permit in accordance with the requirements of s. NR 216.09, Wis. Adm. Code, at least 180 days prior to this permit's expiration date.

COMPLIANCE SCHEDULE SUMMARY

PERMIT CONDITION	ACTIVITY	DUE TO DNR	IMPLEMENT
Public Education and Outreach – Section 3.1	Submit public education and outreach program	Within 18 months of the start date	Within 24 months of the start date
Public Involvement and Participation – Section 3.2	Submit public involvement and participation program	Within 18 months of the start date	Within 24 months of the start date
Illicit Discharge Detection and Elimination – Section 3.3	1. Submit illicit discharge ordinance	Within 24 months of the start date	Within 30 months of the start date
	2. Submit illicit discharge response procedures	Within 24 months of the state date	Within 30 months of the state date
	3. Complete initial field screening		Within 36 months of the start date
	4. Submit on-going field screening	Within 36 months of the start date	Within 48 months of the start date
Construction Site Pollutant Control – Section 3.4	1. Submit construction site pollutant control ordinance	Within 18 months of the start date	Within 24 months of the start date
	2. Submit construction site inspection and enforcement procedures	Within 18 months of the start date	Within 24 months of the start date
Post-Construction Storm Water Management – Section 3.5	1. Submit post-construction storm water management ordinance	Within 18 months of the start date	Within 24 months of the start date
	2. Submit long-term maintenance procedures	Within 18 months of the start date	Within 24 months of the start date
Pollution Prevention – Section 3.6	Submit pollution prevention program	Within 24 months of the start date	Within 30 months of the start date
Storm Water Quality Management – Section 3.7	1. Submit evaluation of flood control structures	By March 10, 2008 or within 24 months after start date	
	2. Submit assessment of compliance	By March 10, 2008 or within 24 months after start date	
MS4 Map – Section 3.8	Submit MS4 map	Within 24 months of the state date	
Annual Report – Section 3.10	Submit annual report	By March 31 of each year*	
Reapplication for Permit Coverage – Section 3.11	Submit reapplication	By March 31, 2009	

***Note:** An annual report does not have to be submitted after the initial calendar year of permit coverage. The first annual report sent to the Department shall report on the previous 2 calendar years of permit coverage.

4. STANDARD CONDITIONS

The conditions in s. NR 205.07(1) and (3), Wis. Adm. Code, are incorporated by reference in this permit. The permittee shall be responsible for meeting these requirements, except for s. NR 205.07(1)(n), which does not apply to facilities covered under general permits. Some of these requirements are outlined below in sections 4.1 through 4.18. Requirements not specifically outlined below can be found in s. NR 205.07(1) and (3), Wis. Adm. Code.

4.1 Duty to Comply: The permittee shall comply with all conditions of the permit. Any act of noncompliance with this permit is a violation of this permit and is grounds for enforcement action or withdrawal of permit coverage under this permit and issuance of an individual permit. If the permittee files a request for an individual WPDES permit or a notification of planned changes or anticipated noncompliance, this action by itself does not relieve the permittee of any permit condition.

4.2 Enforcement Action: The Department is authorized under s. 283.89 and 283.91, Wis. Stats., to utilize citations or referrals to the Department of Justice to enforce the conditions of this permit. Violation of a condition of this permit is subject to a fine of up to $10,000 per day of the violation.

4.3 Compliance Schedules: Reports of compliance or noncompliance with interim and final requirements contained in any compliance schedule of the permit shall be submitted in writing within 14 days after the scheduled due date, except that progress reports shall be submitted in writing on or before each schedule date for each report. Any report of noncompliance shall include the cause of noncompliance, a description of remedial actions taken, and an estimate of the effect of the noncompliance on the permittee's ability to meet the remaining scheduled due dates.

4.4 Noncompliance

4.4.1 Upon becoming aware of any permit noncompliance that may endanger public health or the environment, the permittee shall report this information by a telephone call to the Department regional storm water specialist within 24 hours. A written report describing the noncompliance shall be submitted to the Department regional storm water specialist within 5 days after the permittee became aware of the noncompliance. The Department may waive the written report on a case-by-case basis based on the oral report received within 24 hours. The written report shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times; the steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance; and if the noncompliance has not been corrected, the length of time it is expected to continue.

4.4.2 Reports of any other noncompliance not covered under STANDARD CONDITIONS sections 4.3, 4.4.1, or 4.6. shall be submitted with the annual report. The reports shall contain all the information listed in STANDARD CONDITIONS section 4.4.1.

4.5 Duty to Mitigate: The permittee shall take all reasonable steps to minimize or prevent any adverse impact on the waters of the state resulting from noncompliance with the permit.

4.6 Spill Reporting: The permittee shall immediately notify the Department, in accordance with ch. NR 706, Wis. Adm. Code, in the event of a spill or accidental release of hazardous substances which has resulted or may result in a discharge of pollutants into waters of the state. The Department shall be notified via the 24-hour spill hotline (1-800-943-0003).

4.7 Proper Operation and Maintenance: The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control which are installed or used by the municipality to achieve compliance with the conditions of the permit and the storm water management plan. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems only when necessary to achieve compliance with conditions of this permit.

4.8 Bypass: The permittee may temporarily bypass storm water treatment facilities if necessary for maintenance, or due to runoff from a storm event which exceeds the design capacity of the treatment facility, or during an emergency.

4.9 Duty to Halt or Reduce Activity: Upon failure or impairment of storm water management practices identified in the storm water management program, the permittee shall, to the extent practicable and necessary to maintain permit compliance, modify or curtail operations until the storm water management practices are restored or an alternative method of storm water pollution control is provided.

4.10 Removed Substances: Solids, sludges, filter backwash or other pollutants removed from or resulting from treatment or control of storm water shall be stored and disposed of in a manner to prevent any pollutant from the materials from entering the waters of the state, and to comply with all applicable federal, state, and local regulations.

4.11 Additional Monitoring: If a permittee monitors any pollutant more frequently than required by the permit, the results of that monitoring shall be reported to the Department in the annual report.

4.12 Inspection and Entry: The permittee shall allow authorized representatives of the Department, upon the presentation of credentials, to:

4.12.1 Enter upon the municipal premises where a regulated facility or activity is located or conducted, or where records are required to be maintained under the conditions of the permit;

4.12.2 Have access to and copy, at reasonable times, any records that are required under the conditions of the permit;

4.12.3 Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices or operations regulated or required under the permit; and

4.12.4 Sample or monitor at reasonable times, for the purposes of assuring permit compliance, any substances or parameters at any location.

4.13 Duty to Provide Information: The permittee shall furnish the Department, within a reasonable time, any information which the Department may request to determine whether cause exists for modifying, revoking or reissuing the permit or to determine compliance with the permit. The permittee shall also furnish the Department, upon request, copies of records required to be kept by the permittee.

4.14 Property Rights: The permit does not convey any property rights of any sort, or any

exclusive privilege. The permit does not authorize any injury or damage to private property or an invasion of personal rights, or any infringement of federal, state or local laws or regulations.

4.15 Other Information: Where the permittee becomes aware that it failed to submit any relevant facts in applying for permit coverage or submitted incorrect information in any plan or report sent to the Department, it shall promptly submit such facts or correct information to the Department.

4.16 Records Retention: The permittee shall retain records of all monitoring information, copies of all reports required by the permit, and records of all data used to complete the notice of intent for a period of at least 5 years from the date of the sample, measurement, report or application.

4.17 Permit Actions: Under s. 283.35, Wis. Stats., the Department may withdraw a permittee from coverage under this general permit and issue an individual permit for the municipality if: (a) The municipality is a significant contributor of pollution; (b) The municipality is not in compliance with the terms and conditions of the general permit; (c) A change occurs in the availability of demonstrated technology or practices for the control or abatement of pollutants from the municipality; (d) Effluent limitations or standards are promulgated for a point source covered by the general permit after the issuance of that permit; or (e) A water quality management plan containing requirements applicable to the municipality is approved. In addition, as provided in s. 283.53, Wis. Stats., after notice and opportunity for a hearing this permit may be suspended, modified or revoked, in whole or in part, for cause.

4.18 Signatory Requirements: All applications, reports or information submitted to the Department shall be signed by a ranking elected official, or other person authorized by those responsible for the overall operation of the MS4 and storm water management program activities regulated by the permit. The representative shall certify that the information was gathered and prepared under his or her supervision and, based on report from the people directly under supervision that, to the best of his or her knowledge, the information is true, accurate, and complete.

4.19 Attainment of Water Quality Standards after Authorization: At any time after authorization, the Department may determine that the discharge of storm water from a permittee's MS4 may cause, have the reasonable potential to cause, or contribute to an excursion of any applicable water quality standard. If such determination is made, the Department may require the permittee to do one of the following:

4.19.1 Develop and implement an action plan to address the identified water quality concern to the satisfaction of the Department.

4.19.2 Submit valid and verifiable data and information that are representative of ambient conditions to demonstrate to the Department that the receiving water or groundwater is attaining the water quality standard.

4.19.3 Submit an application to the Department for an individual storm water discharge permit.

5. DEFINITIONS

Definitions for some of the terms found in this permit are as follows:

5.1 Controls Condition means a surface-water pollutant-loading analysis that includes pollutant reductions from storm water management practices.

5.2 Department means the Wisconsin Department of Natural Resources.

5.3 Erosion means the process by which the land's surface is worn away by the action of wind, water, ice or gravity.

5.4 Hazardous substance means any substance which may pose a substantial present or potential hazard to human health or the environment because of its quantity, concentration or physical, chemical or infectious characteristics.

5.5 Illicit Connection means any man-made conveyance connecting an illicit discharge to a MS4.

5.6 Illicit Discharge means any discharge to a MS4 that is not composed entirely of storm water except discharges authorized by a WPDES permit or other discharge not requiring a WPDES permit such as landscape irrigation, individual residential car washing, fire fighting and similar discharges.

5.7 Infiltration means the entry and movement of precipitation or runoff into or through soil.

5.8 Infiltration system means a device or practice such as a basin, trench, rain garden or swale designed specifically to encourage infiltration, but does not include natural infiltration in pervious surfaces such as lawns, redirecting of rooftop downspouts onto lawns or minimal infiltration from practices, such as swales or road side channels designed for conveyance and pollutant removal only.

5.9 Jurisdiction means the area where the permittee has authority to enforce its ordinance(s) or otherwise has authority to exercise control over a particular activity of concern.

5.10 Land Disturbing Construction Activity means any man-made alteration of the land surface resulting in a change in the topography or existing vegetative or non-vegetative soil cover that may result in storm water runoff and lead to increased soil erosion and movement of sediment into waters of the state. Land disturbing construction activity includes, but is not limited to, clearing and grubbing, demolition, excavating, pit trench dewatering, filling and grading activities.

5.11 Maximum Extent Practicable or MEP means a level of implementing management practices in order to achieve a performance standard or other goal which takes into account the best available technology, cost effectiveness and other competing issues such as human safety and welfare, endangered and threatened resources, historic properties and geographic features.

5.12 Major Outfall means a municipal separate storm sewer outfall that meets one of the following criteria:

5.12.1 A single pipe with an inside diameter of 36 inches or more or equivalent conveyance (cross sectional area of 1,018 square inches) which is associated with a drainage area of more than 50 acres.

5.12.2 A single pipe with an inside diameter of 12 inches or more or equivalent conveyance (cross sectional area of 113 square inches) which receives storm water runoff from land zoned for industrial activity with 2 or more acres of industrial activity, but not land zoned for industrial activity that does not have any industrial activity present.

5.13 Municipality means any city, town, village, county, county utility district, town sanitary district, town utility district, school district or metropolitan sewage district or any other public entity created pursuant to law and having authority to collect, treat or dispose of sewage, industrial wastes, storm water or other wastes.

5.14 Municipal Separate Storm Sewer System or MS4 means 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 of the following criteria:

5.14.1 Owned or operated by a municipality.

5.14.2 Designed or used for collecting or conveying storm water.

5.14.3 Which is not a combined sewer conveying both sanitary and storm water.

5.15 No Controls Condition means a surface water pollutant-loading analysis that does not include pollutant reductions from existing storm water management practices including, but not limited to, infiltration systems.

5.16 Outfall means the point at which storm water is discharged to waters of the state or leaves one municipality and enters another.

5.17 Permittee means the owner or operator of a MS4 authorized to discharge storm water into waters of the state.

5.18 Permitted Area refers to the areas of land under the jurisdiction of the permittee that drains into a MS4, which is regulated under a permit issued pursuant to subch. I of NR 216, Wis. Adm. Code.

5.19 Redevelopment means areas where development is replacing older development.

5.20 Riparian Landowners are the owners of lands bordering lakes and rivers.

5.21 Sediment means settleable solid material that is transported by runoff, suspended within runoff or deposited by runoff away from its original location.

5.22 Start Date is the initial date of permit coverage, which is specified in the Department letter authorizing coverage under this permit.

5.23 Storm Water Management Practice means structural or non-structural measures, practices, techniques or devices employed to avoid or minimize soil, sediment or pollutants carried in runoff to waters of the state.

5.24 Storm Water Pollution Prevention Planning refers to the development of a site-specific

plan that describes the measures and controls that will be used to prevent and/or minimize pollution of storm water.

5.25 Structural Storm Water Management Facilities are engineered and constructed systems that are designed to provide storm water quality control such as wet detention ponds, constructed wetlands, infiltration basins and grassed swales.

5.26 Urbanized Area means a place and the adjacent densely settled surrounding territory that together have a minimum population of 50,000 people, as determined by the U.S. bureau of the census based on the latest decennial federal census.

5.27 Waters of the State include surface waters, groundwater and wetlands.

5.28 WPDES Permit means a Wisconsin Pollutant Discharge Elimination System permit issued pursuant to ch. 283, Wis. Stats.

CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: May 14, 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 and subsequent errata dated 8/15/05 and April, 2009***.

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.

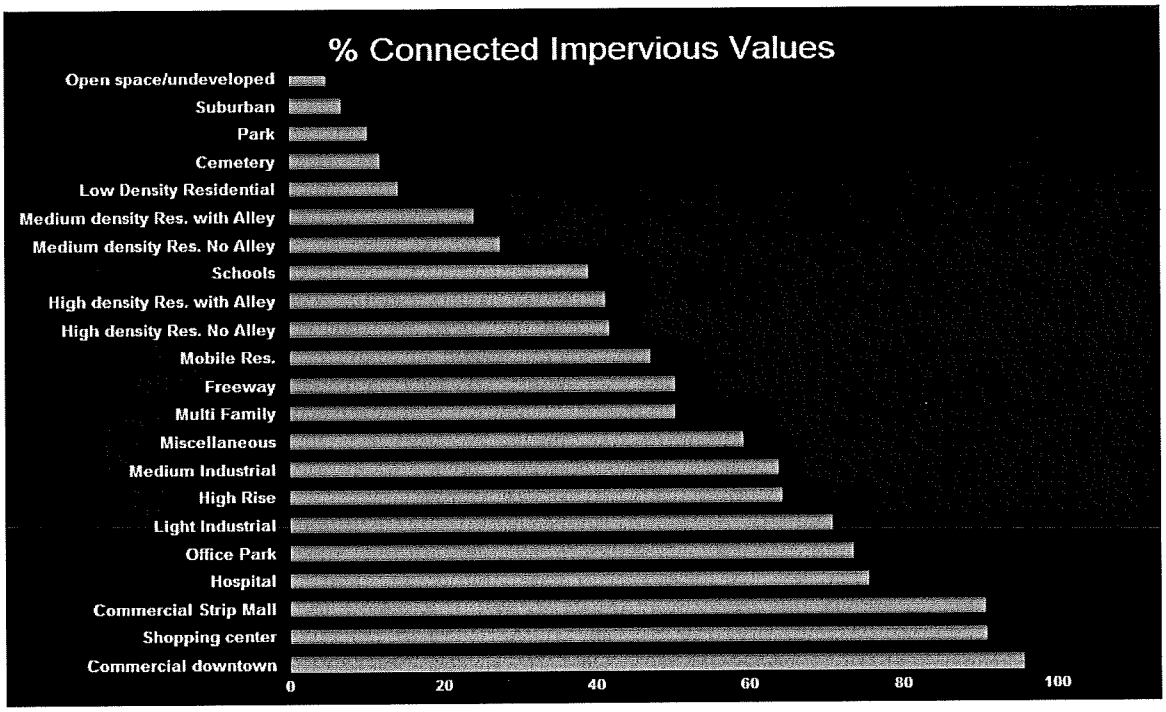
There is no standard land use file specific to a highway right-of-way. For modeling a state or county highway MS4, the "no controls" condition should be based on the actual land use conditions. The adjacent land that drains into the highway MS4 generally could be based on the appropriate standard land use file. The highway right-of-way area should be included using the land use drop down menu and selecting highway to include the actual paved lane & shoulder area and pervious area within the highway right-of-way modeled section.

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 other impervious surfaces is based on the length of the impervious surface contributing flow and whether the impervious surface and the pervious area receiving the flow are graded for sheet flow. If runoff from the impervious surface travels across a pervious area with a flow path equal to or greater than the length of the impervious flow path, it can be considered disconnected, provided all of the following are met:

- the pervious area is in good condition,
- the pervious surface flow path is at least 20 feet in length,
- the entire pervious area flow path does not exceed 8% slope, and
- the impervious surface flow path is no greater than 75 feet.

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.

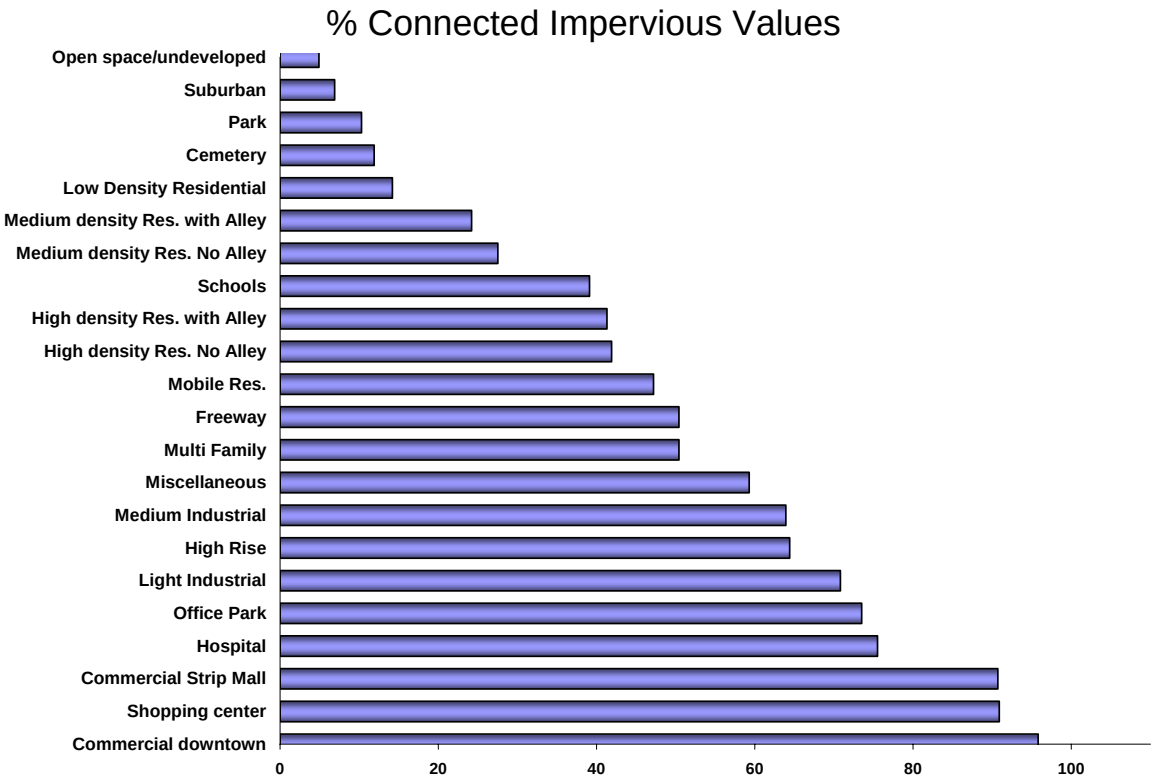
Approved By:

Gordon Stevenson, Chief
Runoff Management Section

Errata for Guidance on Developed Urban Areas and the 20% and 40% TSS Reductions (Sections NR 151.13(2) and NR 216.07(6), Wis. Adm. Code)

Clarification under Model Inputs: "No control"

The standard land use files in SLAMM assume a level of impervious surface disconnection. The "no controls" condition for each land use is based on this assumed percent of disconnected imperviousness. (The values from the SLAMM standard land use files are presented in the chart below as percent connected imperviousness). At a minimum, all land uses as modeled must be equal to the connected imperviousness values in the standard land use files. 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.



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 other impervious surfaces is based on the length of the impervious surface contributing flow and whether the impervious surface and the pervious area receiving the flow are graded for sheet flow. If runoff from the impervious surface travels across a pervious area with a flow path equal to or greater than the length of the impervious flow path, it can be considered disconnected, provided all of the following are met:

- the pervious area is in good condition,
- the pervious surface flow path is at least 20 feet in length,
- the entire pervious area flow path does not exceed 8% slope, and
- the impervious surface flow path is no greater than 75 feet.

Appendix D
Base Pollutant Loads by Subbasin

Basin Name	Area (ac)	Base TSS Load (tons/yr)
BJC-1.1	72.6	7.1
BJC-1.2	37.6	6.8
BJC-10.1	16.6	4.2
BJC-11.1	9.2	1.4
BJC-12.1	49.3	7.0
BJC-13.1	63.1	8.2
BJC-2.1	0.3	0.0
BJC-3.1	1.4	0.1
BJC-4.1	14.6	1.6
BJC-5.1	22.3	5.2
BJC-6.1	10.5	2.4
BJC-7.1	73.2	17.2
BJC-8.1	12.3	3.0
BJC-9.1	13.4	3.0
DOT-1.0	28.6	5.8
MF-1.1	150.3	15.0
MF-2.1	87.6	9.9
WR-1.1	109.5	14.4
WR-10.1	131.5	13.5
WR-11.1	50.9	2.6
WR-12.1	11.4	1.1
WR-13.1	6.5	0.5
WR-14.1	13.2	1.8
WR-15.1	31.6	3.1
WR-16.1	2.4	0.4
WR-17.1	6.1	0.8
WR-18.1	6.6	0.8
WR-19.1	5.5	0.6
WR-2.1	2.0	0.2
WR-20.1	4.1	0.6
WR-3.1	6.1	0.7
WR-4.1	9.8	1.8
WR-5.1	10.4	1.7
WR-6.1	19.9	2.7
WR-7.1	6.9	0.9
WR-8.1	46.8	5.4
WR-9.1	67.7	7.3
TOTAL	**1211.7**	**158.7**

City of Mosinee Infiltration Testing: Summary

Project Number: 60130694

			Static Rate		Dynamic Rate
Location	**Test #**	**Soil**	**Inf. Rate* (in/hr)**	**Geometric Mean (in/hr)**	**Geometric Mean (in/hr)**
Mosinee	1	Silt	3.15	9.30	**4.65**
Mosinee	2	Silt	11.85		
Mosinee	3	Clay	11.49		
Mosinee	4	Sand	6.40		
Mosinee	5	Sand	14.99		
Mosinee	6	Sand	15.77		

*Value from best fit curve at 2 hours.

		Static Rate		Dynamic Rate
Test #	**Soil**	**Inf. Rate* (in/hr)**	**Geometric Mean (in/hr)**	**Geometric Mean (in/hr)**
1	Silt	3.15	6.11	3.05
2	Silt	11.85		
3	Clay	11.49	11.49	5.75
4	Sand	6.40	11.48	5.74
5	Sand	14.99		
6	Sand	15.77		

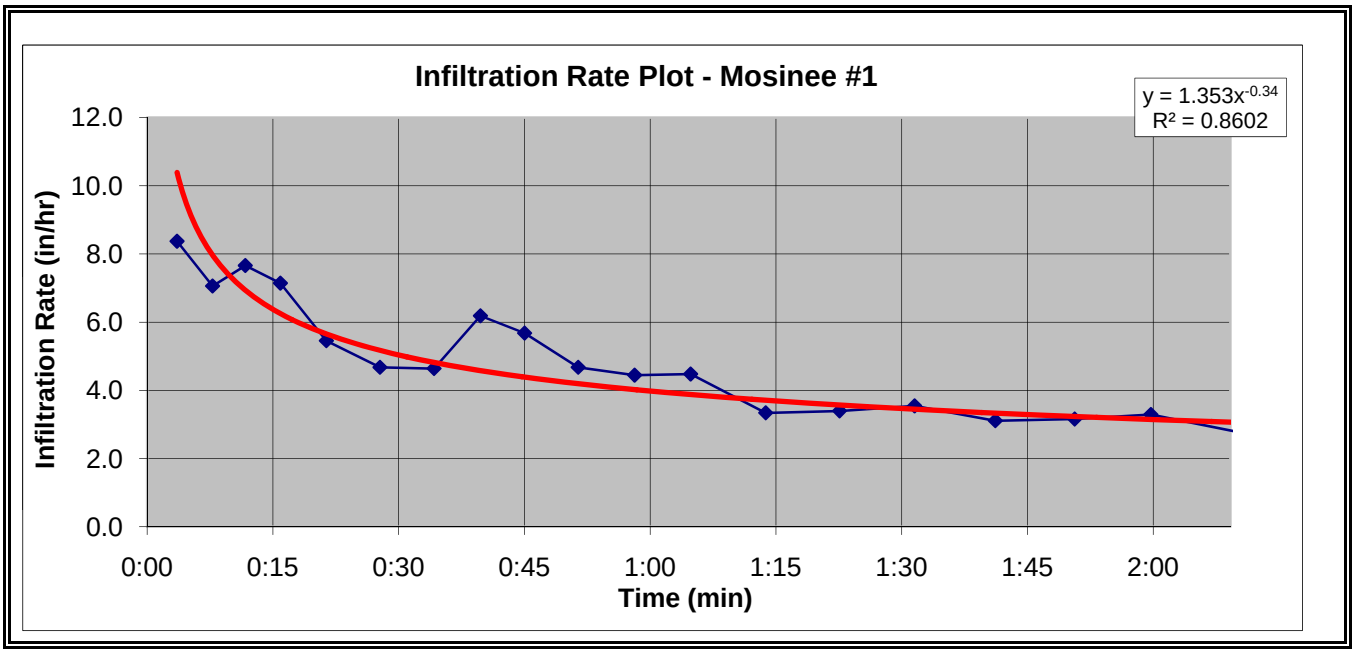
Double-Ring Infiltration Rate Test Field Sheet

Site:	Mosinee Site #1
Date:	8/24/2010
Time:	1:00pm
Conditions:	Overcast , 77 degrees F
Field Staff:	Erik Nielsen
Amount / Date of Last Rain:	0.16" on August 20, 2010
Equipment Used:	12" / 24" PVC Rings
Amount of Water Used:	5 gal.

Water Level	Time	Change in Time	Water Level Change (in)	Time Interval Midpoint (mm:ss)	Cumulative Time to Midpoint (hh:mm:ss)	Infiltration Rate (in/hr)
6.00	0:00:00					
5.50	0:03:35	03:35	0.50	01:47	0:01:47	8.37
5.00	0:07:50	04:15	0.50	02:07	0:05:42	7.06
4.50	0:11:45	03:55	0.50	01:58	0:09:48	7.66
4.00	0:15:57	04:12	0.50	02:06	0:13:51	7.14
3.50	0:21:27	05:30	0.50	02:45	0:18:42	5.45
3.00	0:27:52	06:25	0.50	03:13	0:24:39	4.68
2.50	0:34:20	06:28	0.50	03:14	0:31:06	4.64
6.00	0:35:02	35:02		17:31	0:17:31	
5.50	0:39:53	04:51	0.50	02:25	0:37:27	6.19
5.00	0:45:10	05:17	0.50	02:39	0:42:31	5.68
4.50	0:51:35	06:25	0.50	03:13	0:48:23	4.68
4.00	0:58:20	06:45	0.50	03:22	0:54:58	4.44
3.50	1:05:02	06:42	0.50	03:21	1:01:41	4.48
3.00	1:14:01	08:59	0.50	04:30	1:09:31	3.34
2.50	1:22:51	08:50	0.50	04:25	1:18:26	3.40
6.00	1:23:22	23:22		41:41	0:41:41	
5.50	1:31:50	08:28	0.50	04:14	1:27:36	3.54
5.00	1:41:29	09:39	0.50	04:50	1:36:40	3.11
4.50	1:50:59	09:30	0.50	04:45	1:46:14	3.16
4.00	2:00:06	09:07	0.50	04:33	1:55:32	3.29
3.50	2:10:59	10:53	0.50	05:27	2:05:32	2.76
3.00	2:23:05	12:06	0.50	06:03	2:17:02	2.48
2.50	2:35:26	12:21	0.50	06:11	2:29:15	2.43

shaded cells in table are formulas

Best Fit Rate @ 2 hours = 3.15


Infiltration Rate Plot - Mosinee #1
y = 1.353x-0.34
R² = 0.8602
Infiltration Rate (in/hr)
12.0
10.0
8.0
6.0
4.0
2.0
0.0
0:00
0:15
0:30
0:45
1:00
1:15
1:30
1:45
2:00
Time (min)

Double-Ring Infiltration Rate Test Field Sheet

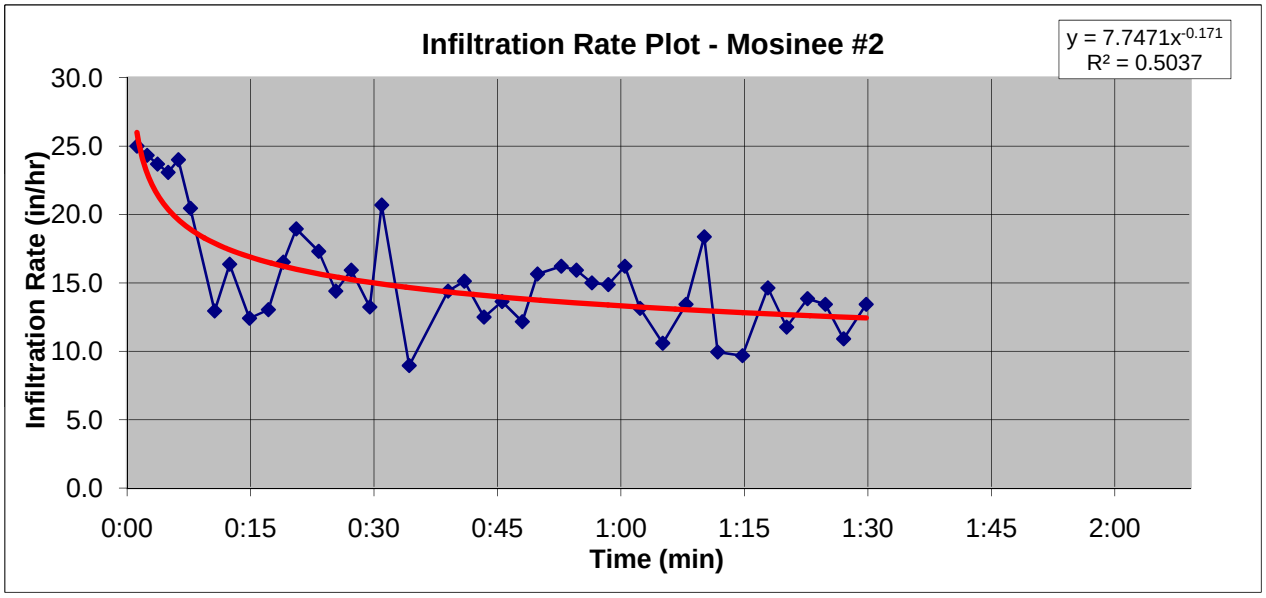
Site:	Mosinee Site #2
Date:	8/20/2010
Time:	7:45am
Conditions:	Overcast , 77 degrees F
Field Staff:	EN & WR
Amount / Date of Last Rain:	0.01" on August 14, 2010
Equipment Used:	12" / 24" PVC Rings
Amount of Water Used:	13 gal.

Water Level	Time	Change in Time	Water Level Change (in)	Time Interval Midpoint (mm:ss)	Cumulative Time to Midpoint (hh:mm:ss)	Infiltration Rate (in/hr)
5.50	0:00:00					
5.00	0:01:12	01:12	0.50	00:36	0:00:36	25.00
4.50	0:02:26	01:14	0.50	00:37	0:01:49	24.32
4.00	0:03:42	01:16	0.50	00:38	0:03:04	23.68
3.50	0:05:00	01:18	0.50	00:39	0:04:21	23.08
3.00	0:06:15	01:15	0.50	00:38	0:05:37	24.00
2.50	0:07:43	01:28	0.50	00:44	0:06:59	20.45
5.50	0:08:21	08:21		04:11	0:04:11	
5.00	0:10:40	02:19	0.50	01:09	0:09:30	12.95
4.50	0:12:30	01:50	0.50	00:55	0:11:35	16.36
4.00	0:14:55	02:25	0.50	01:12	0:13:42	12.41
3.50	0:17:13	02:18	0.50	01:09	0:16:04	13.04
3.00	0:19:02	01:49	0.50	00:55	0:18:07	16.51
2.50	0:20:37	01:35	0.50	00:48	0:19:50	18.95
5.50	0:21:37	21:37		10:48	0:10:48	
5.00	0:23:21	01:44	0.50	00:52	0:22:29	17.31
4.50	0:25:26	02:05	0.50	01:02	0:24:24	14.40
4.00	0:27:19	01:53	0.50	00:57	0:26:22	15.93
3.50	0:29:35	02:16	0.50	01:08	0:28:27	13.24
3.00	0:31:02	01:27	0.50	00:44	0:30:18	20.69
2.50	0:34:23	03:21	0.50	01:40	0:32:43	8.96
5.50	0:37:02	37:02		18:31	0:18:31	
5.00	0:39:07	02:05	0.50	01:02	0:38:04	14.40
4.50	0:41:06	01:59	0.50	01:00	0:40:07	15.13
4.00	0:43:30	02:24	0.50	01:12	0:42:18	12.50
3.50	0:45:42	02:12	0.50	01:06	0:44:36	13.64
3.00	0:48:10	02:28	0.50	01:14	0:46:56	12.16
2.50	0:50:01	01:51	0.50	00:56	0:49:06	16.22
5.50	0:51:00	51:00		25:30	0:25:30	
5.00	0:52:55	01:55	0.50	00:57	0:51:58	15.65
4.50	0:54:46	01:51	0.50	00:56	0:53:51	16.22
4.00	0:56:39	01:53	0.50	00:56	0:55:43	15.93
3.50	0:58:39	02:00	0.50	01:00	0:57:39	15.00
3.00	1:00:40	02:01	0.50	01:01	0:59:40	14.88
2.50	1:02:31	01:51	0.50	00:55	1:01:36	16.22
5.50	1:03:00	03:00		31:30	0:31:30	

5.00	1:05:17	02:17	0.50	01:08	1:04:09	13.14
4.50	1:08:07	02:50	0.50	01:25	1:06:42	10.59
4.00	1:10:21	02:14	0.50	01:07	1:09:14	13.43
3.50	1:11:59	01:38	0.50	00:49	1:11:10	18.37
3.00	1:15:00	03:01	0.50	01:31	1:13:30	9.94
2.50	1:18:06	03:06	0.50	01:33	1:16:33	9.68
5.50	1:18:20	18:20		39:10	0:39:10	
5.00	1:20:23	02:03	0.50	01:02	1:19:22	14.63
4.50	1:22:56	02:33	0.50	01:16	1:21:40	11.76
4.00	1:25:06	02:10	0.50	01:05	1:24:01	13.85
3.50	1:27:20	02:14	0.50	01:07	1:26:13	13.43
3.00	1:30:05	02:45	0.50	01:23	1:28:43	10.91
2.50	1:32:19	02:14	0.50	01:07	1:31:12	13.43

shaded cells in table are formulas

Best Fit Rate @ 2 hours = 11.85



Double-Ring Infiltration Rate Test Field Sheet

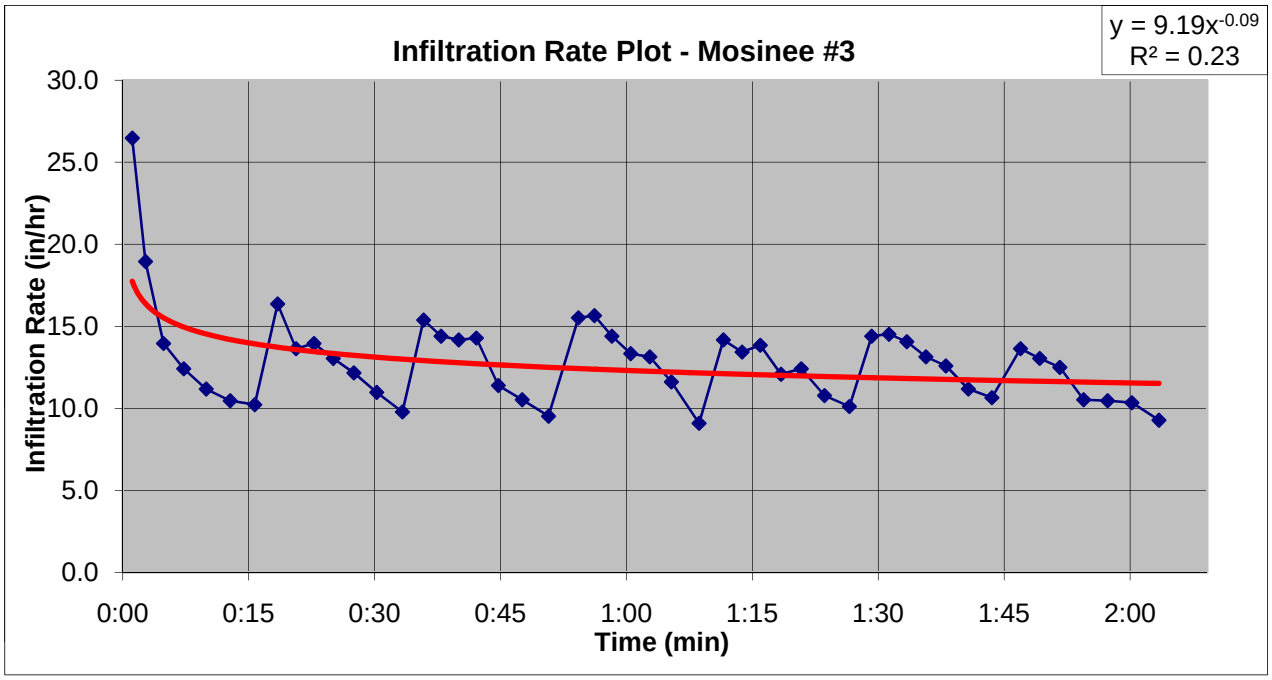
Site:	Mosinee Site #3
Date:	8/24/10
Time:	8:10 AM
Conditions:	Overcast 77 degrees
Field Staff:	EN
Amount / Date of Last Rain:	0.16" on August 20, 2010
Equipment Used:	12" / 24" PVC Rings
Amount of Water Used:	13 gal.

Water Level	Time	Change in Time	Water Level Change (in)	Time Interval Midpoint (mm:ss)	Cumulative Time to Midpoint (hh:mm:ss)	Infiltration Rate (in/hr)
6.00	0:00:00					
5.50	0:01:08	01:08	0.50	00:34	0:00:34	26.47
5.00	0:02:43	01:35	0.50	00:47	0:01:56	18.95
4.50	0:04:52	02:09	0.50	01:05	0:03:48	13.95
4.00	0:07:17	02:25	0.50	01:12	0:06:04	12.41
3.50	0:09:58	02:41	0.50	01:21	0:08:38	11.18
3.00	0:12:50	02:52	0.50	01:26	0:11:24	10.47
2.50	0:15:46	02:56	0.50	01:28	0:14:18	10.23
6.00	0:16:40	16:40		08:20	0:08:20	
5.50	0:18:30	01:50	0.50	00:55	0:17:35	16.36
5.00	0:20:42	02:12	0.50	01:06	0:19:36	13.64
4.50	0:22:51	02:09	0.50	01:05	0:21:46	13.95
4.00	0:25:09	02:18	0.50	01:09	0:24:00	13.04
3.50	0:27:37	02:28	0.50	01:14	0:26:23	12.16
3.00	0:30:21	02:44	0.50	01:22	0:28:59	10.98
2.50	0:33:25	03:04	0.50	01:32	0:31:53	9.78
6.00	0:34:00	34:00		17:00	0:17:00	
5.50	0:35:57	01:57	0.50	00:59	0:34:59	15.38
5.00	0:38:02	02:05	0.50	01:02	0:37:00	14.40
4.50	0:40:09	02:07	0.50	01:04	0:39:06	14.17
4.00	0:42:15	02:06	0.50	01:03	0:41:12	14.29
3.50	0:44:53	02:38	0.50	01:19	0:43:34	11.39
3.00	0:47:44	02:51	0.50	01:26	0:46:19	10.53
2.50	0:50:53	03:09	0.50	01:35	0:49:19	9.52
6.00	0:52:31	52:31		26:15	0:26:15	
5.50	0:54:27	01:56	0.50	00:58	0:53:29	15.52
5.00	0:56:22	01:55	0.50	00:57	0:55:25	15.65
4.50	0:58:27	02:05	0.50	01:03	0:57:24	14.40
4.00	1:00:42	02:15	0.50	01:08	0:59:35	13.33
3.50	1:02:59	02:17	0.50	01:08	1:01:51	13.14
3.00	1:05:34	02:35	0.50	01:18	1:04:17	11.61
2.50	1:08:52	03:18	0.50	01:39	1:07:13	9.09
6.00	1:09:40	09:40		34:50	0:34:50	
5.50	1:11:47	02:07	0.50	01:04	1:10:44	14.17
5.00	1:14:01	02:14	0.50	01:07	1:12:54	13.43
4.50	1:16:11	02:10	0.50	01:05	1:15:06	13.85

4.00	1:18:40	02:29	0.50	01:15	1:17:26	12.08
3.50	1:21:05	02:25	0.50	01:12	1:19:53	12.41
3.00	1:23:52	02:47	0.50	01:24	1:22:28	10.78
2.50	1:26:50	02:58	0.50	01:29	1:25:21	10.11
6.00	1:27:25	27:25		43:43	0:43:43	
5.50	1:29:30	02:05	0.50	01:03	1:28:28	14.40
5.00	1:31:34	02:04	0.50	01:02	1:30:32	14.52
4.50	1:33:42	02:08	0.50	01:04	1:32:38	14.06
4.00	1:35:59	02:17	0.50	01:09	1:34:51	13.14
3.50	1:38:22	02:23	0.50	01:11	1:37:11	12.59
3.00	1:41:03	02:41	0.50	01:20	1:39:42	11.18
2.50	1:43:52	02:49	0.50	01:25	1:42:28	10.65
6.00	1:45:05	45:05		52:33	0:52:33	
5.50	1:47:17	02:12	0.50	01:06	1:46:11	13.64
5.00	1:49:35	02:18	0.50	01:09	1:48:26	13.04
4.50	1:51:59	02:24	0.50	01:12	1:50:47	12.50
4.00	1:54:50	02:51	0.50	01:26	1:53:24	10.53
3.50	1:57:42	02:52	0.50	01:26	1:56:16	10.47
3.00	2:00:36	02:54	0.50	01:27	1:59:09	10.34
2.50	2:03:50	03:14	0.50	01:37	2:02:13	9.28

shaded cells in table are formulas

Best Fit Rate @ 2 hours = 11.49



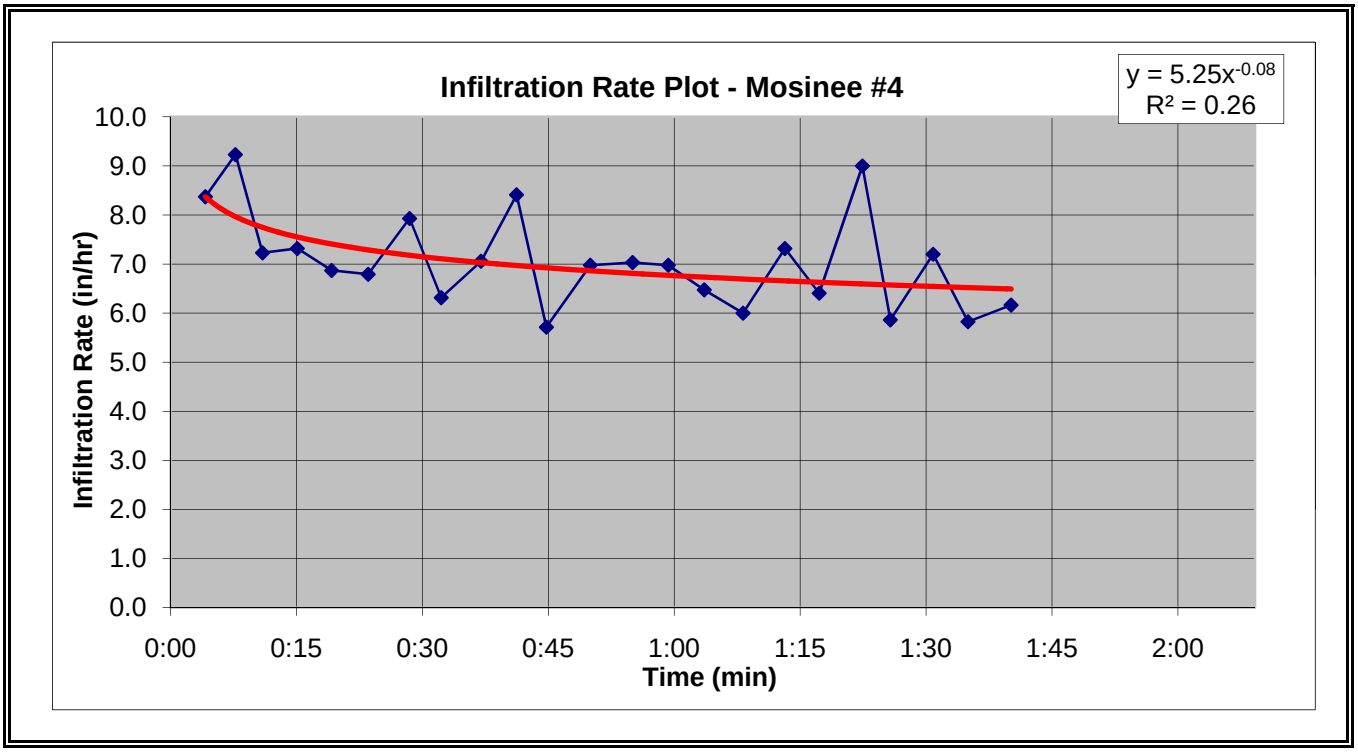
Double-Ring Infiltration Rate Test Field Sheet

Site:	Mosinee Site #4
Date:	8/20/2010
Time:	10:45am
Conditions:	Overcast , 77 degrees F
Field Staff:	EN & WR
Amount / Date of Last Rain:	0.01" on August 14, 2010
Equipment Used:	12" / 24" PVC Rings
Amount of Water Used:	6 gal.

Water Level	Time	Change in Time	Water Level Change (in)	Time Interval Midpoint (mm:ss)	Cumulative Time to Midpoint (hh:mm:ss)	Infiltration Rate (in/hr)
6.00	0:00:00					
5.50	0:04:10	04:10	0.50	02:05	0:02:05	7.20
5.00	0:07:45	03:35	0.50	01:48	0:05:58	8.37
4.50	0:11:00	03:15	0.50	01:37	0:09:22	9.23
4.00	0:15:09	04:09	0.50	02:05	0:13:05	7.23
3.50	0:19:15	04:06	0.50	02:03	0:17:12	7.32
3.00	0:23:37	04:22	0.50	02:11	0:21:26	6.87
6.00	0:24:09	24:09		12:04	0:12:04	
5.50	0:28:34	04:25	0.50	02:13	0:26:21	6.79
5.00	0:32:21	03:47	0.50	01:54	0:30:27	7.93
4.50	0:37:06	04:45	0.50	02:23	0:34:44	6.32
4.00	0:41:21	04:15	0.50	02:07	0:39:14	7.06
3.50	0:44:55	03:34	0.50	01:47	0:43:08	8.41
3.00	0:50:10	05:15	0.50	02:37	0:47:32	5.71
6.00	0:50:55	50:55		25:28	0:25:28	
5.50	0:55:13	04:18	0.50	02:09	0:53:04	6.98
5.00	0:59:29	04:16	0.50	02:08	0:57:21	7.03
4.50	1:03:47	04:18	0.50	02:09	1:01:38	6.98
4.00	1:08:25	04:38	0.50	02:19	1:06:06	6.47
3.50	1:13:25	05:00	0.50	02:30	1:10:55	6.00
3.00	1:17:31	04:06	0.50	02:03	1:15:28	7.32
6.00	1:18:00	18:00		39:00	0:39:00	
5.50	1:22:41	04:41	0.50	02:20	1:20:20	6.41
5.00	1:26:01	03:20	0.50	01:40	1:24:21	9.00
4.50	1:31:08	05:07	0.50	02:33	1:28:35	5.86
4.00	1:35:18	04:10	0.50	02:05	1:33:13	7.20
3.50	1:40:27	05:09	0.50	02:35	1:37:53	5.83
3.00	1:45:19	04:52	0.50	02:26	1:42:53	6.16

shaded cells in table are formulas

Best Fit Rate @ 2 hours = 6.40


Infiltration Rate Plot - Mosinee #4
y = 5.25x-0.08
R² = 0.26
Infiltration Rate (in/hr)
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0:00
0:15
0:30
0:45
1:00
1:15
1:30
1:45
2:00
Time (min)

Double-Ring Infiltration Rate Test Field Sheet

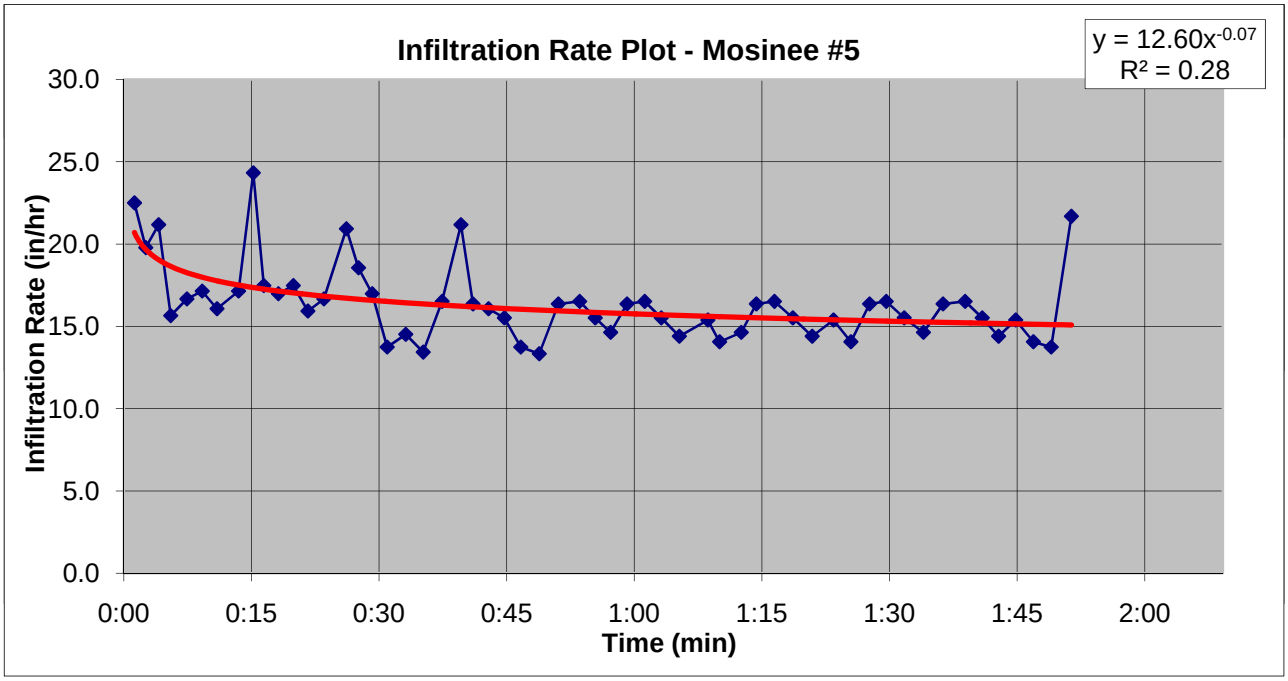
Site:	Mosinee Site #5
Date:	8/20/2010
Time:	12:45pm
Conditions:	Overcast , 77 degrees F
Field Staff:	EN & WR
Amount / Date of Last Rain:	0.57" on October 26, 2010
Equipment Used:	12" / 24" PVC Rings
Amount of Water Used:	13 gal.

Water Level	Time	Change in Time	Water Level Change (in)	Time Interval Midpoint (mm:ss)	Cumulative Time to Midpoint (hh:mm:ss)	Infiltration Rate (in/hr)
6.00	0:00:00					
5.50	0:01:15	01:15	0.50	00:38	0:00:38	24.00
5.00	0:02:35	01:20	0.50	00:40	0:01:55	22.50
4.50	0:04:06	01:31	0.50	00:45	0:03:21	19.78
4.00	0:05:31	01:25	0.50	00:43	0:04:48	21.18
3.50	0:07:26	01:55	0.50	00:58	0:06:29	15.65
3.00	0:09:14	01:48	0.50	00:54	0:08:20	16.67
2.50	0:10:59	01:45	0.50	00:53	0:10:06	17.14
6.00	0:11:39	11:39		05:49	0:05:49	
5.50	0:13:31	01:52	0.50	00:56	0:12:35	16.07
5.00	0:15:16	01:45	0.50	00:53	0:14:24	17.14
4.50	0:16:30	01:14	0.50	00:37	0:15:53	24.32
4.00	0:18:13	01:43	0.50	00:51	0:17:21	17.48
3.50	0:19:59	01:46	0.50	00:53	0:19:06	16.98
3.00	0:21:42	01:43	0.50	00:51	0:20:50	17.48
2.50	0:23:35	01:53	0.50	00:57	0:22:38	15.93
6.00	0:24:26	24:26		12:13	0:12:13	
5.50	0:26:14	01:48	0.50	00:54	0:25:20	16.67
5.00	0:27:40	01:26	0.50	00:43	0:26:57	20.93
4.50	0:29:17	01:37	0.50	00:48	0:28:29	18.56
4.00	0:31:03	01:46	0.50	00:53	0:30:10	16.98
3.50	0:33:14	02:11	0.50	01:06	0:32:08	13.74
3.00	0:35:18	02:04	0.50	01:02	0:34:16	14.52
2.50	0:37:32	02:14	0.50	01:07	0:36:25	13.43
6.00	0:37:56	37:56		18:58	0:18:58	
5.50	0:39:45	01:49	0.50	00:55	0:38:50	16.51
5.00	0:41:10	01:25	0.50	00:43	0:40:28	21.18
4.50	0:43:00	01:50	0.50	00:55	0:42:05	16.36
4.00	0:44:52	01:52	0.50	00:56	0:43:56	16.07
3.50	0:46:48	01:56	0.50	00:58	0:45:50	15.52
3.00	0:48:59	02:11	0.50	01:06	0:47:53	13.74
2.50	0:51:14	02:15	0.50	01:07	0:50:07	13.33
6.00	0:51:42	51:42		25:51	0:25:51	
5.50	0:53:45	02:03	0.50	01:02	0:52:44	14.63
5.00	0:55:35	01:50	0.50	00:55	0:54:40	16.36
4.50	0:57:24	01:49	0.50	00:55	0:56:30	16.51

4.00	0:59:20	01:56	0.50	00:58	0:58:22	15.52
3.50	1:01:25	02:05	0.50	01:02	1:00:23	14.40
3.00	1:03:22	01:57	0.50	00:58	1:02:23	15.38
2.50	1:05:30	02:08	0.50	01:04	1:04:26	14.06
6.00	1:06:41	06:41		33:21	0:33:21	
5.50	1:08:52	02:11	0.50	01:05	1:07:47	13.74
5.00	1:10:15	01:23	0.50	00:42	1:09:34	21.69
4.50	1:12:48	02:33	0.50	01:16	1:11:32	11.76
4.00	1:14:35	01:47	0.50	00:54	1:13:41	16.82
3.50	1:16:43	02:08	0.50	01:04	1:15:39	14.06
3.00	1:18:53	02:10	0.50	01:05	1:17:48	13.85
2.50	1:21:10	02:17	0.50	01:09	1:20:02	13.14
6.00	1:21:38	21:38		40:49	0:40:49	
5.50	1:23:41	02:03	0.50	01:02	1:22:39	14.63
5.00	1:25:44	02:03	0.50	01:02	1:24:43	14.63
4.50	1:27:56	02:12	0.50	01:06	1:26:50	13.64
4.00	1:29:54	01:58	0.50	00:59	1:28:55	15.25
3.50	1:32:01	02:07	0.50	01:04	1:30:57	14.17
3.00	1:34:17	02:16	0.50	01:08	1:33:09	13.24
2.50	1:36:36	02:19	0.50	01:09	1:35:27	12.95
6.00	1:37:03	37:03		48:32	0:48:32	
5.50	1:39:12	02:09	0.50	01:04	1:38:07	13.95
5.00	1:41:13	02:01	0.50	01:01	1:40:13	14.88
4.50	1:43:09	01:56	0.50	00:58	1:42:11	15.52
4.00	1:45:10	02:01	0.50	01:01	1:44:09	14.88
3.50	1:47:15	02:05	0.50	01:02	1:46:12	14.40
3.00	1:49:21	02:06	0.50	01:03	1:48:18	14.29
2.50	1:51:44	02:23	0.50	01:11	1:50:32	12.59

shaded cells in table are formulas

Best Fit Rate @ 2 hours = 14.99



Double-Ring Infiltration Rate Test Field Sheet

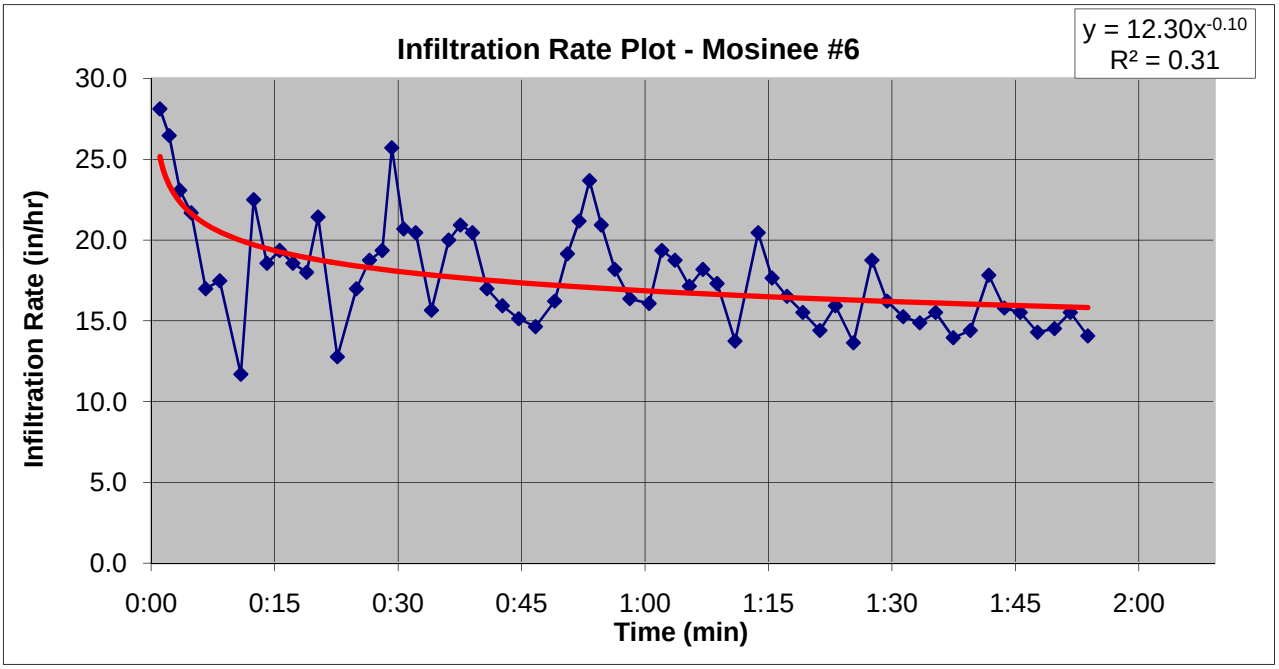
Site:	Mosinee Site #6
Date:	8/24/10
Time:	8:10 AM
Conditions:	Overcast 77 degrees
Field Staff:	EN
Amount / Date of Last Rain:	0.16" on August 20, 2010
Equipment Used:	12" / 24" PVC Rings
Amount of Water Used:	18 gal.

Water Level	Time	Change in Time	Water Level Change (in)	Time Interval Midpoint (mm:ss)	Cumulative Time to Midpoint (hh:mm:ss)	Infiltration Rate (in/hr)
6.00	0:00:00					
5.50	0:01:04	01:04	0.50	00:32	0:00:32	28.13
5.00	0:02:12	01:08	0.50	00:34	0:01:38	26.47
4.50	0:03:30	01:18	0.50	00:39	0:02:51	23.08
4.00	0:04:53	01:23	0.50	00:42	0:04:12	21.69
3.50	0:06:39	01:46	0.50	00:53	0:05:46	16.98
3.00	0:08:22	01:43	0.50	00:52	0:07:30	17.48
2.50	0:10:56	02:34	0.50	01:17	0:09:39	11.69
6.00	0:11:10	11:10		05:35	0:05:35	
5.50	0:12:30	01:20	0.50	00:40	0:11:50	22.50
5.00	0:14:07	01:37	0.50	00:48	0:13:18	18.56
4.50	0:15:40	01:33	0.50	00:47	0:14:54	19.35
4.00	0:17:17	01:37	0.50	00:48	0:16:28	18.56
3.50	0:18:57	01:40	0.50	00:50	0:18:07	18.00
3.00	0:20:21	01:24	0.50	00:42	0:19:39	21.43
2.50	0:22:42	02:21	0.50	01:10	0:21:31	12.77
6.00	0:23:15	23:15		11:37	0:11:37	
5.50	0:25:01	01:46	0.50	00:53	0:24:08	16.98
5.00	0:26:37	01:36	0.50	00:48	0:25:49	18.75
4.50	0:28:10	01:33	0.50	00:46	0:27:23	19.35
4.00	0:29:20	01:10	0.50	00:35	0:28:45	25.71
3.50	0:30:47	01:27	0.50	00:44	0:30:03	20.69
3.00	0:32:15	01:28	0.50	00:44	0:31:31	20.45
2.50	0:34:10	01:55	0.50	00:57	0:33:12	15.65
6.00	0:34:46	34:46		17:23	0:17:23	
5.50	0:36:16	01:30	0.50	00:45	0:35:31	20.00
5.00	0:37:42	01:26	0.50	00:43	0:36:59	20.93
4.50	0:39:10	01:28	0.50	00:44	0:38:26	20.45
4.00	0:40:56	01:46	0.50	00:53	0:40:03	16.98
3.50	0:42:49	01:53	0.50	00:57	0:41:52	15.93
3.00	0:44:48	01:59	0.50	00:59	0:43:48	15.13
2.50	0:46:51	02:03	0.50	01:02	0:45:50	14.63
6.00	0:47:20	47:20		23:40	0:23:40	
5.50	0:49:11	01:51	0.50	00:55	0:48:16	16.22
5.00	0:50:45	01:34	0.50	00:47	0:49:58	19.15
4.50	0:52:10	01:25	0.50	00:42	0:51:28	21.18

4.00	0:53:26	01:16	0.50	00:38	0:52:48	23.68
3.50	0:54:52	01:26	0.50	00:43	0:54:09	20.93
3.00	0:56:31	01:39	0.50	00:49	0:55:42	18.18
2.50	0:58:21	01:50	0.50	00:55	0:57:26	16.36
6.00	0:58:50	58:50		29:25	0:29:25	
5.50	1:00:42	01:52	0.50	00:56	0:59:46	16.07
5.00	1:02:15	01:33	0.50	00:47	1:01:29	19.35
4.50	1:03:51	01:36	0.50	00:48	1:03:03	18.75
4.00	1:05:36	01:45	0.50	00:52	1:04:43	17.14
3.50	1:07:15	01:39	0.50	00:50	1:06:25	18.18
3.00	1:08:59	01:44	0.50	00:52	1:08:07	17.31
2.50	1:11:10	02:11	0.50	01:06	1:10:05	13.74
6.00	1:12:31	12:31		36:15	0:36:15	
5.50	1:13:59	01:28	0.50	00:44	1:13:15	20.45
5.00	1:15:41	01:42	0.50	00:51	1:14:50	17.65
4.50	1:17:30	01:49	0.50	00:55	1:16:36	16.51
4.00	1:19:26	01:56	0.50	00:58	1:18:28	15.52
3.50	1:21:31	02:05	0.50	01:03	1:20:29	14.40
3.00	1:23:24	01:53	0.50	00:56	1:22:28	15.93
2.50	1:25:36	02:12	0.50	01:06	1:24:30	13.64
6.00	1:26:15	26:15		43:07	0:43:07	
5.50	1:27:51	01:36	0.50	00:48	1:27:03	18.75
5.00	1:29:42	01:51	0.50	00:56	1:28:46	16.22
4.50	1:31:40	01:58	0.50	00:59	1:30:41	15.25
4.00	1:33:41	02:01	0.50	01:01	1:32:40	14.88
3.50	1:35:37	01:56	0.50	00:58	1:34:39	15.52
3.00	1:37:46	02:09	0.50	01:04	1:36:41	13.95
2.50	1:39:51	02:05	0.50	01:02	1:38:48	14.40
6.00	1:40:25	00:34		00:17	1:40:08	
5.50	1:42:06	01:41	0.50	00:50	1:41:15	17.82
5.00	1:44:00	01:54	0.50	00:57	1:43:03	15.79
4.50	1:45:56	01:56	0.50	00:58	1:44:58	15.52
4.00	1:48:02	02:06	0.50	01:03	1:46:59	14.29
3.50	1:50:06	02:04	0.50	01:02	1:49:04	14.52
3.00	1:52:02	01:56	0.50	00:58	1:51:04	15.52
2.50	1:54:10	02:08	0.50	01:04	1:53:06	14.06

shaded cells in table are formulas

Best Fit Rate @ 2 hours = 15.77


Infiltration Rate Plot - Mosinee #6
y = 12.30x-0.10
R² = 0.31
Infiltration Rate (in/hr)
30.0
25.0
20.0
15.0
10.0
5.0
0.0
0:00
0:15
0:30
0:45
1:00
1:15
1:30
1:45
2:00
Time (min)

Appendix F
Existing Pollutant Loads by Subbasin

Basin Name	Area (ac)	Existing TSS Load (tons/yr)	Percent TSS Control
BJC-1.1	72.6	1.8	73.9%
BJC-1.2	37.6	1.3	81.4%
BJC-10.1	16.6	4.2	1.0%
BJC-11.1	9.2	1.3	5.4%
BJC-12.1	49.3	4.1	40.4%
BJC-13.1	63.1	2.3	71.6%
BJC-2.1	0.3	0.0	99.3%
BJC-3.1	1.4	0.0	99.5%
BJC-4.1	14.6	1.5	1.1%
BJC-5.1	22.3	1.0	80.0%
BJC-6.1	10.5	0.5	80.0%
BJC-7.1	73.2	15.0	12.9%
BJC-8.1	12.3	2.6	13.9%
BJC-9.1	13.4	2.6	14.1%
DOT-1.0	28.6	5.6	2.7%
MF-1.1	150.3	12.5	16.4%
MF-2.1	87.6	8.2	16.5%
WR-1.1	109.5	12.2	15.5%
WR-10.1	131.5	11.4	15.8%
WR-11.1	50.9	0.2	91.6%
WR-12.1	11.4	0.2	85.0%
WR-13.1	6.5	0.4	8.3%
WR-14.1	13.2	1.6	11.4%
WR-15.1	31.6	1.7	44.6%
WR-16.1	2.4	0.4	11.5%
WR-17.1	6.1	0.8	1.9%
WR-18.1	6.6	0.8	1.1%
WR-19.1	5.5	0.6	1.0%
WR-2.1	2.0	0.2	15.5%
WR-20.1	4.1	0.6	2.6%
WR-3.1	6.1	0.6	15.0%
WR-4.1	9.8	1.6	14.0%
WR-5.1	10.4	1.5	13.9%
WR-6.1	19.9	2.3	14.5%
WR-7.1	6.9	0.7	15.4%
WR-8.1	46.8	4.6	15.5%
WR-9.1	67.7	6.1	16.0%
TOTAL	**1211.7**	**113.1**	**28.7%**

City of Mosinee Stormwater Management Project
Municipal Services Operations & Maintenance Checklist

GENERAL INFORMATION	
AECOM Staff:	**City Contacts (Name, Title, Phone #):**
Kurt Schoen	
	Kevin Breit, Director of Public Works, 693-3840
Date: 12/29/10	
Site Location: Mosinee Municipal Garage	**Responsible City Department**: Mosinee Department of Public Works

SITE ACTIVITIES

General Description: General storage of Public Works equipment and supplies.

Vehicle Parking/Storage:

Vehicle Type	#	In/Out-Door?
1.Plow Trucks	5	In
2.Pickup trucks	3	In
3.Front-end loaders	3	In
4.		
5.		

Vehicle Maintenance On Site? (type, disposal of materials)

Indoors, waste oil retained in storage tank until properly disposed. Waste oil tank surrounded by chain-link fence and concrete spill containment..

Outdoor Storage (Bulk)	Quantity	Location	Comments
Sand	**Pile.**	**East side of site.**	
Soil			
Salt	**Pile**	**Shed**	**Completely enclosed.**
Cold Asphalt			
Oil			
Fuel			

Other?			
Outdoor Storage (Scrap)			
Machinery			
Drums	**~6**	**Adjacent garage building.**	**Should be covered.**
Street Signs/posts			
Cast Iron			
Other?	**2**	**Blades, behind garage**	**For trucks.**
Tires	**~15**	**Behind garage.**	

OTHER POTENTIAL CONCERNS Municipal Garage(s)/Yards

1. Historical Spills/Leaks	**Quantity**	**Location**	**Comments**
N/A			
2. Construction Erosion	**Quantity**	**Location**	**Comments**
N/A			
3. Bare Soil/Gullies	**Quantity**	**Location**	**Comments**
N/A			**Monitor site on side nearest flowage.**
4. Other	**Quantity**	**Location**	**Comments**

Other Notes: **(runoff destination; type of conveyance system, receiving waters; existing BMPs)**:

Site is near the Mosinee Flowage, conveyance is overland flow. City should continue to monitor condition of bulk sand piles to ensure it does not erode and leave the site. Current grass buffer around edges of facility should be protective of the flowage. Good housekeeping practices currently in place, should be continued. Staff should sweep up salt from front of salt shed following daily activities and keep salt shed door closed.

Ordinance No. 2009-03

AN ORDINANCE CREATING CHAPTER 43 OF THE CODE OF ORDINANCES, CITY OF MOSINEE, WISCONSIN TO ESTABLISH STORMWATER MANAGEMENT REGULATIONS AND STORMWATER ILLICIT DISCHARGE REQUIREMENTS

Whereas, the City of Mosinee owns and operates a Municipal Separate Storm Sewer System (MS4); and

Whereas, the State of Wisconsin Department of Natural Resources has issued a General Permit to the City to discharge storm water to the waters of the State; and

Whereas, the MS4 General Permit requires that the City develop, implement and enforce a comprehensive stormwater management program; and

Whereas, the MS4 General Permit also requires that the City develop, implement and enforce a program to detect and remove illicit connections and discharges to the City's storm sewer system; and

Whereas, it is in the public interest to develop requirements pertaining to the illicit discharge of stormwater, in order to comply with the State of Wisconsin Department of Natural Resource requirements.

NOW, THEREFORE, the Common Council of the City of Mosinee, Wisconsin does hereby ordain as follows:

1. That the Code of Ordinances for the City of Mosinee is hereby amended by creating a Chapter 43 which shall be entitled "Stormwater Management Regulations".

2. That Article I of Chapter 43 of the Code of Ordinances for the City of Mosinee is hereby created and shall be entitled "Stormwater Illicit Discharge Detection and Elimination".

3. That Division 1 of Article 1 – Stormwater Illicit Discharge Detection and Elimination, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee is hereby created and shall be entitled "Generally".

4. That Section 43-1 of Division 1 – Generally, Article 1 – Stormwater Illicit Discharge Detection and Elimination, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled" Purpose and Intent" is hereby created to read as follows:

   The purpose of this article is to provide for the health, safety, and general welfare of the Citizens of the City of Mosinee through the regulation of non-storm water discharges to the storm drainage system to the maximum extent practicable as required by federal and state law. This article establishes methods for controlling the introduction of pollutants into the municipal separate storm sewer system (MS4) in order to comply with requirements of the Wisconsin Pollutant Discharge Elimination System (WPDES) permit. The objectives of this article are:

   (1) To regulate the contribution of pollutants to the Municipal Separate Storm Sewer system (MS4) by storm water discharges from any user.
   (2) To prohibit illicit connections and discharges to the Municipal Separate Storm Sewer System.
   (3) To establish legal authority to carry out all inspection, surveillance and monitoring procedures necessary to ensure compliance with these requirements.

5. That Section 43-2 of Division 1 – Generally, Article 1 – Stormwater Illicit Discharge Detection and Elimination, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled" Definitions" is hereby created to read as follows:

   For the purposes of this article, the following shall mean:

   Authorized Enforcement Agency means the City of Mosinee Wisconsin and any of its employees that are designated to enforce this article.

   Best Management Practices (BMPs) means schedules of activities, prohibitions of practices, general good house keeping practices, pollution prevention and educational practices, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants directly or indirectly to stormwater, receiving waters, or stormwater conveyance systems. BMPs also include treatment practices, operating procedures, and practices to control site runoff, spillage or leaks, sludge or water disposal, or drainage from raw materials storage.

   Clean Water Act means the Federal Water Pollution Control Act (33 U.S.C. § 1251 et seq.), and any subsequent amendments thereto.

   Construction Activity means activities subject to WPDES Construction or local building permits. Permits will be required for construction projects resulting in land disturbance of 1 acre or more. Such activities include but are not limited to clearing and grubbing, grading, excavating, and demolition.

Hazardous Materials means any material, including any substance, waste, or combination thereof, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may cause, or significantly contribute to, a substantial present or potential hazard to human health, safety, property, or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

Illegal Discharge means any direct or indirect non-storm water discharge to the storm drain system, except as exempted in Section 43-30 of this article.

Illicit Connections means an illicit connection is defined as either of the following: Any drain or conveyance, whether on the surface or subsurface, which allows an illegal discharge to enter the storm drain system including but not limited to any conveyances which allow any non-storm water discharge including sewage, process wastewater, and washwater to enter the storm drain system and any connections to the storm drain system from indoor drains and sinks, regardless of whether said drain or connection had been previously allowed, permitted, or approved by an Authorized Enforcement Agency; or any drain or conveyance connected from a commercial or industrial land use to the storm drain system which has not been documented in plans, maps, or equivalent records and approved by an authorized enforcement agency.

Industrial Activity means activities subject to WPDES Industrial permits.

Non-Storm Water Discharge means any discharge to the storm drain system that is not composed entirely of storm water.

Person means any individual, association, organization, partnership, firm, corporation or other entity recognized by law and acting as either the owner or as the owner's agent.

Pollutant means anything, which causes or contributes to pollution. Pollutants may include, but are not limited to: paints, varnishes, and solvents; oil and other automotive fluids; non-hazardous liquid and solid wastes and yard wastes; refuse, rubbish, garbage, litter, or other discarded or abandoned objects, ordinances, and accumulations, so that same may cause or contribute to pollution; floatables; pesticides, herbicides, and fertilizers; hazardous substances and wastes; sewage, fecal coliform and pathogens; dissolved and particulate metals; animal wastes; wastes and residues that result from constructing a building or structure; and noxious or offensive matter of any kind.

Premises mean any building, lot, parcel of land, or portion of land whether improved or unimproved including adjacent sidewalks and parking strips.

Storm Drainage System means publicly-owned facilities by which storm water is collected and/or conveyed, including but not limited to any roads with drainage systems, municipal streets, gutters, curbs, inlets, piped storm drains, pumping facilities, retention and detention basins, natural and human-made or altered drainage channels, reservoirs, and other drainage structures.

Stormwater means any surface flow, runoff, and drainage consisting entirely of water from any form of natural precipitation, and resulting from such precipitation.

Stormwater Pollution Prevention Plan means a document which describes the Best Management Practices and activities to be implemented by a person or business to identify sources of pollution or contamination at a site and the actions to eliminate or reduce pollutant discharges to Stormwater, Stormwater Conveyance Systems, and/or Receiving Waters to the Maximum Extent Practicable.

Wastewater means any water or other liquid, other than uncontaminated storm water, discharged from a facility.

Wisconsin Pollutant Discharge Elimination System (WPDES) Stormwater Discharge Permit means a permit issued by the Wisconsin Department of Natural Resources under ch. 283, Wis. Stats., and chs. NR151 & 216, Wis. Adm. Code that authorizes the discharge of pollutants to waters of the State.

6. That Section 43-3 of Division 1 – Generally, Article 1 – Stormwater Illicit Discharge Detection and Elimination, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Applicability" is hereby created to read as follows:

   This article shall apply to all water entering the storm drain system generated on any developed and undeveloped lands unless explicitly exempted by an Authorized Enforcement Agency or this article.

7. That Section 43-4 of Division 1 – Generally, Article 1 – Stormwater Illicit Discharge Detection and Elimination, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Responsibility for Administration" is hereby created to read as follows:

   The City Administrator, Public Works Director, or their designee shall administer, implement, and enforce the provisions of this article. Any powers granted or duties imposed upon the Authorized Enforcement Agency may be delegated in writing by the Common Council to persons or entities acting in the beneficial interest of or in the employment of the Agency.

8. That Section 43-5 of Division 1 – Generally, Article 1 – Stormwater Illicit Discharge Detection and Elimination, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Severability" is hereby created to read as follows:

   The provisions of this article are hereby declared to be severable. If any provision, clause, sentence, or paragraph of this article or the application thereof to any person, establishment, or circumstances shall be held invalid, such invalidity shall not affect the other provisions or application of this article.

9. That Section 43-6 of Division 1 – Generally, Article 1 – Stormwater Illicit Discharge Detection and Elimination, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Ultimate Responsibility" is hereby created to read as follows:

   The standards set forth herein and promulgated pursuant to this section are minimum standards; therefore this section does not intend nor imply that compliance by any person will ensure that there will be no contamination, pollution, nor unauthorized discharge of pollutants.

10. That Division 2 of Article 1 – Stormwater Illicit Discharge Detection and Elimination, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee is hereby created and shall be entitled "Discharge Prohibitions".

11. That Section 43-30 of Division 2 – Discharge Prohibitions, Article 1 – Stormwater Illicit Discharge Detection and Elimination, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Prohibition of Illegal Discharges" is hereby created to read as follows:

    (a) Prohibition of Illegal Discharges. No person shall discharge or cause to be discharged into the municipal storm drain system or waters of the state any materials, including but not limited to pollutants or waters containing any pollutants that cause or contribute to a violation of applicable water quality standards, other than storm water. The commencement, conduct or continuance of any illegal discharge to the storm drain system is prohibited except as follows:

    (1) The following discharges are exempt from discharge prohibitions established by this article: water line flushing or other potable water sources, landscape irrigation or lawn watering, diverted stream flows, rising ground water, ground water infiltration to storm drains, uncontaminated pumped ground water, foundation or footing drains (not including active groundwater dewatering systems), crawl space pumps, air conditioning condensation, springs, non-commercial washing of vehicles, natural riparian habitat or wet-land flows, swimming pools (if dechlorinated - typically less than one PPM chlorine), fire fighting activities, and any other water source not containing Pollutants.

(2) Discharges specified in writing by the Authorized Enforcement Agency as being necessary to protect public health and safety.

(3) Dye testing is an allowable discharge, but requires a verbal notification to the Authorized Enforcement Agency prior to the time of the test.

(4) The prohibition shall not apply to any non-storm water discharge permitted under a WPDES permit, waiver, or waste discharge order issued to the discharger and administered under the authority of the Federal Environmental Protection Agency or Wisconsin Department of Natural Resources, provided that the discharger is in full compliance with all requirements of the permit waiver, or order and other applicable laws and regulations, and provided that written approval has been granted for any discharge to the storm drain system.

(b) Prohibition of Illicit Connections.

(1) The construction, use, maintenance or continued existence of illicit connections to the storm drain system is prohibited.
(2) This prohibition expressly includes, without limitation, illicit connections made in the past, regardless of whether the connection was permissible under law or practices applicable or prevailing at the time of connection.
(3) A person is considered to be in violation of this ordinance if the person connects a line conveying sewage to the MS4, or allows such a connection to continue.

12. That Division 3 of Article 1 – Stormwater Illicit Discharge Detection and Elimination, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee is hereby created and shall be entitled "Illicit Discharge Regulations".

13. That Section 43-50 of Division 3 – Illicit Discharge Regulations, Article 1 – Stormwater Illicit Discharge Detection and Elimination, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Suspension of MS4 Access" is hereby created to read as follows:

(a) Suspension due to Illicit Discharges in Emergency Situations. The City of Mosinee may, without prior notice, suspend MS4 discharge access to a person when such suspension is necessary to stop an actual or threatened discharge, which presents or may present imminent and substantial danger to the environment, or to the health or welfare of persons, or to the MS4 or waters of the State. If the violator fails to comply with a suspension order issued in an emergency, the Authorized Enforcement Agency may take such steps as deemed necessary to prevent or minimize damage to the MS4 or waters of the State, or to minimize danger to persons.

(b) Suspension due to the Detection of Illicit Discharge. Any person discharging to the MS4 in violation of this article may have their MS4 access terminated if such termination would abate or reduce an illicit discharge. The Authorized Enforcement Agency will notify a violator of the proposed termination of its MS4 access. The violator may petition the Authorized Enforcement Agency for a reconsideration and hearing.

(c) A person commits an offense if the person reinstates MS4 access to premises terminated pursuant to this article, without the prior approval of the Authorized Enforcement Agency.

14. That Section 43-51 of Division 3 – Illicit Discharge Regulations, Article 1 – Stormwater Illicit Discharge Detection and Elimination, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Industrial or Construction Activity Discharges" is hereby created to read as follows:

    Any person subject to an industrial or construction activity WPDES stormwater discharge permit shall comply with all provisions of such permit. Proof of compliance with said permit may be required in a form acceptable to the City of Mosinee prior to the allowing of discharges to the MS4.

15. That Section 43-52 of Division 3 – Illicit Discharge Regulations, Article 1 – Stormwater Illicit Discharge Detection and Elimination, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Monitoring of Discharges" is hereby created to read as follows:

    (a) *Applicability.* This section applies to all facilities that have stormwater discharges associated with industrial activity, including construction activity.

    (b) *Access to Facilities.*

    (1) The Authorized Enforcement Agency shall be permitted to enter and inspect facilities subject to regulation under this article as often as may be necessary to determine compliance with this article. If a discharger has security measures in force, which require proper identification and clearance before entry into its premises, the discharger shall make the necessary arrangements to allow access to representatives of the Authorized Enforcement Agency.

    (2) Facility operators shall allow the Authorized Enforcement Agency ready access to all parts of the premises for the purposes of inspection, sampling, examination and copying of records that must be kept under the conditions of a WPDES permit to discharge stormwater, and the performance of any additional duties as defined by state and federal law.

    (3) The Authorized Enforcement Agency shall have the right to set up on any permitted facility such devices as are necessary in the opinion of the Authorized Enforcement Agency to conduct monitoring and/or sampling of the facility's stormwater discharge.

    (4) The Authorized Enforcement Agency has the right to require the discharger to install monitoring equipment as necessary. The facility's sampling and monitoring equipment shall be maintained at all times in a safe and proper operating condition by the discharger at its own expense. All devices used to measure stormwater flow and quality shall be calibrated to ensure their accuracy.

(5) Any temporary or permanent obstruction to safe and easy access to the facility to be inspected and/or sampled shall be promptly removed by the operator at the written or oral request of the Authorized Enforcement Agency and shall not be replaced. The costs of clearing such access shall be borne by the operator.

(6) Unreasonable delays in allowing the Authorized Enforcement Agency access to a permitted facility is a violation of a stormwater discharge permit and of this article. A person who is the operator of a facility with a WPDES permit to discharge stormwater associated with industrial activity commits an offense if the person denies the Authorized Enforcement Agency reasonable access to the permitted facility for the purpose of conducting any activity authorized or required by this article.

(7) If the Authorized Enforcement Agency has been refused access to any part of the premises from which stormwater is discharged, and he/she is able to demonstrate probable cause to believe that there may be a violation of this article, or that there is a need to inspect and/or sample as part of a routine inspection and sampling program designed to verify compliance with this article or any order issued hereunder, or to protect the overall public health, safety, and welfare of the community, then the Authorized Enforcement Agency may seek issuance of a search warrant from any court of competent jurisdiction.

16. That Section 43-53 of Division 3 – Illicit Discharge Regulations, Article 1 – Stormwater Illicit Discharge Detection and Elimination, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Requirements to Prevent, Control, and Reduce Stormwater Pollutants by the Use of Best Management Practices" is hereby created to read as follows:

The Authorized Enforcement Agency shall establish requirements identifying Best Management Practices (BMP's) for any activity, operation, or facility, which may cause or contribute to pollution or contamination of stormwater, the storm drain system, or waters of the State. The owner or operator of a commercial or industrial establishment shall provide, at their own expense, reasonable protection from accidental discharge of prohibited materials or other wastes into the municipal storm drain system or watercourses through the use of these structural and non-structural BMPs. Further, any person responsible for a property or premise, which is, or may be, the source of an illicit discharge, may be required to implement, at said person's expense, additional structural and non-structural BMPs to prevent the further discharge of pollutants to the Municipal Separate Storm Sewer System. Compliance with all terms and conditions of a valid WPDES permit authorizing the discharge of stormwater associated with industrial activity, to the extent practicable, shall be deemed compliance with the provisions of this section. These BMPs shall be part of a stormwater pollution prevention plan (SWPPP) as necessary for compliance with requirements of the WPDES permit.

17. That Section 43-54 of Division 3 – Illicit Discharge Regulations, Article 1 – Stormwater Illicit Discharge Detection and Elimination, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Watercourse Protection" is hereby created to read as follows:

    Every person owning property through which a watercourse passes, or such person's lessee, shall keep and maintain that part of the watercourse within the property free of trash, debris, excessive vegetation, and other obstacles that would pollute, contaminate, or significantly retard the flow of water through the watercourse. In addition, the owner or lessee shall maintain existing privately owned structures within or adjacent to a watercourse, so that such structures will not become a hazard to the use, function, or physical integrity of the watercourse.

18. That Section 43-55 of Division 3 – Illicit Discharge Regulations, Article 1 – Stormwater Illicit Discharge Detection and Elimination, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Notification of Spills" is hereby created to read as follows:

    (a) Notwithstanding other requirements of law, as soon as any person responsible for a facility or operation, or responsible for emergency response for a facility or operation has information of any known or suspected release of materials which are resulting or may result in illegal discharges or pollutants discharging into stormwater, the storm drain system, or waters of the State said person shall take all necessary steps to ensure the discovery, containment, and cleanup of such release.

    (b) In the event of such a release of hazardous materials said person shall immediately notify emergency response agencies of the occurrence via emergency dispatch services. In the event of a release of non-hazardous materials, said person shall notify the Authorized Enforcement Agency in person or by phone or facsimile no later than the next business day. Notifications in person or by phone shall be confirmed by written notice addressed and mailed to the Director of Public Works for the City of Mosinee within three (3) business days of the phone notice.

    (c) If the discharge of prohibited materials emanates from a commercial or industrial establishment, the owner or operator of such establishment shall also retain an on-site written record of the discharge and the actions taken to prevent its recurrence. Such records shall be retained for at least three (3) years.

19. That Division 4 of Article 1 – Stormwater Illicit Discharge Detection and Elimination, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee is hereby created and shall be entitled "Administration and Enforcement".

20. That Section 43-70 of Division 4 – Administration and Enforcement, Article 1 – Stormwater Illicit Discharge Detection and Elimination, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Notice of Violation" is hereby created to read as follows:

    (a) Whenever the Authorized Enforcement Agency finds that a person or entity has violated a prohibition or failed to meet a requirement of this article, the Authorized Enforcement Agency may order compliance by written notice of violation to the responsible person. Such notice may require without limitation:

    (1) The performance of monitoring, analyses, and reporting;

    (2) The elimination of illicit connections or discharges;

    (3) That violating discharges, practices, or operations shall cease and desist;

    (4) The abatement or remediation of stormwater pollution or contamination hazards and the restoration of any affected property;

    (5) Payment of a fine to cover administrative and remediation costs;

    (6) The implementation of source control or treatment BMPs.

    (b) If abatement of a violation and/or restoration of affected property is required, the notice shall set forth a deadline within which such remediation or restoration must be completed. Said notice shall further advise that, should the violator fail to remediate or restore within the established deadline, the work will be done by a designated governmental agency or a contractor and the expense thereof shall be charged to the violator.

21. That Section 43-71 of Division 4 – Administration and Enforcement, Article 1 – Stormwater Illicit Discharge Detection and Elimination, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Appeal of Notice" is hereby created to read as follows:

    Any person receiving a Notice of Violation may appeal the determination of the Authorized Enforcement Agency to the Board of Appeals. The Notice of Appeal must be received within 30 days from the date of the Notice of Violation. Hearing on the appeal before the Board of Appeals shall take place within 30 days from the date of receipt of the Notice of Appeal. The decision of the municipal authority or their designee shall be final.

22. That Section 43-72 of Division 4 – Administration and Enforcement, Article 1 – Stormwater Illicit Discharge Detection and Elimination, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Enforcement Measures After Appeal" is hereby created to read as follows:

    If the violation has not been corrected pursuant to the requirements set forth in the Notice of Violation, or, in the event of an appeal, within 10 days of the decision of the Board of Appeals upholding the decision of the Authorized Enforcement Agency, then representatives of the Authorized Enforcement Agency shall enter upon the subject private property and are authorized to take any and all measures necessary to abate the violation and/or restore the property. It shall be unlawful for any person, owner, agent or person in possession of any premises to refuse to allow the government agency or designated contractor to enter upon the premises for the purposes set forth above.

23. That Section 43-73 of Division 4 – Administration and Enforcement, Article 1 – Stormwater Illicit Discharge Detection and Elimination, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Cost of Abatement of the Violation" is hereby created to read as follows:

    Within thirty (30) days after abatement of the violation by the City, the owner of the property will be notified of the cost of abatement, including administrative costs. The property owner may file a written protest objecting to the amount of the assessment within 10 days. If the amount due is not paid within a timely manner as determined by the decision of the Board of Appeals or by the expiration of the time in which to file an appeal, the charges shall be charged against such property and be collected as a special tax thereon as provided in Wis. Stats.

24. That Section 43-74 of Division 4 – Administration and Enforcement, Article 1 – Stormwater Illicit Discharge Detection and Elimination, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Injunctive Relief" is hereby created to read as follows:

    It shall be unlawful for any person to violate any provision or fail to comply with any of the requirements of this article. If a person has violated or continues to violate the provisions of this article, the Authorized Enforcement Agency may petition for a preliminary or permanent injunction restraining the person from activities which would create further violations or compelling the person to perform abatement or remediation of the violation.

25. That Section 43-75 of Division 4 – Administration and Enforcement, Article 1 – Stormwater Illicit Discharge Detection and Elimination, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Appeal of Notice of Violation" is hereby created to read as follows:

    In lieu of enforcement proceedings, penalties, and remedies authorized by this article, the Authorized Enforcement Agency may impose upon a violator alternative compensatory actions, such as storm drain stenciling, attendance at compliance workshops, creek cleanup, other community service activities, etc.

26. That Section 43-76 of Division 4 – Administration and Enforcement, Article 1 – Stormwater Illicit Discharge Detection and Elimination, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Violations Deemed a Public Nuisance" is hereby created to read as follows:

    In addition to the enforcement processes and penalties provided, any condition caused or permitted to exist in violation of any of the provisions of this article is a threat to public health, safety, and welfare, and is declared and deemed a nuisance, and may be summarily abated or restored at the violator's expense, and/or a civil action to abate, enjoin, or otherwise compel the cessation of such nuisance may be taken.

27. That Section 43-77 of Division 4 – Administration and Enforcement, Article 1 – Stormwater Illicit Discharge Detection and Elimination, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Criminal Prosecution" is hereby created to read as follows:

    Any person that has violated or continues to violate this article shall be subject to a forfeiture of not less than $100 nor more than $5,000 per violation; each day such violation exists shall be deemed a separate violation. The Authorized Enforcement Agency may recover all attorneys' fees court costs and other expenses associated with enforcement of this article, including sampling and monitoring expenses.

28. That Section 43-78 of Division 4 – Administration and Enforcement, Article 1 – Stormwater Illicit Discharge Detection and Elimination, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Remedies Not Exclusive" is hereby created to read as follows:

    The remedies listed in this article are not exclusive of any other remedies available under any applicable federal, state or local law and it is within the discretion of the Authorized Enforcement Agency to seek cumulative remedies.

29. That this ordinance shall be in full force and effect 30 days upon adoption and publication in accordance with applicable state statutes.

30. That all prior ordinances and parts of ordinances in conflict with this ordinance are hereby repealed.

Adopted and approved by the Common Council of the City of Mosinee on this 30TH day of MARCH, 2009.

Alan Erickson, Mayor

Attest: Bruce R. Jamros, City Clerk/Treasurer

Date of Adoption: 3/30/09
Date of Attestation: 3/30/09
Date of Publication: 3/30/09

Ordinance No. 2009-04

AN ORDINANCE CREATING CHAPTER 43 OF THE CODE OF ORDINANCES, CITY OF MOSINEE, WISCONSIN TO ESTABLISH CONSTRUCTION SITE EROSION CONTROL REGULATIONS

Whereas, the City of Mosinee owns and operates a Municipal Separate Storm Sewer System (MS4); and

Whereas, the State of Wisconsin Department of Natural Resources has issued a General Permit to the City to discharge stormwater to the waters of the State; and

Whereas, the MS4 General Permit requires that the City develop, implement and enforce a comprehensive stormwater management program; and

Whereas, the MS4 General Permit also requires that the City develop, implement and enforce a program to reduce the discharge of sediment and construction materials from construction sites into the City's storm sewer system; and

Whereas, it is in the public interest to develop requirements pertaining the discharge of sediment and construction materials from construction sites within the City into the City's stormwater system, in order to comply with the State of Wisconsin Department of Natural Resource requirements.

NOW, THEREFORE, the Common Council of the City of Mosinee, Wisconsin does hereby ordain as follows:

1. That Article II of Chapter 43 - Stormwater Management Regulations of the Code of Ordinances for the City of Mosinee is hereby created and shall be entitled "Construction Site Erosion Control Regulations".

2. That Division 1 of Article 1I – Construction Site Erosion Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee is hereby created and shall be entitled "In General".

3. That Section 43-150 of Division 1 – In General, Article II – Construction Site Erosion Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Intent" is hereby created to read as follows:

The intent of this article is to require use of Best Management Practices to reduce the amount of sediment and other pollutants resulting from land disturbing construction activities on sites that do not include the construction of a building and is otherwise regulated by the Wisconsin Department of Commerce in s. Comm 21.125 or 50.115, Wis. Adm. Code. Use of this article will foster consistent, statewide application of the construction site performance standards for new development and redevelopment contained in subchapters III and IV of ch. NR 151, Wis. Adm. Code.

4. That Section 43-151 of Division 1 – In General, Article II – Construction Site Erosion Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Authority" is hereby created to read as follows:

   (a) This article is adopted under the authority granted by Section 62.234 of the Wis. Stats. This article supersedes all provisions of any ordinance previously enacted under s. 62.23, Wis. Stats., that relate to construction site erosion control. Except as otherwise specified in s. 62.234 Wis. Stats., s. 62.23, Wis. Stats., applies to this article and to any amendments to this article.

   (b) The provisions of this article are deemed not to limit any other lawful regulatory powers of the City.

   (c) The Common Council hereby designates the City Administrator, or the Director of Public Works or their designee to administer and enforce the provisions of this article.

   (d) The requirements of this article do not pre–empt more stringent erosion and sediment control requirements that may be imposed by any of the following:

      (1) Wisconsin Department of Natural Resources administrative rules, permits or approvals including those authorized under ss. 281.16 and 283.33, Wis. Stats.

      (2)Targeted non–agricultural performance standards promulgated in rules by the Wisconsin Department of Natural Resources under s. NR 151.004, Wis. Adm. Code.

5. That Section 43-152 of Division 1 – In General, Article II – Construction Site Erosion Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Findings of Fact" is hereby created to read as follows:

   The City of Mosinee Common Council finds that runoff from land disturbing construction activity carries a significant amount of sediment and other pollutants to the waters of the state in the City of Mosinee.

6. That Section 43-153 of Division 1 – In General, Article II – Construction Site Erosion Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Purpose" is hereby created to read as follows:

It is the purpose of this article to further the maintenance of safe and healthful conditions; prevent and control water pollution; prevent and control soil erosion; protect spawning grounds, fish and aquatic life; control building sites, placement of structures and land uses; preserve ground cover and scenic beauty; and promote sound economic growth, by minimizing the amount of sediment and other pollutants carried by runoff or discharged from land disturbing construction activity to waters of the state in the City of Mosinee.

7. That Division 2 of Article 1I – Construction Site Erosion Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee is hereby created and shall be entitled "Applicability and Jurisdiction".

8. That Section 43-180 of Division 2 – Applicability and Jurisdiction, Article II – Construction Site Erosion Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Applicability" is hereby created to read as follows:

   (a) This article applies to the following land disturbing construction activities except as provided under subsection (b) of this subparagraph:

   A construction site, which has one or more acres of land disturbing construction activity.

   (b) This article does not apply to the following:

   (1) Land disturbing construction activity that includes the construction of 1 and 2 family residential dwellings that are not part of a larger common plan of development or sale and that result in less than 1 acre of disturbance. These construction sites are regulated by the Wisconsin Department of Commerce under s. COMM Chapters 20 and 21.

   (2) Land disturbing activity that includes public buildings and places of employment. These construction sites are regulated by the Wisconsin Department of Commerce.

   (3) A construction project that is exempted by federal statutes or regulations from the requirement to have a national pollutant discharge elimination system permit issued under chapter 40, Code of Federal Regulations, part 122, for land disturbing construction activity.

   (4) Nonpoint discharges from agricultural facilities and practices.

   (5) Nonpoint discharges from silviculture activities.

   (6) Routine maintenance for project sites under 5 acres of land disturbance if performed to maintain the original line and grade, hydraulic capacity or original purpose of the facility.

(c) Notwithstanding the applicability requirements in subparagraph (a), this article applies to construction sites of any size that, in the opinion of the City of Mosinee, are likely to result in runoff that exceeds the safe capacity of the existing drainage facilities or receiving body of water, that causes undue channel erosion, that increases water pollution by scouring or the transportation of particulate matter or that endangers property or public safety.

9. That Section 43-181 of Division 2 – Applicability and Jurisdiction, Article II – Construction Site Erosion Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Jurisdiction" is hereby created to read as follows:

This article applies to land disturbing construction activities on lands within the boundaries and jurisdiction of the City of Mosinee, as well as all lands located within the extraterritorial plat approval jurisdiction of the City of Mosinee, even if plat approval is not involved.

10. That Section 43-182 of Division 2 – Applicability and Jurisdiction, Article II – Construction Site Erosion Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Exclusions" is hereby created to read as follows:

This article is not applicable to activities conducted by a state agency, as defined under s. 227.01 (1), Wis. Stats., but also including the office of district attorney, which is subject to the state plan promulgated or a memorandum of understanding entered into under s. 281.33 (2), Wis. Stats.

11. That Section 43-183 of Division 2 – Applicability and Jurisdiction, Article II – Construction Site Erosion Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Definitions" is hereby created to read as follows:

Administering authority means a governmental employee, or a regional planning Commission empowered under s. [59.693; 60.627; 61.354; 62.234], Wis. Stats., that is designated by the Common Council of the City of Mosinee to administer this article.

Agricultural facilities and practices has the meaning in s. 281.16(1), Wis. Stats.

Average annual rainfall means a calendar year of precipitation, excluding snow, which is considered typical.

Best management practice or "BMP" means structural or non–structural measures, practices, techniques or devices employed to avoid or minimize soil, sediment or pollutants carried in runoff to waters of the state.

Business day means a day the office of the Mosinee City Hall is routinely and customarily open for business.

Cease and desist order means a court–issued order to halt land disturbing construction activity that is being conducted without the required permit.

Construction site means an area upon which one or more land disturbing construction activities occur, including areas that are part of a larger Common plan of development or sale where multiple separate and distinct land disturbing construction activities may be taking place at different times on different schedules but under one plan.

Division of land means the creation from one parcel of two (2) or more parcels or building sites of two (2) or fewer acres each in area where such creation occurs at one time or through the successive partition within a 5 year period.

Erosion means the process by which the land's surface is worn away by the action of wind, water, ice or gravity.

Erosion and sediment control plan means a comprehensive plan developed to address pollution caused by erosion and sedimentation of soil particles or rock fragments during construction.

Extraterritorial means the unincorporated area within 3 miles of the corporate limits of a first, second, or third class city, or within 1.5 miles of a fourth class city or village.

Final stabilization means that all land disturbing construction activities at the construction site have been completed and that a uniform perennial vegetative cover has been established, with a density of at least 70 percent of the cover, for the unpaved areas and areas not covered by permanent structures, or that employ equivalent permanent stabilization measures.

Governing body means the Common Council of the City of Mosinee.

Land disturbing construction activity means any man–made alteration of the land surface resulting in a change in the topography or existing vegetative or non–vegetative soil cover, that may result in runoff and lead to an increase in soil erosion and movement of sediment into waters of the state. Land disturbing construction activity includes clearing and grubbing, demolition, excavating, pit trench dewatering, filling and grading activities.

"MEP" or maximum extent practicable means a level of implementing best management practices in order to achieve a performance standard specified in this article which takes into account the best available technology, cost effectiveness and other competing issues such as human safety and welfare, endangered and threatened resources, historic properties and geographic features. MEP allows flexibility in the way to meet the performance standards and may vary based on the performance standard and site conditions.

Performance standard means a narrative or measurable number specifying the minimum acceptable outcome for a facility or practice.

Permit means a written authorization made by the City of Mosinee to the applicant to conduct land disturbing construction activity or to discharge post–construction runoff to waters of the state.

Pollutant has the meaning given in s. 283.01 (13), Wis. Stats.

Pollution has the meaning given in s. 281.01 (10), Wis. Stats.

Responsible party means any entity holding fee title to the property or performing services to meet the performance standards of this ordinance through a contract or other agreement.

Runoff means storm water or precipitation including rain, snow or ice melt or similar water that moves on the land surface via sheet or channelized flow.

Sediment means settleable solid material that is transported by runoff, suspended within runoff or deposited by runoff away from its original location.

Separate storm sewer means a conveyance or system of conveyances including roads with drainage systems, streets, catch basins, curbs, gutters, ditches, constructed channels or storm drains, which meets all of the following criteria:

(a) Is designed or used for collecting water or conveying runoff.

(b) Is not part of a combined sewer system.

(c) Is not draining to a storm water treatment device or system.

(d) Discharges directly or indirectly to waters of the state.

Site means the entire area included in the legal description of the land on which the land disturbing construction activity is proposed in the permit application.

Stop work order means an order issued by the City of Mosinee which requires that all construction activity on the site be stopped.

Technical standard means a document that specifies design, predicted performance and operation and maintenance specifications for a material, device or method.

Waters of the state has the meaning given in s. 281.01 (18), Wis. Stats.

12. That Division 3 of Article II – Construction Site Erosion Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee is hereby created and shall be entitled "Standards".

13. That Section 43-210 of Division 3 – Standards, Article II – Construction Site Erosion Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Technical Standards" is hereby created to read as follows:

(a) *Design criteria, standards and specifications.* All BMPs required to comply with this article shall meet the design criteria, standards and specifications based on any of the following:

(1) Applicable design criteria, standards and specifications identified in the Wisconsin Construction Site Best Management Practice Handbook, WDNR Pub. WR–222 November 1993 Revision.

(2) Other design guidance and technical standards identified or developed by the Wisconsin Department of Natural Resources under subchapter V of chapter NR 151, Wis. Adm. Code.

(3) For this article, average annual basis is calculated using the appropriate annual rainfall or runoff factor, also referred to as the R factor, or an equivalent design storm using a type II distribution, with consideration given to the geographic location of the site and the period of disturbance.

(b) *Other standards.* Other technical standards not identified or developed in sub. (a), may be used provided that the methods have been approved by the City of Mosinee Common Council.

14. That Section 43-220 of Division 3 – Standards, Article II – Construction Site Erosion Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Performance Standards" is hereby created to read as follows:

(a) *Responsible party.* The responsible party shall implement an erosion and sediment control plan, developed in accordance with Section 43-350 that incorporates the requirements of this article.

(b) *Plan.* A written plan shall be developed in accordance with Section 43-350 and implemented for each construction site.

(c) *Erosion and other pollutant control.* The plan required under sub. (b) shall include the following:

(1) BMPs that, by design, achieve to the maximum extent practicable, a reduction of 80% of the sediment load carried in runoff, on an average annual basis, as compared with no sediment or erosion controls until the construction site has undergone final stabilization. No person shall be required to exceed an 80% sediment reduction to meet the requirements of this paragraph. Erosion and sediment control BMPs may be used alone or in combination to meet the requirements of this paragraph. Credit toward meeting the sediment reduction shall be given for limiting the duration or area, or both, of land disturbing construction activity, or other appropriate mechanism.

(2) Notwithstanding par. (1), if BMPs cannot be designed and implemented to reduce the sediment load by 80%, on an average annual basis, the plan shall include a written and site–specific explanation as to why the 80% reduction goal is not attainable and the sediment load shall be reduced to the maximum extent practicable.

(3) Where appropriate, the plan shall include sediment controls to do all of the following to the maximum extent practicable:

(a) Prevent tracking of sediment from the construction site onto roads and other paved surfaces.

(b) Prevent the discharge of sediment as part of site de–watering.

(c) Protect the separate storm drain inlet structure from receiving sediment.

(4) The use, storage and disposal of chemicals, cement and other compounds and materials used on the construction site shall be managed during the construction period, to prevent their entrance into waters of the state. However, projects that require the placement of these materials in waters of the state, such as constructing bridge footings or BMP installations, are not prohibited by this paragraph.

(d) *Location.* The BMPs used to comply with this section shall be located prior to runoff entering waters of the state.

(e) Alternate Requirements. The Common Council may establish stormwater management requirements more stringent than those set forth in this section if the Common Council determines that an added level of protection is needed for sensitive resources.

15. That Division 4 of Article II – Construction Site Erosion Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee is hereby created and shall be entitled "Permitting Requirements, Procedures and Fees".

16. That Section 43-310 of Division 4 – Permitting Requirements, Procedures and Fees, Article II – Construction Site Erosion Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Permit Required" is hereby created to read as follows:

No responsible party may commence a land disturbing construction activity subject to this article without receiving prior approval of an erosion and sediment control plan for the site and a permit from the City of Mosinee.

17. That Section 43-311 of Division 4 – Permitting Requirements, Procedures and Fees, Article II – Construction Site Erosion Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Permit application and fees" is hereby created to read as follows:

At least one responsible party desiring to undertake a land disturbing construction activity subject to this article shall submit an application for a permit and an erosion and sediment control plan that meets the requirements of this article and shall pay an application fee to the City. A schedule of the fees shall be available for review in the City Clerk's Office. By submitting an application, the applicant is authorizing the City and its designated representatives to enter the site to obtain information required for the review of the erosion and sediment control plan.

18. That Section 43-312 of Division 4 – Permitting Requirements, Procedures and Fees, Article II – Construction Site Erosion Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Review and approval of permit application" is hereby created to read as follows:

    (a) The Director of Public Works or their designee shall review any permit application that is submitted with an erosion and sediment control plan, and the required fee. The following approval procedure shall be used:

        (1) Within 30 calendar days of the receipt of a complete permit application, as required under this article, the Director of Public Works or their designee shall inform the applicant whether the application and plan are approved or disapproved based on the requirements of this ordinance.

        (2) If the permit application and plan are approved, the Director of Public Works or their designee shall issue the permit.

        (3) If the permit application or plan is disapproved, the Director of Public Works or their designee shall state in writing the reasons for disapproval.

        (4) The Director of Public Works or their designee may request additional information from the applicant. If additional information is submitted, the Director of Public Works or their designee shall have thirty (30) business days from the date the additional information is received to inform the applicant that the plan is either approved or disapproved.

19. That Section 43-313 of Division 4 – Permitting Requirements, Procedures and Fees, Article II – Construction Site Erosion Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Surety bond" is hereby created to read as follows:

    As a condition of approval and issuance of the permit, the City of Mosinee may require the applicant to deposit a surety bond or irrevocable letter of credit to guarantee a good faith execution of the approved erosion control plan and any permit conditions.

20. That Section 43-314 of Division 4 – Permitting Requirements, Procedures and Fees, Article II – Construction Site Erosion Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Permit " is hereby created to read as follows:

    (a) All permits shall require the responsible party to:

        (1) Notify the City within 48 hours of commencing any land disturbing construction activity.

(2) Notify the City of completion of any BMPs within 14 days after their installation.

(3) Obtain permission in writing from the Director of Public Works or their designee prior to any modification pursuant to this article of the erosion and sediment control plan.

(4) Install all BMPs as identified in the approved erosion and sediment control plan.

(5) Maintain all road drainage systems, stormwater drainage systems, BMPs and other facilities identified in the erosion and sediment control plan.

(6) Repair any siltation or erosion damage to adjoining surfaces and drainage ways resulting from land disturbing construction activities and document repairs in a site erosion control log.

(7) Inspect the BMPs within 24 hours after each rain of 0.5 inches or more which results in runoff during active construction periods, and at least once each week make needed repairs and document the findings of the inspections in a site erosion control log with the date of inspection, the name of the person conducting the inspection, and a description of the present phase of the construction at the site.

(8) Allow the Director of Public Works or their designee to enter the site for the purpose of inspecting compliance with the erosion and sediment control plan or for performing any work necessary to bring the site into compliance with the control plan. Keep a copy of the erosion and sediment control plan at the construction site.

21. That Section 43-315 of Division 4 – Permitting Requirements, Procedures and Fees, Article II – Construction Site Erosion Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Permit conditions" is hereby created to read as follows:

    Permits issued under this section may include conditions established by the City in addition to the requirements set forth in this article, where needed to assure compliance with the performance standard set forth in this article.

22. That Section 43-316 of Division 4 – Permitting Requirements, Procedures and Fees, Article II – Construction Site Erosion Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Permit duration" is hereby created to read as follows:

    Permits issued under this section shall be valid for a period of 180 days, or the length of the building permit or other construction authorizations, whichever is longer, from the date of issuance. The Director of Public Works or their designee may extend the period one or more times for up to an additional 180 days. The Director of Public Works or their designee may require additional BMPs as a condition of the extension if they are necessary to meet the requirements of this article.

23. That Section 43-317 of Division 4 – Permitting Requirements, Procedures and Fees, Article II – Construction Site Erosion Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Maintenance" is hereby created to read as follows:

    The responsible party throughout the duration of the construction activities shall maintain all BMPs necessary to meet the requirements of this article until the site has undergone final stabilization.

24. That Division 5 of Article 1I – Construction Site Erosion Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee is hereby created and shall be entitled "Erosion and Sediment Control Plan, Statement and Amendments".

25. That Section 43-350 of Division 5 – Erosion and Sediment Control Plan, Statement and Amendments, Article II – Construction Site Erosion Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Erosion and sediment control plan" is hereby created to read as follows:

    (a) An erosion and sediment control plan shall be prepared and submitted to the Director of Public Works or their designee. The plan shall be prepared and sealed by a professional engineer or professional hydrologist registered in the State of Wisconsin.

    (b) The erosion and sediment control plan shall be designed to meet the performance standards in Section 43-220 and other requirements of this article.

    (c) The erosion and sediment control plan shall address pollution caused by soil erosion and sedimentation during construction and up to final stabilization of the site. The erosion and sediment control plan shall include, at a minimum, the following items:

        1. The name(s) and address(es) of the owner or developer of the site, and of any consulting firm retained by the applicant, together with the name of the applicant's principal contact at such firm. The application shall also include start and end dates for construction.

        2. Description of the site and the nature of the construction activity, including representation of the limits of land disturbance on a United States Geological Service 7.5 minute series topographic map.

        3. A sequence of construction of the development site, including stripping and clearing; rough grading; construction of utilities, infrastructure, and buildings; and final grading and landscaping. Sequencing shall identify the expected date on which clearing will begin, the estimated duration of exposure of cleared areas, areas of clearing, installation of temporary erosion and sediment control measures, and establishment of permanent vegetation.

4. Estimates of the total area of the site and the total area of the site that is expected to be disturbed by construction activities.

5. Estimates, including calculations, if any, of the runoff coefficient of the site before and after construction activities are completed.

6. Calculations to show the expected percent reduction in the average annual sediment load carried in runoff as compared to no sediment or erosion controls.

7. Existing data describing the surface soil as well as subsoils.

8. Depth to groundwater, as indicated by Natural Resources Conservation Service soil information where available.

9. Name of the immediate named receiving water from the United States Geological Service 7.5 minute series topographic maps.

(d) The erosion and sediment control plan shall include a site map. The site map shall include the following items and shall be at a scale not greater than 100 feet per inch and at a contour interval not to exceed five feet:

1. Existing topography, vegetative cover, natural and engineered drainage systems, roads and surface waters. Lakes, streams, wetlands, channels, ditches and other watercourses on and immediately adjacent to the site shall be shown. Any identified 100–year flood plains, flood fringes and floodways shall also be shown.

2. Boundaries of the construction site.

3. Drainage patterns and approximate slopes anticipated after major grading activities.

4. Areas of soil disturbance.

5. Location of major structural and non–structural controls identified in the plan.

6. Location of areas where stabilization practices will be employed.

7. Areas which will be vegetated following construction.

8. Area extent of wetland acreage on the site and locations where stormwater is discharged to a surface water or wetland.

9. Locations of all surface waters and wetlands within one mile of the construction site.

10. An alphanumeric or equivalent grid overlying the entire construction site map.

(e) Each erosion and sediment control plan shall include a description of appropriate controls and measures that will be performed at the site to prevent pollutants from reaching waters of the state. The plan shall clearly describe the appropriate control measures for each major activity and the timing during the construction process that the measures will be implemented. The description of erosion controls shall include, when appropriate, the following minimum requirements:

1. Description of interim and permanent stabilization practices, including a practice implementation schedule. Site plans shall ensure that existing vegetation is preserved where attainable and that disturbed portions of the site are stabilized.

2. Description of structural practices to divert flow away from exposed soils, store flows or otherwise limit runoff and the discharge of pollutants from the site. Unless otherwise specifically approved in writing by the Director of Public Works or their designee, structural measures shall be installed on upland soils.

3. Management of overland flow at all sites, unless otherwise controlled by outfall controls.

4. Trapping of sediment in channelized flow.

5. Staging construction to limit bare areas subject to erosion.

6. Protection of downslope drainage inlets where they occur.

7. Minimization of tracking at all sites.

8. Clean up of off–site sediment deposits.

9. Proper disposal of building and waste materials at all sites.

10. Stabilization of drainage ways.

11. Control of soil erosion from dirt stockpiles.

12. Installation of permanent stabilization practices as soon as possible after final grading.

13. Minimization of dust to the maximum extent practicable.

(f) The erosion and sediment control plan shall require that velocity dissipation devices be placed at discharge locations and along the length of any outfall channel, as necessary, to provide a non–erosive flow from the structure to a water course so that the natural physical and biological characteristics and functions are maintained and protected.

26. That Section 43-351 of Division 5 – Erosion and Sediment Control Plan, Statement and Amendments, Article II – Construction Site Erosion Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Erosion and sediment control plan statement" is hereby created to read as follows:

    For each construction site identified under this article, an erosion and sediment control plan statement shall be prepared. This statement shall be submitted to the Director of Public Works or their designee. The control plan statement shall briefly describe the site, including a site map. Further, it shall also include the best management practices that will be used to meet the requirements of the article, including the site development schedule.

27. That Section 43-352 of Division 5 – Erosion and Sediment Control Plan, Statement and Amendments, Article II – Construction Site Erosion Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Amendments" is hereby created to read as follows:

    (a) The applicant shall amend the plan if any of the following occur:

        (1) There is a change in design, construction, operation or maintenance at the site which has the reasonable potential for the discharge of pollutants to waters of the state and which has not otherwise been addressed in the plan.

        (2) The actions required by the plan fail to reduce the impacts of pollutants carried by construction site runoff.

        (3) The Director of Public Works or their designee notifies the applicant of changes needed in the plan.

28. That Division 6 of Article II – Construction Site Erosion Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee is hereby created and shall be entitled "Administration".

29. That Section 43-380 of Division 6 – Administration, Article II – Construction Site Erosion Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Fee Schedule" is hereby created to read as follows:

    The fees referred to in other sections of this article shall be established by the Common Council and may from time to time be modified by resolution. A schedule of the fees established by the Common Council shall be available for review in the Office of the City Clerk.

30. That Section 43-381 of Division 6 – Administration, Article II – Construction Site Erosion Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Inspection" is hereby created to read as follows:

If land disturbing construction activities are being carried out without a permit required by this ordinance, the Director of Public Works or their designee may enter the land pursuant to the provisions of ss. 66.0119(1), (2), and (3), Wis. Stats.

31. That Section 43-382 of Division 6 – Administration, Article II – Construction Site Erosion Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Enforcement" is hereby created to read as follows:

(a) The Director of Public Works or their designee may post a stop–work order if any of the following occurs:

(1) Any land disturbing construction activity regulated under this article is being undertaken without a permit.

(2) The erosion and sediment control plan is not being implemented in a good faith manner.

(3) The conditions of the permit are not being met.

(b) If the responsible party does not cease activity as required in a stop–work order posted under this section or fails to comply with the erosion and sediment control plan or permit conditions, the Common Council may revoke the permit.

(c) If the responsible party, where no permit has been issued, does not cease the activity after being notified by the Director of Public Works or their designee, or if a responsible party violates a stop–work order posted under sub. (a), the Common Council may request the City Attorney to obtain a cease and desist order in any court with jurisdiction.

(d) The Common Council may retract the stop–work order issued under sub. (a) or the permit revocation under sub. (b).

(e) After posting a stop–work order under sub. (a), the Director of Public Works or their designee may issue a notice of intent to the responsible party of its intent to perform work necessary to comply with this article. The Director of Public Works or their designee may go on the land and commence the work after issuing the notice of intent. The costs of the work performed under this subsection by the City, plus interest at the rate authorized by the Common Council shall be billed to the responsible party. In the event a responsible party fails to pay the amount due, the City Clerk shall enter the amount due on the tax rolls and collect as a special assessment against the property pursuant to subch. VII of ch. 66, Wis. Stats.

(f) Any person violating any of the provisions of this article shall be subject to a forfeiture of not less than $100 nor more than $5,000 and the costs of prosecution for each violation. Each day a violation exists shall constitute a separate offense.

(g) Compliance with the provisions of this article may also be enforced by injunction in any court with jurisdiction. It shall not be necessary to prosecute for forfeiture or a cease and desist order before resorting to injunctional proceedings.

32. That Section 43-383 of Division 6 – Administration, Article II – Construction Site Erosion Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Appeals" is hereby created to read as follows:

    (a) *Board of Appeals*. The Board of Appeals created pursuant to section 2-436 of this Code pursuant to s. 62.23(7)(e), Wis. Stats.:

        (1) Shall hear and decide appeals where it is alleged that there is error in any order, decision or determination made by the City Administrator, Director of Public Works or their designee in administering this ordinance except for cease and desist orders obtained under Section 43-382(c).

        (2) Upon appeal, may authorize variances from the provisions of this article which are not contrary to the public interest and where owing to special conditions a literal enforcement of the provisions of the article will result in unnecessary hardship; and

        (3) Shall use the rules, procedures, duties and powers authorized by statute in hearing and deciding appeals and authorizing variances.

    (b) *Who may appeal*. Appeals to the Board of Appeals may be taken by any aggrieved person or by any office, department, board, or bureau of the City of Mosinee affected by any decision of the City Administrator, Director of Public Works or their designee.

33. That Section 43-384 of Division 6 – Administration, Article II – Construction Site Erosion Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Severability" is hereby created to read as follows:

    If a court of competent jurisdiction judges any section, clause, provision or portion of this article unconstitutional or invalid, the remainder of the article shall remain in force and not be affected by such judgment.

34. That this ordinance shall be in full force and effect 30 days upon adoption and publication in accordance with applicable state statutes.

35. That all prior ordinances and parts of ordinances in conflict with this ordinance are hereby repealed.

{document continued on next page}

Adopted and approved by the Common Council of the City of Mosinee on this 30TH day of MARCH, 2009.

Alan Erickson, Mayor

Attest: Bruce R. Jamroz, City Clerk/Treasurer

Date of Adoption: 3/30/09
Date of Attestation: 3/30/09
Date of Publication: 4/23/09

Ordinance No. 2009-05

AN ORDINANCE AMENDING CHAPTER 43 OF THE CODE OF ORDINANCES, CITY OF MOSINEE, WISCONSIN TO ESTABLISH POST CONSTRUCTION STORMWATER MANAGEMENT CONTROL REQUIREMENTS

Whereas, the City of Mosinee owns and operates a Municipal Separate Storm Sewer System (MS4); and

Whereas, the State of Wisconsin Department of Natural Resources has issued a General Permit to the City to discharge stormwater to the waters of the State; and

Whereas, the MS4 General Permit requires that the City develop, implement and enforce a comprehensive stormwater management program; and

Whereas, the MS4 General Permit also requires that the City develop, implement and enforce a program to require control of the quality of stormwater discharges into the City's storm sewer system; and

Whereas, it is in the public interest to develop requirements pertaining to controlling the quality of stormwater discharges into the City's stormwater system, in order to comply with the State of Wisconsin Department of Natural Resource requirements.

NOW, THEREFORE, the Common Council of the City of Mosinee, Wisconsin does hereby ordain as follows:

1. That Article III of Chapter 43 - Stormwater Management Regulations of the Code of Ordinances for the City of Mosinee is hereby created and shall be entitled "Post Construction Control Regulations".

2. That Division 1 of Article III – Post Construction Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee is hereby created and shall be entitled "In General".

3. That Section 43-500 of Division 1 – In General, Article III – Post Construction Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Intent" is hereby created to read as follows:

   The intent of this article is to reduce the amount of post–construction stormwater and associated pollutants reaching waters of the state. Use of this article will foster the consistent statewide application of post–construction performance standards for new development and redevelopment contained in subchapters III and IV of chapter NR 151, Wis. Adm. Code.

4. That Section 43-501 of Division 1 – In General, Article III – Post Construction Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Authority" is hereby created to read as follows:

   (a) This article is adopted by the Common Council under the authority granted by s. 62.234, Wis. Stats. This article supersedes all provisions of an ordinance previously enacted under s. 62.23, Wis. Stats., that relate to stormwater management regulations. Except as otherwise specified in s. 62.234, Wis. Stats., s. 62.23, Wis. Stats., applies to this article and to any amendments to this article.

   (b) The provisions of this article are deemed not to limit any other lawful regulatory powers of the same governing body.

   (c) The Common Council hereby designates the Zoning Administrator, Director of Public Works or their designee to administer and enforce the provisions of this article.

   (d) The requirements of this article do not pre–empt more stringent stormwater management requirements that may be imposed by any of the following:

      (1) Wisconsin Department of Natural Resources administrative rules, permits or approvals including those authorized under ss. 281.16 and 283.33, Wis. Stats.
      (2) Targeted non–agricultural performance standards promulgated in rules by the Wisconsin Department of Natural Resources under s. NR 151.004, Wis. Adm. Code.

5. That Section 43-502 of Division 1 – In General, Article III – Post Construction Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Findings of Fact" is hereby created to read as follows:

   (a) The Common Council finds that uncontrolled, post–construction runoff has a significant impact upon water resources and the health, safety and general welfare of the community and diminishes the public enjoyment and use of natural resources. Specifically, uncontrolled post–construction runoff can:

      (1) Degrade physical stream habitat by increasing stream bank erosion, increasing streambed scour, diminishing groundwater recharge, diminishing stream base flows and increasing stream temperature.

      (2) Diminish the capacity of lakes and streams to support fish, aquatic life, recreational and water supply uses by increasing pollutant loading of sediment, suspended solids, nutrients, heavy metals, bacteria, pathogens and other urban pollutants.

      (3) Alter wetland communities by changing wetland hydrology and by increasing pollutant loads.

      (4) Reduce the quality of groundwater by increasing pollutant loading.

(5) Threaten public health, safety, property and general welfare by overtaxing storm sewers, drainage ways, and other minor drainage facilities.

(6) Threaten public health, safety, property and general welfare by increasing major flood peaks and volumes.

(7) Undermine floodplain management efforts by increasing the incidence and levels of flooding.

6. That Section 43-503 of Division 1 – In General, Article III – Post Construction Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Purpose and Intent" is hereby created to read as follows:

(a) *Purpose.* The general purpose of this article is to establish long–term, post–construction runoff management requirements that will diminish the threats to public health, safety, welfare and the aquatic environment. Specific purposes are to:

(1) Further the maintenance of safe and healthful conditions.

(2) Prevent and control the adverse effects of stormwater; prevent and control soil erosion; prevent and control water pollution; protect spawning grounds, fish and aquatic life; control building sites, placement of structures and land uses; preserve ground cover and scenic beauty; and promote sound economic growth.

(3) Control exceedance of the safe capacity of existing drainage facilities and receiving water bodies; prevent undue channel erosion; control increases in the scouring and transportation of particulate matter; and prevent conditions that endanger downstream property.

(b) *Intent.* It is the intent of the Common Council that this article regulates post–construction stormwater discharges to waters of the state. This article may be applied on a site–by–site basis. The Common Council recognizes, however, that the preferred method of achieving the stormwater performance standards set forth in this article is through the preparation and implementation of comprehensive, systems–level stormwater management plans that cover hydrologic units, such as watersheds, on a municipal and regional scale. Such plans may prescribe regional stormwater devices, practices or systems, any of which may be designed to treat runoff from more than one site prior to discharge to waters of the state. Where such plans are in conformance with the performance standards developed under s. 281.16, Wis. Stats., for regional stormwater management measures and have been approved by the Common Council, it is the intent of this article that the approved plan be used to identify post–construction management measures acceptable for the community.

7. That Section 43-504 of Division 1 – In General, Article III – Post Construction Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Applicability and jurisdiction" is hereby created to read as follows:

(a) *Applicability.*

(1) Where not otherwise limited by law, this article applies after final stabilization to a site of land disturbing construction activity meeting any of the criteria in this paragraph, unless the site is otherwise exempt under paragraph (2).

(a) A post construction site that had 5 or more acres of land disturbing construction activity.

(b) A post–development construction site that had one or more acres of land disturbing construction activity after March 10, 2003.

(2) A site that meets any of the criteria in this paragraph is exempt from the requirements of this article.

(a) A redevelopment post–construction site with no increase in exposed parking lots or roads.

(b) A post–construction site with less than 10% connected imperviousness based on complete development of the post–construction site, provided the cumulative area of all parking lots and rooftops is less than one acre.

(c) Nonpoint discharges from agricultural facilities and practices.

(d) Nonpoint discharges from silviculture activities.

(e) Routine maintenance for project sites under 5 acres of land disturbance if performed to maintain the original line and grade, hydraulic capacity or original purpose of the facility.

(f) Underground utility construction such as water, sewer and fiberoptic lines. This exemption does not apply to the construction of any above ground structures associated with utility construction.

(3) Notwithstanding the applicability requirements in paragraph (a), this article applies to post–construction sites of any size that, in the opinion of the Zoning Administrator is likely to result in runoff that exceeds the safe capacity of the existing drainage facilities or receiving body of water, that causes undue channel erosion, that increases water pollution by scouring or the transportation of particulate matter or that endangers property or public safety.

(b) *Jurisdiction.*

This article applies to post construction sites within the boundaries and jurisdiction of the City of Mosinee as well as the extraterritorial division of land subject to an ordinance enacted pursuant to s. 236.45(2) and (3) Wis. Stats.

(c) *Exclusions.*

This article is not applicable to activities conducted by a state agency, as defined under s. 227.01 (1), Wis. Stats., but also including the office of district attorney, which is subject to the state plan promulgated or a memorandum of understanding entered into under s. 281.33 (2), Wis. Stats.

8. That Section 43-505 of Division 1 – In General, Article III – Post Construction Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Definitions" is hereby created to read as follows:

Administering authority means a governmental employee, or a regional planning commission empowered under s.62.234, Wis. Stats., that is designated by the Common Council to administer this article.

Agricultural facilities and practices has the meaning given in s. 281.16, Wis. Stats.

Average annual rainfall means a calendar year of precipitation, excluding snow, which is considered typical.

Best management practice or "BMP" means structural or non–structural measures, practices, techniques or devices employed to avoid or minimize sediment or pollutants carried in runoff to waters of the state.

Business day means a day the office of the Zoning Administrator is routinely and customarily open for business.

Cease and desist order means a court–issued order to halt land disturbing construction activity that is being conducted without the required permit.

Combined sewer system means a system for conveying both sanitary sewage and stormwater runoff.

Connected imperviousness means an impervious surface that is directly connected to a separate storm sewer or water of the state via an impervious flow path.

Design storm means a hypothetical discrete rainstorm characterized by a specific duration, temporal distribution, rainfall intensity, return frequency, and total depth of rainfall.

Development means residential, commercial, industrial or institutional land uses and associated roads.

Division of land means the creation from one parcel of two or more parcels or building sites of two or fewer acres each in area where such creation occurs at one time or through the successive partition within a 5 year period.

Effective infiltration area means the area of the infiltration system that is used to infiltrate runoff and does not include the area used for site access, berms or pretreatment.

Erosion means the process by which the land's surface is worn away by the action of wind, water, ice or gravity.

Exceptional resource waters means waters listed in s. NR 102.11, Wis. Adm. Code.

Extraterritorial means the unincorporated area within 3 miles of the corporate limits of a first, second, or third class city, or within 1.5 miles of a fourth class city or village.

Final stabilization means that all land disturbing construction activities at the construction site have been completed and that a uniform, perennial, vegetative cover has been established, with a density of at least 70% of the cover, for the unpaved areas and areas not covered by permanent structures, or employment of equivalent permanent stabilization measures.

Financial guarantee means a performance bond, maintenance bond, surety bond, irrevocable letter of credit, or similar guarantees submitted to the Zoning Administrator by the responsible party to assure that requirements of the article are carried out in compliance with the stormwater management plan.

Governing body means the Common Council of the City of Mosinee.

Impervious surface means an area that releases as runoff all or a large portion of the precipitation that falls on it, except for frozen soil. Rooftops, sidewalks, driveways, parking lots and streets are examples of areas that typically are impervious.

In–fill area means an undeveloped area of land located within existing development.

Infiltration means the entry of precipitation or runoff into or through the soil.

Infiltration system means a device or practice such as a basin, trench, rain garden or swale designed specifically to encourage infiltration, but does not include natural infiltration in pervious surfaces such as lawns, redirecting of rooftop downspouts onto lawns or minimal infiltration from practices, such as swales or road side channels designed for conveyance and pollutant removal only.

Karst feature means an area or surficial geologic feature subject to bedrock dissolution so that it is likely to provide a conduit to groundwater, and may include caves, enlarged fractures, mine features, exposed bedrock surfaces, sinkholes, springs, seeps or swallets.

Land disturbing construction activity means any man–made alteration of the land surface resulting in a change in the topography or existing vegetative or non–vegetative soil cover, that may result in runoff and lead to an increase in soil erosion and movement of sediment into waters of the state. Land disturbing construction activity includes clearing and grubbing, demolition, excavating, pit trench dewatering, filling and grading activities.

Maintenance agreement means a legal document that provides for long–term maintenance of stormwater management practices.

"MEP" or maximum extent practicable means a level of implementing best management practices in order to achieve a performance standard specified in this article which takes into account the best available technology, cost effectiveness and other competing issues such as human safety and welfare, endangered and threatened resources, historic properties and geographic features. MEP allows flexibility in the way to meet the performance standards and may vary based on the performance standard and site conditions.

New development means development resulting from the conversion of previously undeveloped land or agricultural land uses.

Off–site means located outside the property boundary described in the permit application.

On–site means located within the property boundary described in the permit application.

Ordinary high–water mark has the meaning given in s. NR 115.03(6), Wis. Adm. Code.

Outstanding resource waters means waters listed in s. NR 102.10, Wis. Adm. Code.

Percent fines means the percentage of a given sample of soil, which passes through a #200 sieve.

Performance standard means a narrative or measurable number specifying the minimum acceptable outcome for a facility or practice.

Permit means a written authorization made by the Zoning Administrator to the applicant to conduct land disturbing construction activity or to discharge post–construction runoff to waters of the state.

Permit administration fee means a sum of money paid to the Zoning Administrator by the permit applicant for the purpose of recouping the expenses incurred by the authority in administering the permit.

Pervious surface means an area that releases as runoff a small portion of the precipitation that falls on it. Lawns, gardens, parks, forests or other similar vegetated areas are examples of surfaces that typically are pervious.

Pollutant has the meaning given in s. 283.01(13), Wis. Stats.

Pollution has the meaning given in s. 281.01(10), Wis. Stats.

Post–construction site means a construction site following the completion of land disturbing construction activity and final site stabilization.

Pre–development condition means the extent and distribution of land cover types present before the initiation of land disturbing construction activity, assuming that all land uses prior to development activity are managed in an environmentally sound manner.

Preventive action limit has the meaning given in s. NR 140.05(17), Wis. Adm. Code.

Redevelopment means areas where development is replacing older development.

Responsible party means any entity holding fee title to the property or other person contracted or obligated by other agreement to implement and maintain post–construction stormwater BMPs.

Runoff means stormwater or precipitation including rain, snow or ice melt or similar water that moves on the land surface via sheet or channelized flow.

Separate storm sewer means a conveyance or system of conveyances including roads with drainage systems, streets, catch basins, curbs, gutters, ditches, constructed channels or storm drains, which meets all of the following criteria:

(a) Is designed or used for collecting water or conveying runoff.

(b) Is not part of a combined sewer system.

(c) Is not draining to a stormwater treatment device or system.

(d) Discharges directly or indirectly to waters of the state.

Site means the entire area included in the legal description of the land on which the land disturbing construction activity occurred.

Stop work order means an order issued by the Zoning Administrator which requires that all construction activity on the site be stopped.

Stormwater management plan means a comprehensive plan designed to reduce the discharge of pollutants from stormwater after the site has undergone final stabilization following completion of the construction activity.

Stormwater management system plan is a comprehensive plan designed to reduce the discharge of runoff and pollutants from hydrologic units on a regional or municipal scale.

Technical standard means a document that specifies design, predicted performance and operation and maintenance specifications for a material, device or method.

Top of the channel means an edge, or point on the landscape, landward from the ordinary high–water mark of a surface water of the state, where the slope of the land begins to be less than 12% continually for at least 50 feet. If the slope of the land is 12% or less continually for the initial 50 feet, landward from the ordinary high–water mark, the top of the channel is the ordinary high–water mark.

TR–55 means the United States Department of Agriculture, Natural Resources Conservation Service (previously Soil Conservation Service), Urban Hydrology for Small Watersheds, Second Edition, Technical Release 55, June 1986.

Type II distribution means a rainfall type curve as established in the "United States Department of Agriculture, Soil Conservation Service, Technical Paper 149, published 1973". The Type II curve is applicable to all of Wisconsin and represents the most intense storm pattern.

Waters of the state has the meaning given in s. 281.01 (18), Wis. Stats.

9. That Division 2 of Article III – Post Construction Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee is hereby created and shall be entitled "Standards".

10. That Section 43-700 of Division 2 – Standards, Article III – Post Construction Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Technical Standards" is hereby created to read as follows:

    The following methods shall be used in designing the water quality, peak flow shaving and infiltration components of stormwater practices needed to meet the water quality standards of this article:

    (a) Technical standards identified, developed or disseminated by the Wisconsin Department of Natural Resources under subchapter V of chapter NR 151, Wis. Adm. Code.

    (b) Where technical standards have not been identified or developed by the Wisconsin Department of Natural Resources, other technical standards may be used provided that the methods have been approved by the Zoning Administrator.

    (c) In this article, the following year(s) and location(s) has been selected as average annual rainfall(s): Green Bay, 1969 (Mar. 29–Nov. 25).

(d) Total suspended solids calculations shall utilize the United States Environmental Protection Agency (USEPA) National Urban Runoff Program (NURP) particle size distribution.

11. That Section 43-750 of Division 2 – Standards, Article III – Post Construction Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Performance Standards" is hereby created to read as follows:

(a) *Responsible party.* The responsible party shall implement a post–construction stormwater management plan that incorporates the requirements of this section.

(b) *Plan.* A written stormwater management plan in accordance with Section 43-1010 shall be developed and implemented for each post–construction site.

(c) *Requirements.* The plan required under subparagraph (b) shall include the following:

(1) *Total suspended solids.* BMPs shall be designed, installed and maintained to control total suspended solids carried in runoff from the post–construction site as follows:

(a) For new development, by design, reduce to the maximum extent practicable, the total suspended solids load by 80%, based on the average annual rainfall, as compared to no runoff management controls. No person shall be required to exceed an 80% total suspended solids reduction to meet the requirements of this subdivision.

(b) For redevelopment, by design, reduce to the maximum extent practicable, the total suspended solids load by 40%, based on the average annual rainfall, as compared to no runoff management controls. No person shall be required to exceed a 40% total suspended solids reduction to meet the requirements of this subdivision.

(c) For in–fill development by design, reduce to the maximum extent practicable, the total suspended solids load by 80%, based on an average annual rainfall, as compared to no runoff management controls. No person shall be required to exceed an 80% total suspended solids reduction to meet the requirements of this subdivision.

(d) Notwithstanding subds. (a) to (c)., if the design cannot achieve the applicable total suspended solids reduction specified, the stormwater management plan shall include a written and site–specific explanation why that level of reduction is not attained and the total suspended solids load shall be reduced to the maximum extent practicable.

(2) *Peak discharge.*

(a). By design, BMPs shall be employed to maintain or reduce the peak runoff discharge rates, to the maximum extent practicable, as compared to predevelopment conditions for the 2–year, 24–hour; the 10-year, 24-hour; the 25-year, 24-hour and the 100-year, 24-hour design storm applicable to the post–construction site. BMPs shall be employed to safely pass the 100-year, 24-hour design storm applicable to the post-construction site. Pre–development conditions shall assume "good hydrologic conditions" for appropriate land covers as identified in TR–55 or an equivalent methodology. The meaning of "hydrologic soil group" and "runoff curve number" are as determined in TR–55. However, when pre–development land cover is cropland, rather than using TR–55 values for cropland, the runoff curve numbers in Table 1 shall be used.

Design storms shall be SCS Type II distribution or, preferably, appropriate rainfall distributions taken from Floyd A. Huff and James R. Angel, Rainfall Frequency Atlas of the Midwest, Midwestern Climate Center, Illinois State Water Survey, 1992.

Table 1 – Maximum Pre–Development Runoff Curve Numbers for Cropland Areas

Hydrologic Soil Group	A	B	C	D
Runoff Curve Number	56	70	79	83

(3) *Infiltration.* BMPs shall be designed, installed, and maintained to infiltrate runoff in accordance with the following, except as provided in subds. (e) through (h):

a. For residential developments one of the following shall be met:

(1) Infiltrate sufficient runoff volume so that the post–development infiltration volume shall be at least 90% of the pre–development infiltration volume, based on an average annual rainfall. However, when designing appropriate infiltration systems to meet this requirement, no more than 1% of the project site is required as an effective infiltration area.

(2) Infiltrate 25% of the post–development runoff from the 2 year – 24 hour design storm with a type I I distribution. Separate curve numbers for pervious and impervious surfaces shall be used to calculate runoff volumes and not composite curve numbers as defined in TR–55. However, when designing appropriate infiltration systems to meet this requirement, no more than 1% of the project site is required as an effective infiltration area.

b. For non–residential development, including commercial, industrial and institutional development, one of the following shall be met:

(1) Infiltrate sufficient runoff volume so that the post–development infiltration volume shall be at least 60% of the pre–development infiltration volume, based on an average annual rainfall. However, when designing appropriate infiltration systems to meet this requirement, no more than 2% of the project site is required as an effective infiltration area.

(2) Infiltrate 10% of the runoff from the 2 year – 24 hour design storm with a type II distribution. Separate curve numbers for pervious and impervious surfaces shall be used to calculate runoff volumes, and not composite curve numbers as defined in TR–55. However, when designing appropriate infiltration systems to meet this requirement, no more than 2% of the project site is required as an effective infiltration area.

c. Pre–development condition shall be the same as in par. (b).

d. A model to calculate runoff volumes using a methodology approved by the City of Mosinee must be used.

e. Before infiltrating runoff, pretreatment shall be required for parking lot runoff and for runoff from new road construction in commercial, industrial and institutional areas that will enter an infiltration system. The pretreatment shall be designed to protect the infiltration system from clogging prior to scheduled maintenance and to protect groundwater quality in accordance with subd. (h). Pretreatment options may include, but are not limited to, oil/grease separation, sedimentation, biofiltration, filtration, swales or filter strips.

f. Exclusions. The runoff from the following areas are prohibited from meeting the requirements of this paragraph:

(1) Areas associated with tier 1 industrial facilities identified in s. NR 216.21(2)(a), Wis. Adm. Code, including storage, loading, rooftop and parking.

(2) Storage and loading areas of tier 2 industrial facilities identified in s. NR 216.21(2)(b), Wis. Adm. Code.

(3) Fueling and vehicle maintenance areas.

(4) Areas within 1000 feet upgradient or within 100 feet downgradient of karst features.

(5) Areas with less than 3 feet separation distance from the bottom of the infiltration system to the elevation of seasonal high groundwater or the top of bedrock, except this subsection does not prohibit infiltration of roof runoff.

(6) Areas with runoff from industrial, commercial and institutional parking lots and roads and residential arterial roads with less than 5 feet separation distance from the bottom of the infiltration system to the elevation of seasonal high groundwater or the top of bedrock.

(7) Areas within 400 feet of a community water system well as specified in s. NR 811.16(4), Wis. Adm. Code, or within 100 feet of a private well as specified in s. NR 812.08(4), Wis. Adm. Code, for runoff infiltrated from commercial, industrial and institutional land uses or regional devices for residential development.

(8) Areas where contaminants of concern, as defined in s. NR 720.03(2), Wis. Adm. Code are present in the soil through which infiltration will occur.

(9) Any area where the soil does not exhibit one of the following soil characteristics between the bottom of the infiltration system and the seasonal high groundwater and top of bedrock: at least a 3–foot soil layer with 20% fines or greater; or at least a 5–foot soil layer with 10 percent fines or greater. This does not apply where the soil medium within the infiltration system provides an equivalent level of protection. This subsection does not prohibit infiltration of roof runoff.

g. Exemptions. The following are not required to meet the requirements of this paragraph:

(1) Areas where the infiltration rate of the soil is less than 0.6 inches/hour measured at the site.

(2) Parking areas and access roads less than 5,000 square feet for commercial and industrial development.

(3) Infiltration areas during periods when the soil on the site is frozen.

(4) Roads in commercial, industrial and institutional land uses and arterial residential roads

h. Where alternate uses of runoff are employed, such as for toilet flushing, laundry or irrigation, such alternate use shall be given equal credit toward the infiltration volume required by this paragraph.

(1) Infiltration systems designed in accordance with this paragraph shall, to the extent technically and economically feasible, minimize the level of pollutants infiltrating to groundwater and shall maintain compliance with the preventive action limit at a point of standards application in accordance with ch. NR 140, Wis. Adm. Code. However, if site specific information indicates that compliance with a preventive action limit is not achievable, the infiltration BMP may not be installed or shall be modified to prevent infiltration to the maximum extent practicable.

(2) Notwithstanding subparagraph (1), the discharge from BMPs shall remain below the enforcement standard at the point of standards application.

(4) *Protective areas.*

a. "Protective area" means an area of land that commences at the top of the channel of lakes, streams and rivers, or at the delineated boundary of wetlands, and that is the greatest of the following widths, as measured horizontally from the top of the channel or delineated wetland boundary to the closest impervious surface. However, in this paragraph, "protective area" does not include any area of land adjacent to any stream enclosed within a pipe or culvert, such that runoff cannot enter the enclosure at this location.

1. For outstanding resource waters and exceptional resource waters, and for wetlands in areas of special natural resource interest as specified in s. NR 103.04, 75 feet.

2. For perennial and intermittent streams identified on a United States geological survey 7.5–minute series topographic map, or a county soil survey map, whichever is more current, 50 feet.

3. For lakes, 50 feet.

4. For highly susceptible wetlands, 50 feet. Highly susceptible wetlands include the following types: fens, sedge meadows, bogs, low prairies, conifer swamps, shrub swamps, other forested wetlands, fresh wet meadows, shallow marshes, deep marshes and seasonally flooded basins. Wetland boundary delineations shall be made in accordance with s. NR 103.08(1m). This paragraph does not apply to wetlands that have been completely filled in accordance with all applicable state and federal regulations. The protective area for wetlands that have been partially filled in accordance with all applicable state and federal regulations shall be measured from the wetland boundary delineation after fill has been placed.

5. For less susceptible wetlands, 10 percent of the average wetland width, but no less than 10 feet nor more than 30 feet. Less susceptible wetlands include degraded wetlands dominated by invasive species such as reed canary grass.

6. In subsection. a.1., a.4 and a.5, determinations of the extent of the protective area adjacent to wetlands shall be made on the basis of the sensitivity and runoff susceptibility of the wetland in accordance with the standards and criteria in s. NR 103.03.

7. For concentrated flow channels with drainage areas greater than 130 acres, 10 feet.

b. This paragraph applies to post–construction sites located within a protective area, except those areas exempted pursuant to subsection d below.

c. The following requirements shall be met:

1. Impervious surfaces shall be kept out of the protective area. The stormwater management plan shall contain a written site–specific explanation for any parts of the protective area that are disturbed during construction.

2. Where land disturbing construction activity occurs within a protective area, and where no impervious surface is present, adequate sod or self–sustaining vegetative cover of 70% or greater shall be established and maintained. The adequate sod or self–sustaining vegetative cover shall be sufficient to provide for bank stability, maintenance of fish habitat and filtering of pollutants from upslope overland flow areas under sheet flow conditions. Non–vegetative materials, such as rock riprap, may be employed on the bank as necessary to prevent erosion, such as on steep slopes or where high velocity flows occur.

3. Best management practices such as filter strips, swales, or wet detention basins that are designed to control pollutants from non–point sources may be located in the protective area.

d. This paragraph does not apply to:

1. Structures that cross or access surface waters such as boat landings, bridges and culverts.

2. Structures constructed in accordance with s. 59.692(1v), Wis. Stats.

3. Post–construction sites from which runoff does not enter the surface water, except to the extent that vegetative ground cover is necessary to maintain bank stability.

(5) *Fueling and vehicle maintenance areas.* Fueling and vehicle maintenance areas shall have BMPs designed, installed and maintained to reduce petroleum within runoff, such that the runoff that enters waters of the state contains no visible petroleum sheen.

(6) *Swale treatment for transportation facilities.*

a. Applicability. Except as provided in subsection (b) below, transportation facilities that use swales for runoff conveyance and pollutant removal meet all of the requirements of this section, if the swales are designed to do all of the following:

1. Be vegetated. However, where appropriate, non–vegetative measures may be employed to prevent erosion or provide for runoff treatment, such as rock riprap stabilization or check dams.

2. Carry runoff through a swale for 200 feet or more in length that is designed with a flow velocity no greater than 1.5 feet per second for the peak flow generated using either a 2–year, 24–hour design storm or a 2–year storm with a duration equal to the time of concentration as appropriate. If a swale of 200 feet in length cannot be designed with a flow velocity of 1.5 feet per second or less, then the flow velocity shall be reduced to the maximum extent practicable.

b. Exemptions. The Zoning Administrator may, consistent with water quality standards, require other provisions of this section be met on a transportation facility with an average daily travel of vehicles greater than 2500 and where the initial surface water of the state that the runoff directly enters is any of the following:

1. An outstanding resource water.

2. An exceptional resource water.

3. Waters listed in s. 303(d) of the Federal Clean Water Act that are identified as impaired in whole or in part, due to nonpoint source impacts.

4. Waters where targeted performance standards are developed under s. NR 151.004, Wis. Adm. Code, to meet water quality standards.

(d) *General considerations for on-site and off-site stormwater management measures.* The following considerations shall be observed in managing runoff:

(1) Natural topography and land cover features such as natural swales, natural depressions, native soil infiltrating capacity, and natural groundwater recharge areas shall be preserved and used, to the extent possible, to meet the requirements of this section.

(2) Emergency overland flow for all stormwater facilities shall be provided to prevent exceeding the safe capacity of downstream drainage facilities and prevent endangerment of downstream property or public safety.

(3) Except as provided herein, all rainleader downspouts shall be placed so that drainage is to pervious surfaces. The owner is responsible for arranging drainage in a manner that complies with the law. Rainwater from downspouts shall be drained so as not to cause flooding of or dampness to walls, ceilings, or floors in any portion of the building or in and adjacent building, structure, or property. Downspout placement shall be allowed so long as no conflicts exist with this section or any other applicable municipal codes.

(e) *Location and regional treatment option.*

(1) The BMPs may be located on–site or off–site as part of a regional storm water device, practice or system.

(2) Post–construction runoff within a non–navigable surface water that flows into a BMP, such as a wet detention pond, is not required to meet the performance standards of this article. Post–construction BMPs may be located in non–navigable surface waters.

(3) Except as allowed under subparagraph (4), post–construction runoff from new development shall meet the post–construction performance standards prior to entering a navigable surface water.

(4) Post–construction runoff from any development within a navigable surface water that flows into a BMP is not required to meet the performance standards of this article if:

a. The BMP was constructed prior to the effective date of this article and the BMP either received a permit issued under ch. 30, Stats., or the BMP did not require a ch. 30, Wis. Stats., permit; and

b. The BMP is designed to provide runoff treatment from future upland development.

(5) Runoff from existing development shall meet the post–construction performance standards in accordance with this paragraph.

a. To the maximum extent practicable, BMPs shall be located to treat runoff prior to discharge to navigable surface waters.

b. Post–construction BMPs for such runoff may be located in a navigable surface water if allowable under all other applicable federal, state and local regulations such as ch. NR 103, Wis. Adm. Code and ch. 30, Wis. Stats.

(6) The discharge of runoff from a BMP, such as a wet detention pond, or after a series of such BMPs is subject to this chapter.

(7) The Zoning Administrator may approve off–site management measures provided that all of the following conditions are met:

a. The Zoning Administrator determines that the post–construction runoff is covered by a stormwater management system plan that is approved by the City of Mosinee and that contains management requirements consistent with the purpose and intent of this article.

b. The off–site facility meets all of the following conditions:

1. The facility is in place.

2. The facility is designed and adequately sized to provide a level of stormwater control equal to or greater than that which would be afforded by on–site practices meeting the performance standards of this article.

3. The facility has a legally obligated entity responsible for its long–term operation and maintenance.

(8) Where a regional treatment option exists such that the Zoning Administrator exempts the applicant from all or part of the minimum on–site stormwater management requirements, the applicant shall be required to pay a fee in an amount determined in negotiation with the Zoning Administrator. In determining the fee for post–construction runoff, the Zoning Administrator shall consider an equitable distribution of the cost for land, engineering design, construction, and maintenance of the regional treatment option.

(f) *Alternate Requirements*. The Zoning Administrator may establish stormwater management requirements more stringent than those set forth in this section if the Zoning Administrator determines that an added level of protection is needed to protect sensitive resources.

12. That Division 3 of Article III – Post Construction Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee is hereby created and shall be entitled "Administration".

13. That Section 43-900 of Division 3 – Administration, Article III – Post Construction Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Permitting requirements, procedures and fees" is hereby created to read as follows:

(a) *Permit required.* No responsible party may undertake a land disturbing construction activity without receiving a post–construction runoff permit from the Zoning Administrator prior to commencing the proposed activity.

(b) *Permit application and fees.* Unless specifically excluded by this article, any responsible party desiring a permit shall submit to the Zoning Administrator a permit application made on a form provided by the Zoning Administrator for that purpose.

(1) Unless otherwise excepted by this article, a permit application must be accompanied by a stormwater management plan, a maintenance agreement and a non–refundable permit administration fee.

(2) The stormwater management plan shall be prepared to meet the requirements of Section 43-750 and Section 43-1010, the maintenance agreement shall be prepared to meet the requirements of Section 43-1030, the financial guarantee shall meet the requirements of Section 43-1050, and fees shall be those established by the Common Council as set forth in Section 43-2000.

(c) *Review and approval of permit application.* The Zoning Administrator shall review any permit application that is submitted with a stormwater management plan, maintenance agreement, and the required fee. The following approval procedure shall be used:

1. Within 30 calendar days of the receipt of a complete permit application, including all items as required by sub. (b), the Zoning Administrator shall inform the applicant whether the application, plan and maintenance agreement are approved or disapproved based on the requirements of this article.

2. If the stormwater permit application, plan and maintenance agreement are approved, or if an agreed upon payment of fees in lieu of stormwater management practices is made, the Zoning Administrator shall issue the permit.

3. If the stormwater permit application, plan or maintenance agreement is disapproved, the Zoning Administrator shall detail in writing the reasons for disapproval.

4. The Zoning Administrator may request additional information from the applicant. If additional information is submitted, the Zoning Administrator shall have 30 business days from the date the additional information is received to inform the applicant that the plan and maintenance agreement are either approved or disapproved.

(d) *Permit requirements*. All permits issued under this article shall be subject to the following conditions, and holders of permits issued under this article shall be deemed to have accepted these conditions. The Zoning Administrator may suspend or revoke a permit for violation of a permit condition, following written notification of the responsible party. An action by the Zoning Administrator to suspend or revoke this permit may be appealed in accordance with this article.

1. Compliance with this permit does not relieve the responsible party of the responsibility to comply with other applicable federal, state, and local laws and regulations. Copies of all applicable state, federal and local permits shall be submitted to administering authority.

2. The responsible party shall design and install all structural and non–structural stormwater management measures in accordance with the approved stormwater management plan and this permit.

3. The responsible party shall notify the Zoning Administrator at least 7 business days before commencing any work in conjunction with the stormwater management plan, and within 7 business days upon completion of the stormwater management practices. If required as a special condition under subsection 5, the responsible party shall make additional notification according to a schedule set forth by the Zoning Administrator so that practice installations can be inspected during construction.

4. Practice installations required as part of this article shall be surveyed by a Registered Land Surveyor or Professional Engineer and certified "as built" by a licensed professional engineer or hydrologist. Completed stormwater management practices must pass a final inspection by the Zoning Administrator or its designee to determine if they are in accordance with the approved stormwater management plan and this article. The Zoning Administrator or its designee shall notify the responsible party in writing of any changes required in such practices to bring them into compliance with the conditions of this permit.

5. The responsible party shall notify the Zoning Administrator of any significant modifications it intends to make to an approved stormwater management plan. The Zoning Administrator may require that the proposed modifications be submitted to it for approval prior to incorporation into the stormwater management plan and execution by the responsible party.

6. The responsible party shall maintain all stormwater management practices in accordance with the stormwater management plan until the practices either become the responsibility of the City of Mosinee or are transferred to subsequent private owners as specified in the approved maintenance agreement.

7. The responsible party authorizes the Zoning Administrator to perform any work or operations necessary to bring stormwater management measures into conformance with the approved stormwater management plan, and consents to a special assessment or charge against the property as authorized under subch. VII of ch. 66, Wis. Stats., or to charging such costs against the financial guarantee posted under Section 43-1050.

8. If so directed by the Zoning Administrator, the responsible party shall repair at the responsible party's own expense all damage to adjoining municipal facilities and drainage ways caused by runoff, where such damage is caused by activities that are not in compliance with the approved stormwater management plan.

9. The responsible party shall permit property access to the Zoning Administrator or its designee for the purpose of inspecting the property for compliance with the approved stormwater management plan and this permit.

10. Where site development or redevelopment involves changes in direction, increases in peak rate and/or total volume of runoff from a site, the Zoning Administrator will require the responsible party to make appropriate legal arrangements with affected property owners concerning the prevention of endangerment to property or public safety.

11. The responsible party is subject to the enforcement actions and penalties detailed in Section 43-2010, if the responsible party fails to comply with the terms of this permit.

(e) *Permit conditions.* Permits issued under this subsection may include conditions established by Zoning Administrator in addition to the requirements needed to meet the performance standards in Section 43-750 or a financial guarantee as provided for in Section 43-1050.

(f) *Permit duration.* Permits issued under this section shall be valid from the date of issuance through the date the Zoning Administrator notifies the responsible party that all stormwater management practices have passed the final inspection required under sub. (d)(4).

14. That Division 4 of Article III – Post Construction Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee is hereby created and shall be entitled "Stormwater Management Plan and Maintenance Agreement".

15. That Section 43-1010 of Division 4 – Stormwater Management Plan and Maintenance Agreement, Article III – Post Construction Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Stormwater Management Plan" is hereby created to read as follows:

(a) *Plan requirements.* The stormwater management plan required under Section 43-900(b) shall contain at a minimum the following information:

(1) Name, address, and telephone number for the following or their designees: landowner; developer; project engineer for practice design and certification; person(s) responsible for installation of stormwater management practices; and person(s) responsible for maintenance of stormwater management practices prior to the transfer, if any, of maintenance responsibility to another party.

(2) A proper legal description of the property proposed to be developed, referenced to the U.S. Public Land Survey system or to block and lot numbers within a recorded land subdivision plat.

(3) Pre–development site conditions, including:

a. One or more site maps at a scale of not less than 1 inch equals 40 feet. The site maps shall show the following: site location and legal property description; predominant soil types and hydrologic soil groups; existing cover type and condition; topographic contours of the site at a scale not to exceed 2 feet; topography and drainage network including enough of the contiguous properties to show runoff patterns onto, through, and from the site; watercourses that may affect or be affected by runoff from the site; flow path and direction for all stormwater conveyance sections; watershed boundaries used in hydrology determinations to show compliance with performance standards; lakes, streams, WiDNR and Army Corps of Engineers certified wetlands, channels, ditches, and other watercourses on and immediately adjacent to the site; limits of the 100 year floodplain; location of wells and wellhead protection areas covering the project area and delineated pursuant to s. NR 811.16, Wis. Adm. Code.

b. Hydrology and pollutant loading computations as needed to show compliance with performance standards. All major assumptions used in developing input parameters shall be clearly stated. The geographic areas used in making the calculations shall be clearly cross–referenced to the required map(s).

(4) Post–development site conditions, including:

a. Explanation of the provisions to preserve and use natural topography and land cover features to minimize changes in peak flow runoff rates and volumes to surface waters and wetlands.

b. Explanation of any restrictions on stormwater management measures in the development area imposed by wellhead protection plans and ordinances.

c. One or more site maps at a scale of not less than 1 inch equals 40 feet showing the following: post–construction pervious areas including vegetative cover type and condition; impervious surfaces including all buildings, structures, and pavement; post–construction topographic contours of the site at a scale not to exceed 2 feet; post–construction drainage network including enough of the contiguous properties to show runoff patterns onto, through, and from the site; locations and dimensions of drainage easements; locations of maintenance easements specified in the maintenance agreement; flow path and direction for all stormwater conveyance sections; location and type of all stormwater management conveyance and treatment practices, including the on–site and off–site tributary drainage area; location and type of conveyance system that will carry runoff from the drainage and treatment practices to the nearest adequate outlet such as a curbed street, storm drain, or natural drainage way; watershed boundaries used in hydrology and pollutant loading calculations and any changes to lakes, streams, wetlands, channels, ditches, and other watercourses on and immediately adjacent to the site.

d. Hydrology and pollutant loading computations as needed to show compliance with performance standards. The computations shall be made for each discharge point in the development, and the geographic areas used in making the calculations shall be clearly cross–referenced to the required map(s).

e. Results of investigations of soils and groundwater required for the placement and design of stormwater management measures. Detailed drawings including cross–sections and profiles of all permanent stormwater conveyance and treatment practices.

(5) Description and installation schedule for the stormwater management practices needed to meet the performance standards in Section 43-750.

(6) A maintenance plan developed for the life of each stormwater management practice including the required maintenance activities and maintenance activity schedule.

(7) Cost estimates for the construction, operation, and maintenance of each stormwater management practice.

(8) Other information requested in writing by the Zoning Administrator to determine compliance of the proposed stormwater management measures with the provisions of this article.

(9) All site investigations, plans, designs, computations, and drawings shall be certified by a professional engineer or hydrologist licensed in the State of Wisconsin to be prepared in accordance with accepted engineering practice and requirements of this article.

(b) *Alternate requirements.* The Zoning Administrator may prescribe alternative submittal requirements for applicants seeking an exemption to on–site stormwater management performance standards under Section 43-750(e).

16. That Section 43-1030 of Division 4 – Stormwater Management Plan and Maintenance Agreement, Article III – Post Construction Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Maintenance Agreement" is hereby created to read as follows:

(a) *Maintenance Agreement Required.* The maintenance agreement required under Section 43-900(b) for stormwater management practices shall be an agreement between the City and the responsible party to provide for maintenance of stormwater practices beyond the duration period of this permit. The maintenance agreement shall be filed with the County Register of Deeds as a property deed restriction so that it is binding upon all subsequent owners of the land served by the stormwater management practices.

(b) *Agreement Provision.* The maintenance agreement shall contain the following information and provisions and be consistent with the maintenance plan required by Section 43-1010(a)(6):

1. Identification of the stormwater facilities and designation of the drainage area served by the facilities.

2. A schedule for regular maintenance of each aspect of the stormwater management system consistent with the stormwater management plan required under Section 43-900(b).

3. Identification of the party(s) responsible for long term maintenance of the stormwater management practices identified in the stormwater management plan required under Section 43-900 (b).

4. Requirement that the responsible party(s) shall maintain stormwater management practices in accordance with the schedule included in par. 2.

5. Authorization for the Zoning Administrator or designee to access the property to conduct inspections of stormwater management practices as necessary to ascertain that the practices are being maintained and operated in accordance with the agreement.

6. A requirement on the Zoning Administrator to maintain public records of the results of the site inspections, to inform the responsible party responsible for maintenance of the inspection results, and to specifically indicate any corrective actions required to bring the stormwater management practice into proper working condition.

7. Agreement that the party designated under par. 3, as responsible for long term maintenance of the stormwater management practices, shall be notified by the Zoning Administrator of maintenance problems which require correction. The specified corrective actions shall be undertaken within a reasonable time frame as set by the Zoning Administrator.

8. Authorization of the Zoning Administrator to perform the corrected actions identified in the inspection report if the responsible party designated under par. 3 does not make the required corrections in the specified time period. The Zoning Administrator shall enter the amount due on the tax rolls and collect the money as a special charge against the property pursuant to subch. VII of ch. 66, Wis. Stats.

17. That Section 43-1050 of Division 4 – Stormwater Management Plan and Maintenance Agreement, Article III – Post Construction Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Financial Guarantee" is hereby created to read as follows:

(a) *Establishment of guarantee*. The Zoning Administrator will require the submittal of a financial guarantee, the form and type of which shall be acceptable to the Zoning Administrator. The financial guarantee shall be in an amount determined by the Zoning Administrator to be the estimated cost of construction and the estimated cost of maintenance of the stormwater management practices during the period which the designated party in the maintenance agreement has maintenance responsibility. The financial guarantee shall give the Zoning Administrator the authorization to use the funds to complete the stormwater management practices if the responsible

party defaults or does not properly implement the approved stormwater management plan, upon written notice to the responsible party by the Zoning Administrator that the requirements of this article have not been met.

(b) *Conditions for release.* Conditions for the release of the financial guarantee are as follows:

(1) The Zoning Administrator shall release the portion of the financial guarantee established under this section, less any costs incurred by the Zoning Administrator to complete installation of practices, upon submission of "as built plans" by a licensed professional engineer. The Zoning Administrator may make provisions for a partial pro–rata release of the financial guarantee based on the completion of various development stages.

(2) The Zoning Administrator shall release the portion of the financial guarantee established under this section to assure maintenance of stormwater practices, less any costs incurred by the Zoning Administrator, at such time that the responsibility for practice maintenance is passed on to another entity via an approved maintenance agreement.

18. That Division 5 of Article III – Post Construction Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee is hereby created and shall be entitled "Administration".

19. That Section 43-2000 of Division 5 – Administration, Article III – Post Construction Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Fee schedule" is hereby created to read as follows:

The fees referred to in other sections of this article shall be established by the Common Council and may from time to time be modified by resolution. A schedule of the fees established by the Common Council shall be available for review at City Hall.

20. That Section 43-2010 of Division 5 – Administration, Article III – Post Construction Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Enforcement" is hereby created to read as follows:

(a) Any land disturbing construction activity or post–construction runoff initiated after the effective date of this article by any person, firm, association, or corporation subject to the article provisions shall be deemed a violation unless conducted in accordance with the requirements of this article.

(b) The Zoning Administrator shall notify the responsible party by certified mail of any non–complying land disturbing construction activity or post–construction runoff. The notice shall describe the nature of the violation, remedial actions needed, a schedule for remedial action, and additional enforcement action which may be taken.

(c) Upon receipt of written notification from the Zoning Administrator under sub. (b), the responsible party shall correct work that does not comply with the stormwater management plan or other provisions of this permit. The responsible party shall make corrections as necessary to meet the specifications and schedule set forth by the Zoning Administrator in the notice.

(d) If the violations to a permit issued pursuant to this article are likely to result in damage to properties, public facilities, or waters of the state, the Zoning Administrator may enter the land and take emergency actions necessary to prevent such damage. The costs incurred by the City of Mosinee plus interest and legal costs shall be billed to the responsible party.

(e) The Zoning Administrator is authorized to post a stop work order on all land disturbing construction activity that is in violation of this article, or to request the City Attorney to obtain a cease and desist order in any court with jurisdiction.

(f) The Zoning Administrator may revoke a permit issued under this article for non–compliance with article provisions.

(g) Any permit revocation, stop work order, or cease and desist order shall remain in effect unless retracted by the Zoning Administrator or by a court with jurisdiction.

(h) The Zoning Administrator is authorized to refer any violation of this article, or of a stop work order or cease and desist order issued pursuant to this article, to the City Attorney for the commencement of further legal proceedings in any court with jurisdiction.

(i) Any person, firm, association, or corporation who does not comply with the provisions of this article shall be subject to a forfeiture of not less than $100 dollars or more than $5,000 dollars per offense, together with the costs of prosecution. Each day that the violation exists shall constitute a separate offense.

(j) Compliance with the provisions of this article may also be enforced by injunction in any court with jurisdiction. It shall not be necessary to prosecute for forfeiture or a cease and desist order before resorting to injunctional proceedings.

(k) When the Zoning Administrator determines that the holder of a permit issued pursuant to this article has failed to follow practices set forth in the stormwater management plan, or has failed to comply with schedules set forth in said stormwater management plan, the Zoning Administrator or a party designated by the Zoning Administrator, may enter upon the land and perform the work or other operations necessary to bring the condition of said lands into conformance with requirements of the approved plan. The Zoning Administrator shall keep a detailed accounting of the costs and expenses of performing this work. These costs and expenses shall be deducted from any financial security posted pursuant to Section 43-1050 of this article. Where such a security has not been established, or where such a security is insufficient to cover these costs, the costs and expenses shall be entered on the tax roll as a special charge against the property and collected with any other taxes levied thereon for the year in which the work is completed.

21. That Section 43-2030 of Division 5 – Administration, Article III – Post Construction Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Appeals" is hereby created to read as follows:

    (a) *Board of Appeals.* The Zoning Board of Appeals, created pursuant to Section 2-436 of the City of Mosinee Code of Ordinances pursuant to s. 62.23(7)(e), Wis. Stats, shall hear and decide appeals where it is alleged that there is error in any order, decision or determination made by the Zoning Administrator in administering this article. The board shall also use the rules, procedures, duties, and powers authorized by statute in hearing and deciding appeals. Upon appeal, the board may authorize variances from the provisions of this article that are not contrary to the public interest, and where owing to special conditions a literal enforcement of the article will result in unnecessary hardship.

    (b) *Who may appeal.* Appeals to the Zoning Board of Appeals may be taken by any aggrieved person or by an officer, department, board, or bureau of the City of Mosinee affected by any decision of the Zoning Administrator.

22. That Section 43-2040 of Division 5 – Administration, Article III – Post Construction Control Regulations, Chapter 43 - Stormwater Management Regulations, of the Code of Ordinances for the City of Mosinee entitled "Severability" is hereby created to read as follows:

    If any section, clause, provision or portion of this article is judged unconstitutional or invalid by a court of competent jurisdiction, the remainder of the article shall remain in force and not be affected by such judgment.

23. That this ordinance shall be in full force and effect 30 days upon adoption and publication in accordance with applicable state statutes.

24. That all prior ordinances and parts of ordinances in conflict with this ordinance are hereby repealed.

Adopted and approved by the Common Council of the City of Mosinee on this 30TH day of MARCH, 2009.

Alan Erickson, Mayor

Attest: Bruce R. Jamroz, City Clerk/Treasurer

Illicit Discharge Detection and Elimination (IDDE) Program Procedures

Prepared for:
City of Mosinee
WPDES Permit No. WI-S050075
225 Main Street
Mosinee, WI 54455

Prepared by:
AECOM
200 Indiana Avenue
Stevens Point, WI 54481

January 2010

AECOM Project No. 104349

TABLE OF CONTENTS

LIST OF APPENDICES

Appendix

1.0 ILLICIT DISCHARGE STRATEGY

A. The Wisconsin Department of Natural Resources (WDNR) requires that the City develop a strategy to address all types of illicit discharges.

B. The City's overall strategy is as follows:

1. The City will develop a program to inspect the major outfalls for signs of illicit discharges on an annual basis. If flows are found, they shall be analyzed using approved methods. If necessary, an investigation will be performed to track those discharges to their source. If the flows are found to be an illicit discharge, a procedure will be implemented to remove them from the storm drainage system.

2. Inform the public on procedures for reporting spills and illicit discharges and improve their awareness of stormwater related pollution and ways to reduce it.

This strategy is described in more detail in the program elements that follow.

2.0 FIELD SCREENING

A. The WDNR requires that the City develop procedures and methods for performing field screening at all major outfalls.

1. Methods shall include visual and grab sample analysis according to NR 216.07(3), Wisconsin Administrative Code. Additional methods may be included at the City's discretion.

2. The safety of personnel and accessibility of the location shall be considered when performing field screenings.

3. Field screening points shall be located where practicable, either at the outfall, farthest downstream manhole, or other accessible location downstream in the system.

B. The City proposes the following program to comply with the requirements of Section 2.A:

The City will conduct a field screening analysis of all major outfalls once in 2009. Field analysis points shall be located where practicable at the outfall, farthest downstream manhole, or other accessible location downstream in the system. The field screening analysis will follow the guidelines of NR 216.07(3)(i) for field screening and will be conducted during dry weather periods (typically at least 72 hours after any measurable rainfall). A sample Illicit Discharge Inspection Form is attached and will be used for all inspections to record color, turbidity, surface sheen, odor, flow depth, flow velocity, deposits or stains, damage to outfall structures, temperature, and chemical testing results (if necessary).

If an outfall exhibits no dry weather flow during the 2009 field screening and drains only residential neighborhoods that are not expected to produce significant non-point source pollution, the City will not screen that outfall during subsequent years for the duration of the permit. All other major outfall locations will be screened annually, regardless of whether or not they exhibited dry weather flow unless mutually agreed upon.

If any flow is observed, the City will perform a field chemical analysis of the outfall. The field chemical analysis will consist of one grab sample that will be tested using a field test kit. The test kit will provide approximate readings for pH, total chlorine, total copper, total phenols, and detergents or surfactants. The results of the testing are recorded on the Illicit Discharge Inspection Form.

3.0 INVESTIGATION OF POTENTIAL ILLICIT DISCHARGES

A. The WDNR requires that the City develop procedures to be followed to investigate those areas of the municipal separate storm sewer system that, based on the results of field screening analysis or other information, indicate a reasonable potential for containing illicit discharges, illicit connections, or other sources of non-stormwater.

The following are not considered illicit discharges unless identified by either the City of Mosinee or the department as a significant source of pollutants to waters of the state:

1. Water line flushing
2. Landscape irrigation
3. Diverted stream flows
4. Uncontaminated ground water infiltration
5. Uncontaminated pumped ground water
6. Discharges from potable water sources
7. Foundation drains
8. Air conditioning condensate
9. Irrigation water
10. Lawn watering
11. Individual residential car washing
12. Flows from riparian habitats and wetlands
13. Dechlorinated swimming pool water
14. Street wash water
15. Fire fighting

If any of these discharges are identified as significant sources of pollutants, the City of Mosinee shall incorporate appropriate control measures into the stormwater management program.

B. The City proposes the following program to comply with the requirements listed in Section 3.A:

For those major outfalls identified in the field chemical analysis or identified by other information as having a reasonable potential for containing illicit discharges or other sources of unallowable non-stormwater discharges, the City will attempt to locate the source of the potential discharge. The following procedure will generally be followed:

1. The suspect outfall will be tested using the grab sample technique identified above to confirm the presence of the suspect contaminant(s).

2. The sampling crew will follow the storm drainage system to the next accessible upstream manhole or storm sewer junction to confirm the flow and contaminant. This procedure will be continued until the suspect illicit discharge contaminant is isolated.

3. The crew will sample within the isolated area using the test kits to further attempt to locate the source of the discharge.

4. Once the location is narrowed down, the crew will search for obvious signs of illicit connections and discharges.

5. Building records may be researched to identify potential cross connections and discussions will be held with building owners.

6. If no immediate source is apparent after visual site inspection of sewers and buildings, the City will consider other methods to identify the flow such as sewer system televising, dye water testing, smoke testing, etc.

4.0 ELIMINATION OF POTENTIAL ILLICIT DISCHARGES

A. The WDNR requires that the City develop procedures to eliminate illicit connections or discharges following detection. Features of the procedure shall include:

1. The elimination of illicit connections shall be done as expediently as possible upon identification of responsible parties or within 72 hours if practicable.

2. Prior to disconnection, the City shall require the operator of the illicit connection or illicit discharge to take all reasonable measures to minimize the discharge of pollutants to the municipal separate storm sewer system.

3. The City proposes the following program to comply with the requirements listed in Section 4.A:

When an illicit connection/discharge is located, the City will begin procedures to work with the subject property/owner to eliminate the connection as expediently as possible. Prior to the actual disconnection, the City will require the owner/operator of the illicit connection/discharge to take all reasonable measures to minimize the discharge of pollutants to the municipal storm sewer system. Each illicit connection/discharge discovery will be handled on a case-by-case basis. The City has not prepared an exact remedy or timeframe for illicit discharge correction because of the wide variability of potential discharge situations but will attempt to meet the 72-hour disconnection time as identified in their permit. More complicated or costly remedies may take a longer period of time to correct. If it appears that more than 72 hours will be required to remedy the situation, the WDNR will be contacted and provided details on the problem, interim measures to eliminate or reduce pollutant exposure, and a timeline for complete elimination.

5.0 PUBLIC REPORTING OF DISCHARGES

A. The WDNR requires that the City develop procedures for the promotion of public reporting of the presence of illicit discharges or water quality impacts associated with discharges from municipal separate storm sewers. This may include stormwater inlet stenciling, neighborhood storm watches, and hotlines to report dumping.

B. The City proposes the following program to comply with the requirements listed in Section 5.A:

In an effort to promote public reporting of the presence of illicit discharges or water quality impacts associated with discharges from the municipal separate storm sewer system, a contact name and number will be published in the Mosinee Times and placed on the City's website. The public will be asked to call the number and relay their suspicions of illegal dumping activities or unusual discoloration or odors in outfall flows or receiving waters.

In addition, the City will explore opportunities to provide the public with educational materials on non-point source pollution including illicit discharges in their public information and education program. The subject matter will include, but not be limited to, activities that may pollute stormwater (such as used oil management, toxic materials, yard waste, pet waste, lawn care, and car washing) and practices to eliminate or reduce non-point pollution (such as rain gardens, rooftop disconnections and other source area management practices). The City will use materials that are readily available from sources such as the UW-Extension and the WDNR.

6.0 SANITARY INFILTRATION INTO STORM SEWER SYSTEMS

A. The WDNR requires that the City develop a program with controls to limit infiltration of leakage from municipal sanitary sewers into the municipal separate storm sewer system.

B. The City proposes the following program to comply with the requirements listed in Section 6.A:

If field screening and sampling indicate the presence of pollutants, but point source discharges are not readily apparent, infiltration from sanitary sewer leakage may be responsible. The City will consider investigating the sanitary sewer system in the area of the suspected discharge in an effort to identify the probability of sanitary sewer leakage. Methods of investigation may include sewer system televising, smoke testing, dye water testing, etc.

7.0 IMPLEMENTATION

As required, the dry weather screening program was implemented in 2009.

APPENDIX B

INSTRUCTIONS FOR CONDUCTING AN ILLICIT DISCHARGE DETECTION DRY WEATHER SCREENING

1. During dry weather (less than 0.1 inch of precipitation in the previous 72 hours), locate the outfall. Verify that the site matches the picture and project description on the Illicit Discharge Inspection Form.

2. Inspect the outfall conditions.

    a. Is the pipe in good condition?

    b. Are there any other factors that should be noted? (e.g. sediment in pipe, end-wall is broken or missing)

3. Fill out the top section including inspector name, date, and date/amount of last rainfall on the Illicit Discharge Inspection Form.

4. Is the outfall dry?

    a. If the outfall is dry, state that the outfall is not active and proceed to the next site.

    b. If it is wet but the amount of flow is insufficient to sample, document on the inspection form that the outfall is active but the flow is insufficient to measure go to step No. 5.

    c. If enough flowing water is present to obtain a sample, measure the ambient (air) temperature and document it on the form.

        Document that the outfall is active, and go to step No. 5.

    d. If standing water is present in the outfall, conduct the inspection process at the manhole upstream from the outfall. If the first manhole upstream of the outfall contains standing water, attempt the inspection process at the next manhole upstream. If the second manhole upstream from the outfall (third specific site related to this outfall) also contains standing water, write “submerged” after the “is pipe/outfall active” question on the inspection form.

    e. Look around for buildings, factories, or other possible connections that are leading to the flow. Note these facilities on the inspection form.

5. Observe and write down the following:

    a. Color (clear, rusty, note other colors, etc.)

    b. Odor (organic, diesel, etc.)

c. Turbidity (sediment in the water, can you see flocculants or cloudiness in the water)

d. Floatables (objects in the water)

e. Surface Sheen (oil sheen)

6. Record the water depth in the outfall structure on the inspection form.

7. Estimate the velocity of the water by professional judgment. Velocity can be estimated by placing a small floating object such as a twig or leaf in the outfall and counting the number of seconds the object takes to travel an estimated distance.

8. Take a grab sample with the sample cup. Rinse the sample cup out with water from the outfall. Ideally, the sample is captured by placing the cup under the outfall and allowing water to fall into the cup. Many outfall configurations prevent this procedure. In such instances, carefully obtain the sample by placing the collection cup into the flowing stream of water. Take the sample without scraping the cup on the bottom of the pipe/outfall, as the scraping can dislodge sediment which may cause inappropriate chemical test results.

9. Complete chemical testing in accordance with the attached test procedures and document the testing results on the inspection form. If any of the test results exceed the thresholds on the inspection form, call:

Kevin Breit
City of Mosinee
Director of Public Works
225 Main Street
Mosinee, WI 54455
(715) 693-3840

APPENDIX D

2009 RESULTS/CONCLUSIONS

Detailed observations and results for each outfall are provided on the inspection forms included in Appendix A and summarized in Table A.

TABLE A
OUTFALL LOCATION/DESCRIPTION

Outfall ID	Outfall Location	Pipe Size (inches)	Receiving Waterbody
BJC-1	N/S Old 51 50 ft± South of Bielen Road	36	Bull Junior Creek
BJC-5	N/S Indianhead 200 ft into Golf Club	18	Bull Junior Creek
BJC-6	At Pond Opp Golf Club N/S Indianhead	15	Bull Junior Creek
BJC-7	Drains S/S to SW	24	Bull Junior Creek
BJC-7	E/S Indianhead 75 ft± North of North View, Drains S/S to NW	24	Bull Junior Creek
BJC-7	Cross Culver for Creek Flow West to East	30	Bull Junior Creek
BJC-8	At intersection STH 153 and West View	18	Bull Junior Creek
BJC-9	At intersection Golf Club and STH 153	30	Bull Junior Creek
BJC-10	At intersection East View and STH 153		Bull Junior Creek
BJC-13	On W/S Golden Hawk between Maple Ridge and Alyx Lane	36	Bull Junior Creek
MF-2	W/S 14th 200 ft North of CTH B at edge of pond	42	Mosinee Flowage
WR-1	In Park at Waters Edge	32	Wisconsin River
WR-9	500 ft± south of Elm and Pasha	24	Wisconsin River
WR-10	East of North End of Soccer Field	36	Wisconsin River
WR-14	West end Luke Street S/S		Wisconsin River

The results from testing conducted in October 2009 are below minimum detectable limits. See Table B for expected parameter ranges. All the outfalls are within an acceptable range for active outfalls.

TABLE B
EXPECTED PARAMETER RANGES

Parameter	Lowest Limits of Detection from Chemetrics Kit	Parameter Accuracy	Follow-up Level (1)
pH	0.0 ≤ Sample ≤ 14.0	+/- 0.1	Sample <6.0 Sample >9.0
Color	N/A	N/A	Color Present
Turbidity	N/A	N/A	Turbidity Present
Surface Sheen	N/A	N/A	Sheen Present
Odor	N/A	N/A	Odor Present
Detergents	Sample < 0.25 mg/L	0.125 – 0.5 mg/L	Sample ≥ 0.5 mg/L
Total Chlorine	Sample < 0.1 mg/L	0.05 – 0.25 mg/L	Sample ≥ 1.0 mg/L
Phenols	Sample < 0.1 mg/L	0.05 – 1.0 mg/L	Sample ≥ 0.1 mg/L
Total Copper	Sample < 0.1 mg/L	0.05 – 1.0 mg/L	Sample ≥ 0.2 mg/L

Results from all of the outfalls were entered and summarized. Chemical information was also included and is shown in Table C.

It is recommended that each outfall continue to be monitored once per year.

TABLE D
RECOMMENDED MONITORING PROGRAM

Outfalls	Recommendation
All	Monitor annually (test if flow is present)
All	If outfall tests show elevated pollutant readings, conduct follow-up investigation

About AECOM
AECOM (NYSE: ACM) is a global provider of professional technical and management support services to a broad range of markets, including transportation, facilities, environmental and energy. With more than 40,000 employees around the world, AECOM is a leader in all of the key markets that it serves. AECOM provides a blend of global reach, local knowledge, innovation, and technical excellence in delivering solutions that enhance and sustain the world's built, natural, and social environments.

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Method for Predicting the Efficiency of Proprietary Storm Water Sedimentation Devices (1006)

Wisconsin Department of Commerce
Wisconsin Department of Natural Resources
Conservation Practice Standard

Introduction and Organization

Both regulators and the regulated community must be able to predict how well proprietary sedimentation devices will perform in the field. These predictions will be used in storm water management planning and for evaluating compliance with regulatory and grant programs.

The purpose of this standard is to establish a uniform process for predicting the site-specific efficiency of proprietary sedimentation devices. There are two approaches that may be used in Wisconsin to meet state regulatory and grant requirements:

- One is to use an acceptable model that calculates efficiency based on Stokes' Law settling.
- The other is to use an acceptable model that contains device-specific efficiency data in lieu of Stokes' Law settling.

This technical standard is separated into four divisions. The first division is the core of the technical standard, and includes modeling and reporting requirements for predicting device efficiency using either Stokes' Law settling or device-specific efficiency data. The second division is Appendix A, which establishes criteria for acceptable models. The third division is Appendix B, which establishes laboratory testing criteria for defining device-specific efficiency curves when used in lieu of Stokes' Law settling. The fourth division is Appendix C, the required method for using a coulter counter to quantify small sediment particles under the laboratory testing protocol.

Throughout the text of this standard and its appendices:

- the term "Section" refers to portions of the technical standard proper;
- the term "Part" refers to portions of the appendices;
- criteria are requirements that must be met to comply with the standard; and
- considerations include additional background information and recommendations, which may be followed at the discretion of the user.

Words in the standard that are shown in italics are described in VIII. Definitions. The words are italicized the first time they are used in the text.

TABLE OF CONTENTS

Method for Predicting the Efficiency of Proprietary Storm Water Sedimentation Devices

I. Definition

This standard includes modeling, data and reporting requirements for predicting the efficiency of *proprietary flow-through storm water sedimentation devices* (*devices*) in reducing *total suspended solids* mass loads and concentrations. This standard also includes device installation and maintenance requirements necessary to assure devices are installed consistent with modeling assumptions. This standard does not constitute a *general product approval method*.

II. Purpose

This standard is used to predict the reduction in the *average annual* mass load of total suspended solids and to predict the concentration of total suspended solids discharged from a sedimentation device when installed to treat runoff from a specific drainage area of defined characteristics. Application of this standard provides information necessary for regulators and the regulated community to predict the effectiveness of these devices in meeting *regulatory*, grant-based and other storm water management requirements and goals.

III. Applicability

A. This standard applies to devices installed to control total suspended solids, through *sedimentation processes*, from *development*, *new development*, *re-development* and *infill areas*.

B. These methods and procedures are acceptable as a basis for evaluating whether predicted device performance meets State of Wisconsin regulatory and grant requirements for urban storm water management.

Note: See Consideration VI.A and VI.B. for information about state requirements.

IV. Federal, State and Local Laws

Users of this standard shall be aware of applicable federal, state and local laws, rules, regulations or permit requirements governing the installation, maintenance and required treatment efficiency of proprietary devices. This standard does not contain the text of any federal, state or local laws.

V. Criteria

A. **Modeling Requirements**

1. **Accepted Model Required**. An accepted model shall be used to predict the reduction in the average annual mass load of total suspended solids and to predict the concentration of total suspended solids discharged from a sedimentation device installed to treat runoff from a specific drainage area of defined characteristics.

   a. The Source Loading and Management Model (SLAMM) is accepted for this use when applied in accordance with the modeling procedures specified in Appendix A, Parts 1.0 and 2.0.

   b. The administering authority may approve other models using the approval process set forth in Appendix A, Part 3.0.

2. **Model Process Sub-routines**. The model may predict pollution control efficiency based on either of the following:

   a. **Theoretical Sedimentation Modeling Method**. This method predicts the total suspended solids reduction efficiency of a device based on principles of gravity settling (Stokes' Law and Newton's Law).

   Note: See Consideration VI.C for a discussion of Stokes' and Newton's law settling.

   b. **Laboratory Data-Based Sedimentation Modeling Method**. This method predicts the total suspended solids reduction efficiency of a device based on device-specific efficiency data generated in a laboratory in lieu of generic gravity settling algorithms.

      i. The efficiency data for tested devices shall be generated in accordance with the laboratory testing protocol and reporting requirements presented in Appendix B.

      ii. Laboratory data collected and evaluated in accordance with Appendix B may be scaled for use with untested devices in the same device classification. Scaling shall meet the requirements of Appendix B, Part 3.2.A and the analysis and reporting requirements of Appendix B, Part 6.0.

   Note: In this method, the device pollutant reduction efficiency reflects the sum total of gravimetric and enhanced settling processes provided by the device. Although scour is not modeled as a separate process, scour testing is required to identify the design treatment flow rate

and by-pass requirements for modeling and installation.

B. **Requirements for Reporting Performance Predictions**. The following information shall be reported to the *administering state agency* in support of performance predictions for a device installed to control total suspended solids in a drainage area of specified characteristics.

1. Device name, schematic (plan and elevation) diagrams and model number.
2. Device cross-sectional surface area and dimensions used in making the surface area calculation.
3. *Design treatment flow rate* for the device.
4. Sump information, including: depth of clean sump (in feet) as measured from the bottom of the sediment chamber to the outlet invert; and maximum allowable sediment depth (in feet) as measured from the bottom of the sediment chamber to the top of the maximum allowable sediment depth.
5. By-pass information, including: location (internal, external); flow-rated capacity; and justification for selected by-pass capacity.
6. Tributary area size, land use type, acres of the paved and unpaved surfaces, and the connectedness of these areas to the storm drain system.
7. Identity of model input files.
8. Efficiency determinations:
   a. Average annual % reduction of total suspended solids mass load; and
   b. Range and mean of the event-mean total suspended solids discharge concentrations.

C. **Device Installation and Maintenance Requirements**. Proprietary sedimentation devices shall be installed and maintained in a manner consistent with laboratory testing and modeling assumptions used to predict effectiveness. This includes the following requirements:

1. The device shall be installed in accordance with manufacturer recommendations.
2. The installed device shall be equipped with an internal or external bypass to divert flows in excess of the design treatment flow rate.
   a. For the Theoretical Sedimentation Modeling Method, the design treatment flow rate shall not exceed .08 cfs/ft^2, where ft^2 is the cross sectional area of the primary sedimentation chamber.

   Note: See Considerations VI.D. for the derivation of this factor.

   b. For the Laboratory Data-Based Sedimentation Modeling Method, the design treatment flow rate shall be determined through the scour verification testing conducted under Appendix B, Part 4.0.
3. Accumulated pollutants shall be removed from the device as recommended by the manufacturer. This includes periodic removal of sediment to maintain device efficiency and reduce scour. Sediment shall not be allowed to accumulate to a depth greater than the *maximum recommended sediment storage depth*.
4. If the device is modeled using the Theoretical Sedimentation Modeling Method, the device shall be equipped with either a permanent pool having a depth at least three (3) feet above the maximum sediment storage depth to reduce scour, or shall be equipped with internal flow control structures to reduce scour velocities.

   Note: See Consideration VI.E for a discussion of scour.

VI. Considerations

A. Regulations Comm 20, Comm 60, NR 151 and NR 216, Wis. Adm. Code, either contain or make reference to requirements for reducing the average annual mass load of total suspended solids discharged in storm water runoff to waters of the state. Comm 82, Wis. Adm. Code, establishes requirements for the effluent concentrations of total suspended solids discharged from *storm water plumbing systems* to subsurface dispersal or irrigation areas.

B. Comm 82, Wis. Adm. Code, also includes effluent limitations on the discharge of oil & grease, BOD_5 and fecal coliform from storm water plumbing systems to subsurface dispersal or irrigation systems. This standard does not address the effectiveness of these devices for reducing these pollutants.

C. The theoretical sedimentation model approach applies the upflow (surface overflow) equation to

a defined particle size distribution. The predicted reductions apply to the influent load estimated for each runoff event. Load reductions are predicted by particle size class. Scour is not typically modeled as a separate process. The model also predicts the event mean total suspended solids discharge concentrations for each runoff event based on the combined effects of device treatment and by-passing.

The method predicts retention efficiency based on the upflow (surface overflow) equation:

v= Q/A, where:

v = critical particle settling velocity

Q = discharge rate from the sedimentation chamber

A = sedimentation chamber surface area

Stokes' law is for laminar flow conditions and is generally applicable to plain settling for particles up to about 100 µm in size. Newton's law is applicable for turbulent settling, generally for particles larger than 5,000 µm in diameter (assuming a specific gravity of about 2.65). Between these sizes, a smooth transition is used to predict settling. Stokes' Law covers the most critical range, where most of the storm water particles are likely present, and the large particles are "easily" captured by the proprietary devices.

D. For devices modeled using the Theoretical Sedimentation Modeling Method, the design treatment flow rate shall not exceed .08 cfs/ft^2, where ft^2 is the cross sectional area of the primary sedimentation chamber. This limitation is intended to reduce scour by requiring that larger flows by-pass the treatment chamber. The factor of .08 is based on the settling rate of a 250 micron particle size with a specific gravity of 2.7 in water at a temperature of 68^o F, and a safety factor of 1.5. The 250 micron particle size was selected as a basis for scour protection for three reasons. First, an average of 73% of the particles removed from three proprietary devices are 250 microns or greater, thus, limiting the expected mass of material subject to scour (see Table B-7 in Appendix B). Second, it is anticipated that some of the remaining 27% of the trapped load, which would be less than 250 microns in size, would be protected from scour by armoring. Third, an evaluation of design parameters for four selected families of proprietary devices indicates that this by-pass requirement is practical, as it can be met by nearly all of these devices using their existing by-pass capacities.

E. The Theoretical Sedimentation Modeling Method assumes no re-suspension (scour) of previously trapped material, which is known to occur and which will decrease efficiency of the device. The requirement for by-pass or internal flow controls is meant to reduce scour so that modeled efficiency is closer to actual operating efficiency. The Theoretical Sedimentation Modeling Method also does not account for any other processes, such as filtration, which can increase pollution control efficiency.

VII. Bibliography

Bannerman, Roger, 2005, *Verification of a Method for Sizing All Proprietary Single Chamber Treatment Devices with Settling as a Unit Process*, StormCon Proceedings, www.STormCon.com.

BaySaver Technologies, Inc. 2006, *Peclet Number Relationships*, BaySaver Technologies, Inc., 1302 Rising Ridge Road, Suite 1, Mount Airy, Md. 21771.

Burton, Allen G. and Pitt, Robert E., *Stormwater Effects Handbook: A Toolbox for Watershed Managers, Scientists, and Engineers*; Lewis Publishers, 2002.

California, Massachusetts, Maryland, New Jersey, Pennsylvania, and Virginia, 2003, *The TARP Protocol for Stormwater Best Management Practice Demonstrations*.

Dhamotharan, S., Gulliver, J.S., and Stefan, H.G., 1981, *Unsteady One-Dimensional Settling of Suspended Sediment Water Resources Research*, Vol. 17, No. 4, pp. 1125-1132.

Horwatich, J.A., Bannerman, R.T., and Pearson, R., 2007, *Effectiveness of a Hydrodynamic Settling Device and a Stormwater Filtration Device in Milwaukee, Wis.*, U.S. Geological Technical Report.

Hydro International, 2005, *Procedure for Hydrodynamic Separator Washout Testing*, Hydro International, 94 Hutchins Drive, Portland, Maine 04102.

Hydro International, 2005, *Procedure for Testing an Advanced Hydrodynamic Vortex Separator by the Direct Method*, Hydro International, 94 Hutchins Drive, Portland, ME 04102.

Imbrium, 2004, *Total Suspended Solids Removal Laboratory Testing Protocol*, Imbrium, Canada.

Pitt, R. and Voorhees, J., 2002, winslamm.com.

Pitt, R. and Voorhees, J., 2003, *The Design, Use, and Evaluation of Wet Detention Ponds for Stormwater Quality Management*.

Waschbusch, R.J., 1999, *Evaluation of the Effectiveness of an Urban Stormwater Treatment Unit in Madison, Wisconsin, 1996-1997*; U.S. Geological Survey Water-Resources Investigations Report 99-4195, 49 pp.

VIII. Definitions

Administering state agency (V.B.): The state agency or its agents responsible for administering the storm water regulations applicable to the site. Responsible state agencies are the Department of Natural Resources for NR 151 and NR 216, Wis. Adm. Code, and the Department of Commerce for Comm 20, Comm 60 and Comm 82, Wis. Adm. Code.

Average Annual (II): A condition (such as rainfall or mass load) characterized by a calendar year of precipitation, excluding snow, which is considered typical. Typical average rainfall years for five regions in Wisconsin are available from the Department of Natural Resources.

Design treatment flow rate (V.B.3.): The maximum hydraulic discharge capacity (volume/time) of the sedimentation treatment chamber allowable for installations in Wisconsin. It is the capacity at which scour losses are acceptable, as determined by the requirements of this standard.

Note: The design treatment flow rate has a safety factor built in. The safety factor is 1.5 for devices modeled with the Theoretical Sedimentation Modeling Method (See VI.D.). The safety factor is 1.2 for devices that have had a scour verification test under Appendix B, Part 4.0.

Development (III.A.): As defined in NR 151.002, Wis. Adm. Code.

Devices (I): See definition of *Proprietary flow-through storm water sedimentation device.*

Device classification (Appendix B, Part 1.1): A group or "family" of devices that include similar geometry, flow pattern, sedimentation mechanism and high-flow bypass ability. Devices in the same classification are best thought of as a series of devices of different sizes offered under a similar name by the same manufacturer.

General product approval method (I): A method that gives blanket approval for use of a device.

In-fill area (III.A.): As defined in NR 151.002, Wis. Adm. Code.

Maximum recommended sediment storage depth (V.C.3.) This is the maximum depth of sediment accumulation recommended by the manufacturer to maintain acceptable sediment removal efficiency and reduce scour losses.

For devices modeled using the Theoretical Sedimentation Modeling Method, this depth is specified by the device manufacturer.

For devices modeled using the Laboratory Data-Based Sedimentation Method, it is the sediment depth at which the device passes the scour verification test specified in Appendix B, Part 4.0.

New development (III.A.): As defined in NR 151.002, Wis. Adm. Code.

Proprietary flow-through storm water sedimentation device (I): A chamber or set of chambers (which may include internal baffles or other equipment and associated piping) that is provided as a defined product by a commercial vendor, and is warranted by that vendor to provide specific storm water pollutant removal performance under specified conditions. These devices can consist of prefabricated equipment supplied by a manufacturer, structures constructed on-site, or a combination thereof.

Redevelopment (III.A.): As defined in NR 151.002, Wis. Adm. Code.

Regulatory (II): Decisions made in administering state storm water management requirements. This includes sites regulated by the Department of Natural Resources under NR 151 and NR 216, Wis. Adm. Code, and the Department of Commerce under Comm 20, Comm 60 and Comm 82, Wis. Adm. Code.

Sedimentation processes (III.A.): Removal of sediment by a device through entrainment in the settling chamber(s). Includes basic gravity settling as well as settling enhanced through other physical processes such as centrifugation or tube settling. It does not include the effects of filtration.

Storm water plumbing system (VI.A.): Piping, appliances and devices that convey, hold or treat storm water from building runoff. This includes all piping connected to piping conveying runoff from buildings. The portion of the storm plumbing system under the authority of the Wisconsin Uniform Plumbing Code is that portion conveying storm water to the municipal system or discharging to grade.

Suspended sediment concentration (Appendix B, Part 3.1.C.): Operationally defined as the concentration or mass of sediment determined by testing under method ASTM D3977-97 (1989 Standard Methods).

Total suspended solids (I): Operationally defined as the concentration or mass of sediment determined by testing under method EPA 160.2 (EPA 1979).

Appendix A

Criteria for the Theoretical Sedimentation Modeling Method and Laboratory Data-Based Sedimentation Modeling Method

1.0 Introduction

This appendix contains modeling requirements for predicting the site-specific efficiency of proprietary flow through sedimentation devices. The pollution reduction algorithms used in the model may be based either on basic Stokes' Law settling or on device-specific efficiency data generated under the lab protocol set forth in Appendix B.

SLAMM is an accepted model for both the theoretical sedimentation modeling method and the laboratory data-based modeling method. Part 2.0 of this appendix covers requirements for using the Source Loading and Management Model (SLAMM).

An alternative model to SLAMM may be used, but it must be accepted by the administering authority under Part 3.0 of this appendix.

2.0 Modeling Procedures

Note: See Section V.B of this technical standard for reporting requirements.

2.1. **General Modeling Requirements.** The following requirements apply when using models in either the theoretical sedimentation modeling method or the laboratory data-based sedimentation modeling method.

A. The NURP particle size distribution shall be assumed for the influent storm water.

Note: The NURP particle size distribution is shown in the first two columns of Appendix B, Table B-6.

B. The rainfall files shall meet those specified by the Department of Natural Resources.

Note: DNR requirements for rainfall files can be found either in NR 151, Wis. Adm. Code, or on the DNR Website.

C. The device shall be modeled to by-pass flows greater than the design treatment flow rate. The modeled design treatment flow rate of the device shall not exceed the flows allowed under sections V.C.2.a or V.C.2.b of the standard.

D. Efficiency calculations shall include by-pass effects in final calculations of mass load reduction and concentration of total suspended solids discharged in the device's effluent. Water by-passed around the sedimentation chamber shall be modeled as receiving zero treatment.

E. The device surface area shall be the plan-view area of the settling chamber where the bulk of the sedimentation occurs.

F. Credit shall not be given for sedimentation that occurs, or is predicted to occur, in storm water conveyance pipes leading to or exiting the device.

2.2 **Additional SLAMM Modeling Requirements for the Theoretical Modeling Method**

A. SLAMM version 9.0.1, or later, shall be used. The SLAMM model is available from PV & Associates at http://www.winslamm.com.

B. For model versions 9.0.1 through 9.2.0, the catch-basin subroutine shall be used to model the device. For model version 9.2.1 or later, the hydrodynamic device subroutine shall be used.

C. Parameter files appropriate for use in Wisconsin are identified in Table A-1. File selection depends on the version of SLAMM being used. Parameter files shall be selected in accordance with the following Table A-1.

Table A-1. Parameter Files Required When Using SLAMM for the Theoretical Sedimentation Modeling Method or the Laboratory Data-Based Sedimentation Modeling Method

Parameter File	Model v. 9.0.1	Model v. 9.1.0 – 9.1.2____ ____	Model v. 9.2.0
Rainfall (*.ran)	Select files, start & end dates in accordance with s. NR 151.12(1)	Select files, start & end dates in accordance with s. NR 151.12(1)	Select files, start & end dates and winter season range in accordance with s. NR 151.12(1)
Particle Size Distr.	NURP.cpz	NURP.cpz	NURP.cpz
Pollutant File	WI_GEO01.ppd	WI_GEO01.ppd	WI_GEO01.ppd
Delivery File	WI_DLV01.prr	WI_DLV01.prr	WI_DLV01.prr
Particulate Solids Concentration File	WI_AVG01.psc	WI_AVG01.psc	WI_AVG01.psc
Runoff Coefficient File	WI_SL01.rsv	WI_SL01.rsv	WI_SL06 Dec06.rsv
Street Delivery Files	WI_Com Inst Indust May05.std WI_Res and Other Urban May05.std	WI_Com Inst Indust May05.std WI_Res and Other Urban May05.std Freeway.std	WI_Res and Other Urban Dec06.std WI_Com Inst Indust Dec06.std Freeway Dec06.std

2.3 **Additional SLAMM Modeling Requirements for Laboratory Data-Based Modeling Method**

A. SLAMM version 9.2.1, or later, shall be used.

B. The hydrodynamic device subroutine shall be used.

C. The parameter files shown in Table A-1 for model version 9.2.1, or later, shall be used.

D. Lab tested efficiency input data – The device performance shall be modeled using efficiency data developed from the data collected and analyzed in accordance with Appendix B.

Note: The Department of Natural Resources will take the data reported for the laboratory testing under Appendix B, Part 6.0 and incorporate it into SLAMM as device-defined efficiency data. Manufacturer's reports on performance projections may be reviewed by a technical committee prior to incorporating the device efficiency data into SLAMM. The administering state agency may make revisions to the manufacturer's performance projections based on comments of the technical committee. The administering state agency will give the manufacturer an opportunity to challenge any such changes.

3.0 Approval of Alternative Models

A. The administering authority may approve the use of a model other than WinSLAMM. In making its determination, the administering authority will use the following process.

B. The applicant shall submit a written request to the administering authority that identifies the proposed model and justification as to why the alternative model should be accepted.

C. If acceptable monitoring data has been collected during field test, the justification for acceptance of the alternative model shall be based on a comparison of modeled device efficiency to monitored device efficiency. In the absence of acceptable monitoring data, the device efficiency determined with the alternative model shall be compared with the device efficiency determined using WinSLAMM.

1. To be acceptable, monitoring data shall have been collected and analyzed using the U.S. EPA Environmental Testing Verification Protocol. In performing the comparative analysis, the site characteristics of the monitored site shall be used as inputs in the model.

Note: In 2007, test data sets were available for Stormceptor, Vortechs, and Downstream Defender devices. The Stormceptor, Vortechs,and Downstream Defender were the subject of intensive monitoring efforts designed to verify the performance of each device and verify the load reductions estimated by WinSLAMM. All the monitoring was conducted by the U.S. Geological Survey (USGS) and the results of the monitoring are available in USGS reports. Verification of the Vortechs and Downstream Defender was part of EPA's Environmental Technology Verification (ETV) program.

D. Comparisons shall be made using the sum of the loads (SOL) method, where:

% Load Reduction =

(inlet SOL – outlet SOL)/inlet SOL * 100, where

Note: The SOL is the combined percent load reduction efficiencies for all the modeled events and provides a measure of the overall performance efficiency for the events sampled during the monitoring period.

E. The administering authority shall compare the applicant's modeling results with the monitored results or the WinSLAMM results for the test site and make a determination whether the alternative model is acceptable. For acceptance based on monitored efficiency, the alternative modeling method must be able to produce an estimate of the device efficiency that is within 15 percentage points of the efficiency measured in the field. For approval based on a comparison with WinSLAMM, the alternative model must be able to produce an estimate of device efficiency within 5 percentage points of the efficiency determined using WinSLAMM.

F. The administering authority will send a written response to the applicant with a decision concerning the acceptability of the alternative model. Until a written acceptance is determined, the proposed model is not accepted for documenting compliance with any regulations at site installations.

Appendix B

Wisconsin Laboratory Testing Method for Determining and Reporting The Performance of Proprietary Storm Water Sedimentation Devices

1.0 Introduction

1.1 Purpose and Overview of Testing Method

The purpose of this testing method is to determine the performance of a full-scale device in a lab setting. The data from this testing will be used to prepare pollutant reduction efficiency curves for incorporation into models that will in turn be used to predict the annual efficiency of the device when deployed in a specific location under a specified annual rainfall sequence.

In this appendix, the word "testing" refers to a suite of tests. The suite of tests for each device includes a set of sedimentation tests and a scour verification test. The set of sedimentation tests includes a defined test repeated for each of four specified flow rates.

In the sedimentation tests, total suspended solids (TSS) and suspended solids concentrations (SSC) of the influent and effluent are measured to determine pollution control efficiency. A mass balance of sediment entering and retained in the device provides supplemental data. Performance data is evaluated by particle size class at four flow rates. Performance may also be reported for untested devices within a *device classification* based on scaling relationships determined from the test data. Data may be reported to the Department of Natural Resources for incorporation into the Source Loading and Management Model (SLAMM), or may be incorporated into an alternative model accepted in accordance with Appendix A, Part 3.0.

The scour verification test is run once at a stepped, increasing flow rate to identify by-pass requirements for the device.

1.2 Testing Objectives

Objective 1. To quantify the mass, by particle size class, of sediment particles trapped by a device under different flow rates.

Objective 2. To present and analyze data to show device efficiency as a function of particle size and flow rate, and to show scaling relationships for predicting the efficiency of untested devices in the same device classification.

Objective 3. To verify that at flows up to 1.2 times the design treatment flow rate, significant scour of previously deposited sediment does not occur.

2.0 Laboratory and Data Analyst Qualifications

2.1. Laboratory Qualifications

A. Laboratory testing shall be conducted by an independent laboratory, or shall be overseen by an independent party if conducted at the manufacturer's own laboratory.

B. The laboratory conducting the performance testing must be able to provide the range of flows, sediment characteristics, measurement and recording systems, and trained personnel necessary to generate reliable test results. A general statement of laboratory qualifications shall be submitted with the required report (see Part 6.0.)

C. If the manufacturer is using its own lab and an independent observer, the observer shall meet the following requirements:

i) The observer shall have no financial or personal conflict of interest regarding the test results.

ii) The observer shall have experience in a hydraulics, sampling and sedimentation lab, be familiar with the test and lab methods specified in this standard and have a professional license in an appropriate discipline.

iii) The observer shall approve the experimental set-up and lab testing protocol and observe the test during its full duration.

D. Prior to initiating tests, the manufacturer shall contact the administering state agency to discuss selection of a laboratory to conduct the required testing. If the manufacturer is using its own lab, it shall contact the administering state agency to discuss selection of an independent observer.

i) For the Department of Natural Resources, contact:

Wisconsin Department of Natural Resources
Attn: State Storm Water Coordinator
Bureau of Watershed Management

101 South Webster Street
P.O. Box 7921
Madison, WI 53707-7921
General Bureau Phone: (608) 267-7694

ii) For the Department of Commerce, contact:

Wisconsin Department of Commerce
Attn: Plumbing Product Review
Safety and Buildings Division
P.O. Box 7162
Madison, WI 53707-7162
Phone: (608) 266-6742

2.2 **Data Analysis**

A. The analysis of lab data shall be performed by a qualified individual. A statement of qualification for the selected individual shall be submitted with the report required under Appendix B, Part 6.0.

B. Prior to initiating data analysis the manufacturer shall contact the administering state agency to discuss selection of an individual to perform this task.

3.0 Sediment Removal Performance Testing

3.1 **Test Parameters**

Note: The scour verification test described under Part 4.0 should be performed first because the results are needed to identify the design treatment flow rate (DTFR). The DTFR is needed to identify flow rates for the sedimentation testing.

A. Flow Rates. Each device shall be tested at a minimum of four discrete steady-state flow rates. These are 5%, 20%, 50% and 100% of the design treatment flow rate.

Note: See Appendix B, Considerations Part 7.0.AA for justification of the selected flow rates.

i) The design treatment flow rate shall not exceed 83% of the maximum flow rate for which the device passes the scour test requirements in Appendix B, Part 4.0.

Note: This provides a safety factor of 1.2.

B. Test Sediment Composition.

i) Test sediment shall be comprised of ground silica mixed in accordance with the proportions shown in Table B-1.

Table B-1. Test Sediment Mix

Total mixed weight: 15.35 lbs.	
US Silica Product Gradation	**Weight**
F 65	0.90 lbs
OK 110	1.2 lbs
Sil-Co-Sil 250	0.25 lbs.
Sil-Co-Sil 106	4.0 lbs.
Sil-Co-Sil 52	1.0 lbs
Min-U-Sil 40	2.0 lbs
Min-U-Sil 30	1.0 lbs
Min-U-Sil 15	1.0 lbs
Min-U-Sil 10	4.0 lbs.

Note: See Appendix B, Considerations Part 7.A. for the derivation of this mix.

ii) A particle size distribution analysis of the dry sediment test mix shall be performed prior to running the lab test and the results shall be reported as part of the requirements set forth under Appendix B, Part 6.0.

C. Influent Concentration. The *suspended sediment concentration* in the influent pipe shall be maintained between 150 mg/l and 250 mg/l. The concentration of inorganic sediment in the influent water prior to adding the test sediment shall be as low as practical.

Note: It is recommended that the concentration of inorganic sediment in the influent water be kept below approximately 10 mg/l prior to mixing with the test sediment.

D. Water Temperature. Water temperature shall be maintained between 50°F and 80°F.

3.2 **Procedure and Data Collection**

A. Number of Devices. When the purpose of the testing is to characterize the efficiency of a series of devices in the same device classification through scaling, testing shall be performed on at least two of the device models.

i) The definition of a device classification shall be the responsibility of the manufacturer. It must be based on technically defensible criteria including similarity between models in geometry, flow pattern, sedimentation mechanism and by-pass.

ii) The devices selected to represent the device classification must reasonably represent the range of device models for which the efficiency curves are being defined. The ratio between the primary sedimentation chamber surface areas of the devices tested shall be at least 2.5.

B. Component tests. For each device model, the required test procedure shall be completed for each of the four flow rates identified in Appendix B, Part 3.1.A.

C. Chamber. A "false floor" shall be constructed in the sediment chamber to simulate a device that is partially filled. The false floor shall be placed to simulate a sediment accumulation of 50% of the maximum recommended sediment storage depth for the device. At the start of the test, the chamber shall be clean of sediment.

D. Test length. Each test shall be run for the duration needed to accumulate a mass of trapped sediment adequate to perform the required analyses.

Note: It is recommended that each sediment removal performance test be run until approximately 5 pounds of material has been trapped. See Appendix B, Considerations Part 7.B for an example calculation of estimated test time to trap this mass of material. If tests can be performed on less than 5 pounds of material, that is acceptable.

E. Sediment sampling frequency. For each test, samples shall be collected and analyzed in accordance with Table B-2. Numbers in parentheses are the minimum number of samples that must be collected and reported for each test flow. Influent samples taken during each test flow may be collected on a random schedule or at equal time intervals. An effluent sample shall be collected immediately after each influent sample.

F. Particle size analysis. The particle size distribution for material in the sediment supply hopper and for material trapped in the sediment chamber shall be determined in accordance with the ASTM standards C117, C136 and D422.

The particle size distribution for samples taken from the influent and effluent pipes shall be determined as follows:

i) Particle sizes 63 microns and greater shall be quantified using ASTM standards C117, C136 and D422.

ii) Particle sizes less than 63 microns shall be quantified using a coulter counter method that conforms to the method set forth in Appendix C.

G. Sample Splitting. Each sample of influent and effluent water shall be collected into three separate bottles to be filled one immediately after the other. One sample bottle is for TSS analysis, one is for SSC analysis and one is for particle size analysis. The TSS, SSC and PSD samples shall be collected in the same order for each flow rate.

Table B-2. Sediment Removal Performance Test: Required Sampling for Each Flow Rate

Sampling Location	Particle Size Distribution	Total Sediment Mass	Total Suspended Solids Concentration	Suspended Sediment Concentration
Sediment Supply Hopper	(1)	Total mass weighed at beginning and end of test		
Influent Pipe	(5)		(5)	(5)
Settling Chamber	(composite from 3 sub-samples of collected mass)	Total mass collected		
Effluent Pipe	(5)		(5)	(5)

H. Flow sampling frequency. Flow shall be monitored throughout the test.

I. Temperature sampling frequency. Water temperature shall be monitored periodically during the course of the test.

4.0 Scour Verification Testing

4.1 **Purpose**

The purpose of the scour verification test is to verify that the device will not lose a significant amount of pre-deposited sediment at a flow rate up to 1.2 times the design treatment flow rate. This verification test

will be used to identify the design treatment flow rate to meet modeling and field installation requirements.

4.2 **Pre-loading and Flow**

A. The sediment chamber shall be pre-loaded to the maximum recommended sediment storage depth. A false floor may be used to create an apparent sediment depth provided that the depth of sediment placed on the false floor averages at least six (6) inches. Sediment shall be well-mixed and distributed as evenly as practical.

B. The material used to pre-load the device shall be mixed according to the formula presented in Table B-3.

Table B-3. Sediment Specifications for the Scour Verification Test

Material	% by Weight
Concrete Sand (ASTM C33)	15
US Silica: Mauricetown Series – NJ 0 Sand	10
US Silica: Mauricetown Series – NJ 4 Sand	20
US Silica: Ottawa Flint Silica Series-Flint #12	15
US Silica: Ottawa Flint Silica Series-Flint #15	10
US Silica: Ottawa Foundary Sand –F60 Grade	15
US Silica: 20/40 OIL FRAC	10
US Silica: HI-50	5

Note: See Appendix B, Considerations Part 7.C. for derivation of this mix.

C. The device shall be filled with clean water to operating depth prior to initiating the scour test. Sediment suspended during the process of filling the chamber shall be given sufficient time to settle prior to initiating scour test flows.

D. The concentration of inorganic sediment in the influent water shall be as low as practical.

Note: It is recommended that the concentration of inorganic sediment in the influent water be kept below approximately 10 mg/l.

4.3 **Scour Test Sampling**

A. Once the scour test sediment has been added to the sediment chamber and allowed to settle, the scour test shall be run starting at the lowest test flow and progressing to increasingly greater flows. Do not add new test sediment to the device for each new test flow.

Each test flow shall be constant for a period of 30 minutes or the time it takes to replace 5 volumes of water in the primary sedimentation chamber, whichever is greater. In calculating the volume to be displaced by the test flow, the volume of the sedimentation chamber shall not include any volume below the maximum sediment storage depth.

Samples shall be collected at equal time intervals during each flow. A viewing window shall be installed in the sediment chamber to allow direct observation and video documentation of scour test results. If scour begins between chosen flow increments, testing shall be adjusted to include the start of scour.

B. Samples for each flow rate shall be collected and analyzed in accordance with Table B-4. All samples shall be discrete samples unless otherwise noted. Numbers in parentheses are the minimum number of samples that must be collected and reported.

Table B-4. Required Sampling for Each Flow Rate of the Sediment Scour Test

Sampling Location	Suspended Sediment Concentration
Influent pipe	(5)
Effluent Pipe	(5)

C. Flow sampling frequency. Flow shall be monitored periodically throughout the course of the test.

D. Temperature sampling frequency. Water temperature shall be monitored periodically throughout the course of the test.

4.4 **Analysis**

A. A device passes the scour test if the average suspended sediment concentration in the effluent pipe does not exceed the average suspended sediment concentration of the influent pipe by more than 25 mg/l.

B. The design treatment flow rate for modeling under Appendix A, Part 2.1.C. shall not exceed 83% of the maximum flow rate for which the device is determined to pass the scour verification test.

Note: This provides a safety factor of 1.2.

5.0 Quality Assurance and Control

Laboratory data submitted under this technical standard shall be collected under a quality assurance/quality control plan. The QA/QC plan shall include the following:

A. Project description.

B. Project organization & responsibility.

C. Data quality objectives.

D. Project test methods.

i) Sample collection methods.

ii) Methods to adjust for expected background concentrations of material in inflow test water.

iii) Calibration of the system used to dose sediment during the sediment removal performance testing, including calibration of sediment dosing equipment and flow pump rates to assure that influent concentrations are maintained within test parameters and that the mass of sediment added to the influent pipe can be accurately measured.

iv) Equipment cleaning and blanks.

v) Duplicate samples.

vi) Sample preservation methods.

vii) Chain of custody.

E. Laboratory procedures.

i) Constituents for analysis.

ii) Laboratory performance standards.

iii) Analysis method references.

iv) Frequency and type of lab QA samples.

v) Data reporting requirements.

vi) Data validation procedures.

vii) Corrective actions.

6.0 Reporting Test Results

6.1 **Laboratory Report**—A laboratory report shall be prepared and submitted to the administering state agency. The report shall follow the following format. The administering state agency may allow deviation from this format upon request of the manufacturer or the lab.

Chapter 1.0 Executive Summary

Chapter 2.0 Background

2.1 Name of laboratory, principal investigator and subcontractors.

2.2 Qualifications statements for laboratories and data analysts.

2.3 Lab equipment list, including: name, model and dimensions (depth & height) of the device tested; pumps, compressors, mixers, valves, flow and water quality sampling equipment; storage tanks; standpipe and plunge pool; and filtration equipment.

2.4. Settling chamber diameter (L_1) and depth (L_2) measurements.

2.5 Inlet and outlet pipe dimensions.

2.6 Results of scour verification test.

2.7 Modifications made to the device to enhance transportation or test feasibility and explanation of why these modifications are not expected to affect the lab results.

2.8 Process flow diagram showing test device, piping, water source, pump, storage tanks, filters, sediment injection system, sampling locations and flow meter.

Chapter 3.0 Sedimentation Efficiency Testing and Results

The following shall be reported for each device tested.

3.1 Date, flow rate and elapsed time for the test.

3.2 Tabular results of test parameters required under Table B-2 (Appendix B, Part 3.2.E). Where particle size data is required, it shall be reported for each of the following 8 particle size classes (in microns):

1) < 20

2) 20 – 40

3) 40 – 63

4) 63 – 80

5) 80 – 125

6) 125 – 250

7) 250 – 300

8) > 300

a. Test Sediment Introduced. Total mass of test sediment placed in the sediment hopper, total mass remaining in the hopper, and total mass (calculated by difference) of test sediment discharged from the hopper during the test. Component mass by particle size class of test sediment placed in the hopper.

b. Influent and Effluent Sampling Results. For each discrete influent and effluent sample, the total suspended solids concentration, the suspended sediment concentration, the component mass and concentration by particle size class.

Note: For each sample, three separate one-liter bottles will need to be filled and submitted to the lab for a specific analysis (SSC, PSD and TSS). Each analysis will be assigned to one of the three bottles, so the order of the analysis will be the same each time. For example, if the first bottle of the three collected is sent to the lab for SSC analysis, this order should be maintained for all samples.

c. Test Sediment Retained. Total mass of test sediment removed from the settling chamber. Component mass by particle size class of sediment removed from the settling chamber.

3.3 Performance Efficiency: Concentration Data. Tabular data for each test flow showing the calculated percent reduction in mass of test sediment based on inlet and outlet concentrations reported in Chapter 3.2 of the lab report. Calculations shall be by total mass and by particle size class.

a. Percent reduction shall be based on a comparison of inlet and outlet concentrations. Discrete sample results must be combined to perform this analysis.

% Reduction = (inlet – outlet)/inlet * 100

b. The report shall describe how the inlet and outlet concentrations determined from discrete sampling are combined in calculating the percent reduction for each test flow.

c. The tabular analysis shall be presented in the following format:

Flow Rate (cfs)	Total Mass Reduction (%)	% Reduction by Particle Size Class (Microns) Based on Inlet/Outlet Concentrations							
		<20	20-40	40-63	63-80	80-125	125-250	250-300	>300
.10*DTFR [1]									
.20*DTFR									
.50*DTFR									
1.00*DTFR									

[1]DTFR = design treatment flow rate as determined by the scour verification test.

d. The tabular data set above shall also be presented in graphical form. A separate graph for each particle size class shall be presented that shows the percent reduction (y) as a function of flow rate (x) for the particle size class. A formula shall be developed for each graph.

Note: See Appendix B, Considerations Part 7.D. for an example of how these data may be graphically reported.

3.4 Performance Efficiency: Mass Retained. Tabular data for each test flow showing the calculated percent reduction based on mass entering the device and mass retained. Calculations shall be by total mass and by particle size class. Particle size classes shall include those identified under Chapter 3.2 of the lab report.

a. Percent reduction shall be based on a comparison of mass of sediment introduced to the sediment chamber and the mass of sediment retained in the sedimentation chamber, where:

% Reduction = (mass retained/mass in) * 100

b. The tabular analysis shall be presented in the following format:

Flow Rate (cfs)	Total Mass Reduction (%)	% Reduction by Particle Size Class (Microns) Based on Mass Introduced and Mass Retained in the Sediment Chamber							
		<20	20-40	40-63	63-80	80-125	125-250	250-300	>300
.10*DTFR [1]									
.20*DTFR									
.50*DTFR									
1.00*DTFR									

[1]DTFR = design treatment flow rate as determined by the scour verification test.

c. Graphical representation of this data is not required.

Chapter 4.0 Scaling Relationships

4.1 Method Documentation

a. Scaling formula.

b. Theoretical basis and verification.

Note: See Appendix B, Considerations Part 7.E. for one approach to scaling.

4.2 Application of Formula to Specific Devices

a. Device characteristics, including critical dimensions and design treatment flow rate.

b. Tabular and graphic results for device (see 3.3.c and 3.3.d above).

Chapter 5.0 Scour Test and Results

5.1 Test date and elapsed time for test.

5.2 Test flow rate.

5.3 Test material used to pre-load the device.

5.4 Influent and effluent concentration measurements.

5.5 Data interpretation.

5.6 Calculated design treatment flow rate for use in Wisconsin.

Note: The calculated design treatment flow rate will be 0.83 times the flow rate at which the device passes the scour test.

Chapter 6.0 Quality Assurance and Control Test Data

Chapter 7.0 Signatures for Report Submittal

The report shall be signed by the laboratory director or his designee, the person responsible for data analysis and reporting and, if applicable, the independent observer. The signers shall attest that the laboratory testing and data analysis has been conducted in accordance with the requirements of this technical standard.

7.0 Considerations

AA. The majority of the annual runoff volume to a properly sized device can be expected to occur during runoff events having peak flow discharges well below the design treatment flow rate. Sediment testing for each device will generate only 4 data points, one for each test flow rate. The flow rates for which data is collected should be reflective of the flow rates that the device will encounter most often when modeled.

Table B.4.A shows modeling results for a theoretical device having a design treatment flow rate of 0.5 cfs and an impervious tributary area of 0.5 acres. The test file included 109 rainfall events. Of the runoff events that did not by-pass the device, most (81%) generated peak flow rates less than or equal to 25% of the DTFR and few events (8%) generated peak flow rates over 50% of the DTFR. This phenomenon has also been observed at actual field installations. Based on this information, test flow rates equal to 5%, 20%, 50%, and 100% of the design treatment flow rate are required. If a manufacturer desires to get additional definition in the efficiency curve for low flows, it can add additional flows at its discretion.

Table B.4.A. Frequency Distribution of Runoff Event Peak Flows Modeled for a Theoretical Device Installation Having 109 Rainfall Events, a DTFR of 0.5 cfs and a Tributary Area of 0.5 Impervious Acres

Peak Flow Class (% of the Design Treatment Flow Rate, or DTFR)	Runoff Events in the Class (number)	Portion of Peak Runoff Events in Class
0 – 25%	81	81%
25 – 50%	11	11%
50 – 75%	5	5%
75 – 100%	3	3%

Note: This modeling exercise includes 109 rainfall events. Nine (9) events exceeded the DTFR and would have by-passed the device. Statistics are based on 100 events.

A. The ground silica mixture required for sediment testing is a modification of a base mix prepared to meet the NURP particle size distribution. The base mix formula was calculated by Hydro, International using a selection of standard ground silica products and a computer program. A batch of the base mix was prepared by Hydro and sent to Wisconsin DNR for lab testing to validate that it closely matches the NURP particle size distribution. The base mix formula (shown in the table below) was shown by lab testing to be very close to the NURP particle size distribution. The results of the lab testing are shown in the second table.

Table B-5. Base Mix Formula for Sediment Testing

Total mixed weight: 14.3 lbs.	
US Silica Product Gradation	**Weight**
F 65	0.45 lbs
OK 110	0.6 lbs
Sil-Co-Sil 250	0.25 lbs.
Sil-Co-Sil 106	4.0 lbs.
Sil-Co-Sil 52	1.0 lbs
Min-U-Sil 40	2.0 lbs
Min-U-Sil 30	1.0 lbs
Min-U-Sil 15	1.0 lbs
Min-U-Sil 10	4.0 lbs.

Note to Table B-5: Do not use this table to make the test mix.

Note to Table B-6: Do not use this table to make the test mix. Although the base mix accurately matches the NURP particle size distribution, there are not enough sand sized particles to allow an evaluation of how the test device deals with these coarser particles. To correct this problem, the base mix was adjusted by doubling the amount of OK110 (from 0.6 to 1.2 pounds) and F65 (from .045 to 0.90 pounds). Almost all the particles in the OK 110 are between 90 and 125 microns, while the F65 contains particles that are primarily in the range of 106 to 250 microns.

Table B-6. Results of Verification that Compares Base Mix with the NURP Particle Size Distribution

Particle Size, Microns	NURP, % Finer Than	Test Material, % Finer Than
1	2	11
2	14	17
3	23	23
4	29	31
5	35	35
6	41	40
7	46	45
8	51	49
9	53	52
10	56	54
11	58	56
12	60	-
13	62	-
14	63	62
15	65	63
20	71	68
25	75	73
30	78	76
35	80	80
40	82	83
50	84	86
60	87	88
63	-	88
80	89	90
100	91	93
125	-	95
150	94	96
200	95	97
250	-	98
300	97	99
500	99	100

B. The sediment removal performance test under Appendix B, Part 3.0 should probably be run until at least 5 pounds of material has been trapped. Assuming an influent concentration of 250 mg/l suspended sediment concentration, a control efficiency of 10% (using the NURP particle size distribution) and a test flow rate of 0.5 cfs, it should take approximately 120 minutes to run this test once the flow has achieved equilibrium assuming there is no significant scour. The mass of test sediment placed in the supply hopper would have to be at least 50 pounds.

C. The Department of Natural Resources provided Hydro, International with a particle size distribution based on the material measured in the sedimentation chambers of three field installations (Vortechs, Downstream Defender, and StormCeptor). Hydro used a program to develop the specified mix. The average particle size distribution from monitored devices is shown in Table B-7.

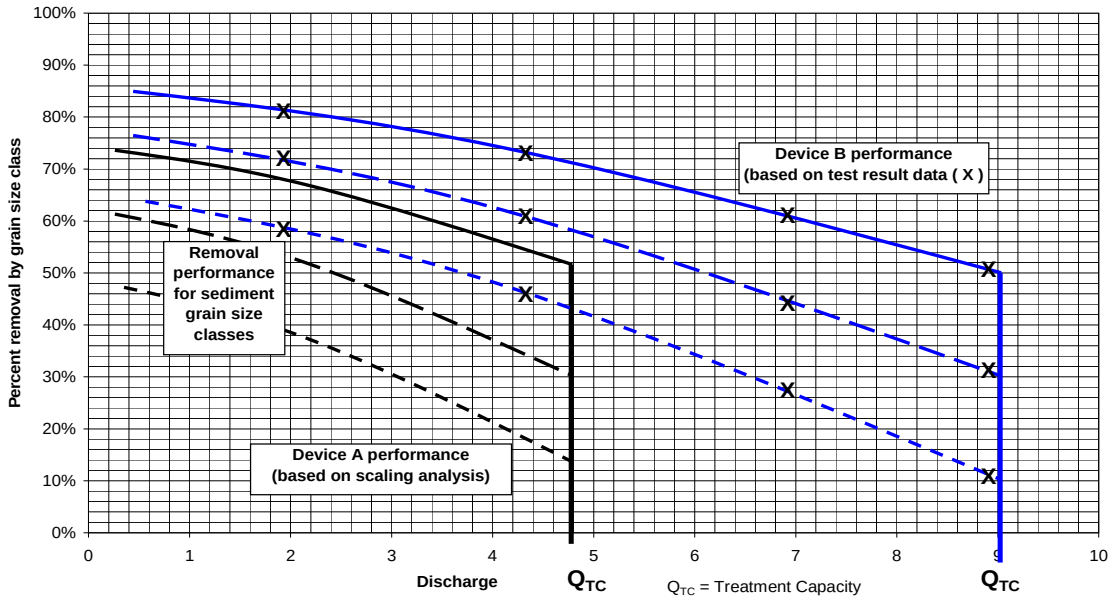
Table B-7. Particle Size Distribution for Sediment Removed from Treatment Chambers of Three Proprietary Devices. (Average of data from three devices: Vortechs, Downstream Defender, StormCeptor)

Particle Size, Microns	Percent Finer Than
8000	97
4000	93
2000	86
1000	75
500	56
250	27
125	12
63	6

D. Suggested graphical presentation of sedimentation test data showing data for multiple devices on the same graph.

Illustration of performance data required for Propriettary Storm Water Sedimentation Devices

Note: Only three grain size clsses shown



E. Manufacturers are encouraged to consider an approach to developing a predictive formula for scaling device performance using the following format:

Percent Reduction = Function $(L_1 * L_2 * Vs)/Q$

Where:

L1 = Device characteristic length 1
L2 = Device characteristic length 2
Vs = Particle size settling velocity
Q = discharge through the device

Manufacturers are also encouraged to provide the most accurate predictive methodology for their devices, including approaches other than that listed above.

APPENDIX C

ESS INO METHOD 355.3
Beckman Coulter Multisizer 3, Particle-Size Counter
(Beckman Coulter)

Title: Beckman Coulter Multisizer 3, Particle-Size Counter
ESS INO METHOD 355.3, Revision 0
Effective Date: April 2007
Wisconsin State Laboratory of Hygiene, Environmental Health Division, Inorganic Chemistry Department

1. Scope and Application

1.1 Evaluating the size distribution of particles <32-μm in diameter has become a critical tool in assessing the environmental impact of point/non-point source pollution runoff in urban areas. The potential effects of the smaller-sized particles on receiving waters are not well understood. Consequently the ability to quantify and characterize this size category is extremely important for designing storm water control devices and future decision-making policy.

1.2 There are a wide range of methods available for determining particle size distributions. However, each is based upon different assumptions and principles. Consequently there is not one specific method that is ideal for every application. For example, settling velocities of particles are directly affected by several variables including size, shape, specific gravity, etc. Most standardized methods were established with soils and sediments and ultimately categorize particles <32-μm in diameter into the typical size breaks for sands, silts and clays (15.1, 16.1). Particles carried by storm water runoff may not "fit" into the traditional categories due to their non-terrestrial nature.

1.3 Typically the size distribution of particles in water is established by sieving the sample through a series of sieves (15.3). Each sieve is certified by the size of mesh, and the material trapped on the sieve is quantified, gravimetrically, and expressed as a percentage of the entire sample. Quantifying the mass of material smaller than 32 μm by sieving can be labor intensive, less accurate and at times, impossible due to the small amount of material available for current standard practices (e.g., sieve-pipette method, visual acuity tubes, sediment counters).

1.4 The Wisconsin State Laboratory of Hygiene (WSLH) has developed a method for estimating the distribution of particles that are <32-μm in diameter, by combining data from gravimetric analysis with results obtained from a Beckman Coulter® *Multisizer 3*™ Particle Size Counter (15.2).

1.5 The original Coulter® Principle (*aka* "Electrical Sensing Zone" method) allows for simultaneous counting and sizing of particles in a homogeneous suspension. The sensing zone is established with two electrodes that are separated by a small cylindrical opening (*aperture*). A small amount of electrical current flows through the aperture and between the electrodes. The resistance created by the restricted area separating the electrodes produces current density within the area of the aperture. Particles passing through the aperture displace the volume of the conducting liquid, which creates changes in electrical impedance. The change in the impedance produces a small but proportional flow of current into an amplifier, which further converts the current fluctuation into voltage. The change in magnitude of the current is small (typically 1 mA) but significant enough to generate a voltage large enough to be measured. The Coulter® Principle states that the amplitude of the voltage pulse is directly proportional to the volume of particle that produced it. This principle was developed in the 1940's by Wallace Coulter, who originally developed and patented this technique for blood cell analyses. This technology has evolved over the years to include many industrial applications.

1.6 The Coulter® Principle is applied to particle-size analysis by adding aliquots of sieved sample to an electrolytic solution (i.e., conducting liquid) to facilitate suspension of the particles.

1.7 Urban runoff conditions from specific locations can be monitored both spatially and temporally with WSLH methodology.

1.8 With the appropriate aperture, the Coulter® *Multisizer 3*™ Particle Size Counter can provide particle sizing and counting capabilities within an overall size range of 0.4 to 1200 μm.

2. Summary of Method

2.1 Each sample is processed through a series of standard sieves to trap all particles ≥ 32 µm (15.2). Approximately 250 to 1000 mL of well mixed sample (<32-µm in diameter) is recovered after sieving for analysis by the Coulter® *Multisizer 3*™ Particle Size Counter and microfiltration (gravimetric component).

2.2 A metered portion of sample suspension (sample + electrolyte) is drawn through a 50-µm aperture (sensing zone) at a steady rate. The 50-µm aperture provides sizing and counting resolution to 1 to 60% of aperture size (i.e., 2 - 30 µm).

2.3 Data from the instrument is integrated with software to produce a "percent less than" result based upon size breaks assigned by the analyst.

2.4 The percent distribution results from the Coulter® *Multisizer 3*™ Particle Size Counter are applied to gravimetric results from 0.4-µm filtration data and mathematically converted to concentration (mg/L).

2.5 Finally, the estimated concentration data in the size fractions less than 32 µm are compared to the total concentration of particles in the sample. A percent distribution is developed within the Laboratory Information Management System (LIMS) for subsequent report generation.

2.6 Coulter® *Multisizer 3*™ Particle Size Counter data combined with the sieve results provides the WSLH with the ability to mathematically estimate the complete particle size distribution in a sample from ≥ 500 to below 0.4 µm.

2.7 Coulter® *Multisizer 3*™ Particle Size Counter offers a high degree of flexibility in size ranges obtained by simply changing the size of the instrument's aperture.

3. Safety and Waste Management

3.1 General safety practices for all laboratory operations are outlined in the Chemical Hygiene Plan for the Environmental Health Division (15.4).

3.2 All laboratory waste, excess reagents and samples must be disposed of in a manner that is consistent with applicable rules and regulations.

3.3 Waste disposal guidelines are described in the University of Wisconsin Laboratory Safety Guide (15.5).

4. Sampling Handling and Preservation

4.1 Samples to be processed and analyzed for particle sizing are typically collected in 1-gallon, polyethylene containers.

4.2 Prior to analysis commencing, WSLH personnel will weigh the sample container on a high-capacity analytical balance to establish the original mass/volume of sample received at WSLH (15.6).

4.3 After sieving, WSLH personnel will recover approximately 250 to1000 mL of the <32µm fraction in a WSLH quart bottle. The bottle will be assigned the same WSLH sample Identification number (ID) and reserved for analysis with the Coulter® *Multisizer 3*™ Particle Size Counter and microfiltration at 0.4µm.

4.4 Samples are stored at 4C.

4.5 Samples collected for particle size determinations are not preserved.

4.6 Although a specific holding time for particle size samples has not yet been established, every effort should be made to process the sample within 30 days of collection for best results.

5. Interferences

5.1 Samples containing a large amount of particles may clog apertures.

5.2 Each aperture allows the measurement of particles within 2 to 60% of the nominal diameter of the aperture. For example, a 100-µm aperture allows sizing of particles between 2 and 60 µm, not inclusive.

5.3 Particles in samples may aggregate or clump during storage and can cause clogging of the aperture. For best results, samples should be at room temperature and mixed thoroughly prior to analyzing.

5.4 Aliquots of sample should be combined with a diluent to facilitate dispersion and minimize clogging of the aperture.

6. Reagents and Standards

6.1 ASTM Type-1 Water (*MQ*).

6.2 Conductance/electrolyte solution: ISOTON® II diluent (Beckman Coulter®).

6.3 Particle Characterization/Sizing Standards: Certified sizing standards (e.g., polystyrene latex beads or polymer microspheres in an aqueous medium) are available from Beckman Coulter, Duke Scientific, etc. and should be used for performing or validating the instrument calibration and for use as a Quality Control

Standard. The standards should be NIST traceable. Calibration or verification is only needed at one size for each aperture, preferably between 5 and 20% of the aperture diameter (15.2).

6.4 Aperture Instrument Concentration Control (Beckman Coulter®): Control standard used to verify instrument count accuracy performance (units = **#Total Particles/mL**); acceptable results are typically within ±10% of the assay value.

7. Apparatus

7.1 Beckman Coulter® *Multisizer 3*™ Particle Size Counter (M3).

7.2 Electronic pipette.

7.3 Beakers of assorted sizes.

7.4 Cuvettes, 20 mL, e.g., Accuvette™ II container (Beckman Coulter®).

8. Quality Control

8.1 **Corrective Action** documentation for QC failures within analytical runs will include: a) identifying the QC failure and cause, if known; b) specific corrective actions that were performed; c) the next action that will be taken.

8.1.1 Attached to each analytical run will be lists of specific analytical items to be checked in the event of a QC failure. The lists will be tailored to the specific method and instrumentation as an aid in documenting corrective action. If the analytical failure cannot be identified, the analyst will note: "*Analytical Checks ok; Unknown cause*" on the benchsheet.

8.2 **An instrument logbook** is maintained for each instrument. Maintenance, performance problems, date calibrated, analyst, and other pertinent information are documented in the logbook.

8.3 **A Quality Control Standard (QCS)** is analyzed with each run. The analytical result must be within ± 10% of the true value to continue the analysis. If the recommended limits are exceeded, corrective action includes reanalyzing the QCS or the analyst may recalibrate if necessary. Choose a QCS with certified particle size that is within the analytical range of the aperture (15.2).

8.4 **A Laboratory Reagent Blank (LRB)**, aka "Check Blank (CB). For purposes of this method, a LRB/CB is not applicable for particle size determinations in environmental sample. However, if samples of a biological nature are analyzed, the dispersion agent may be utilized as the LRB/CB (aka "Control Blank").

8.5 **Laboratory Fortified Blank (LFB): not applicable for this method**.

8.6 **Matrix Duplicates:** Prepare **a minimum of 10%** of the samples, per matrix, as duplicates**. Matrix Spikes are not applicable for this method**. Refer to the QL dataset in LIMS for a detailed listing of all QC limits used for various sample matrices. If the duplicate (precision QA) is not met, the matrix group should be reanalyzed unless clogging of the aperture is a problem. If limits are exceeded a second time, a smaller volume of sample from this matrix group may be added to the diluent (6.2) and reanalyzed. If limits are exceeded a second time, qualify the matrix group (15.8) as a comment or memo. Because M3 data is used for LIMS calculations, data cannot be qualified as "** result*."

8.7 **An Instrument Performance Check (IPC)** is not applicable for this method. The instrument performance is based upon a Calibration Verification Check (9.1 – 9.6), which is analyzed at the beginning of each batch. The M3 software will notify the analyst if the instrument is not within calibration based upon the size of aperture installed at the time of calibration. Choose a calibration standard or verification standard as recommended by the manufacturer (15.2). A new calibration check should be performed whenever a new or different aperture is installed.

8.8 **Initial Demonstration of Capability (IDOC):** Initial DOC and annual continued proficiency checks are performed according to ESS INO QA 115 (15.9). The QCS (6.3) may be used for this procedure.

8.9 **Limit of Detection (LOD, 15.10): not applicable for this method** and is defined by the size limit of the aperture installed at the time of use.

9. Method Calibration

9.1 Allow the instrument to warm up a minimum of 15 minutes prior to operation.

9.2 Calibrate every new aperture following the M3 Operator's manual (15.2). Once a particular aperture has been calibrated, a verification standard should be analyzed prior to each analytical batch. Calibration of an aperture

should be performed whenever a verification procedure fails, or whenever a new aperture is installed.

9.3 Prepare a calibration/verification standard by adding approximately 30 drops of standard solution and diluting to the 20-mL mark on the M3 cuvette. Mix thoroughly.

9.4 Open the door to the sample compartment on the M3 and lower the sample platform.

9.5 Secure the cuvette containing the calibration or verification standard into the platform. Raise the platform until the electrode and aperture are submerged in the standard solution.

9.6 Close the door.

9.7 Check the concentration level of the suspension by selecting ***Preview*** from the left-hand status panel. The concentration index bar will be displayed and notify the analyst if the concentration is ok; the manufacturer recommends a concentration of 10% for best results. If the concentration is high, calibration may be incorrect; if too low, the time required for calibration will be too long.

9.8 Exit the ***Preview*** mode by selecting <cancel>.

9.9 Activate the ***Calibrate*** mode via the M3 software.

9.9.1 If calibrating for the first time, choose the appropriate size calibrator and click on the calibration icon. The Calibrator Size box will open; enter the modal value of the calibrator—this is the certified value provided by the manufacturer. Beckman Coulter recommends repeating the calibration ten times and record the ***Kd*** each time. Calculate the mean ***Kd*** for the aperture and enter this value into the "Aperture Tube list" along with the serial number of each aperture. The "Aperture Tube list" can be accessed via the <*Change Aperture Tube Wizard…*>.

9.9.2 Once the calibration standard has been analyzed, the instrument is ready for analyzing samples and need not be calibrated again unless the daily verification standard is exceeded. Future verifications of **this** calibration should always be within ± 4% of the mean value obtained in 9.9.1 (15.2).

9.10 If the aperture has already been calibrated, the analyst needs only to ***Verify the calibration***.

9.10.1 Prepare the verification standard (9.3 – 9.8).

9.10.2 Activate the ***Verify*** mode via the M3 software.

9.10.3 Enter the modal value of the verification standard in the Calibrator Size box (9.9.1). Note: If the same aperture is being used for each batch, the Calibrator Size box will retain the certified modal value of the previous verification standard.

9.10.4 Press <*Start*> from the Calibrator Size box to activate the *Verification* process.

9.10.5 The software will automatically notify the analyst if the verification has been successful. The software will prompt the analyst of the change between the old ***Kd*** and the new ***Kd***. Record the new ***Kd*** in the instrument logbook to maintain a record for each specific aperture.

9.11 Always verify aperture calibration prior to analyzing samples.

9.12 Recalibrate any time the verification process fails or if a new aperture is installed.

10. Procedure

10.1 Select the appropriate analytical settings for the M3 from the Main Menu. Alternatively, *Load* the desired Standard Operating Procedure (SOP) by selecting **Settings** from the Main Menu bar.

10.1.1 An M3 SOP consists of pre-selected analytical settings that have been saved as a "Standard Operating Method (SOM)." See the Beckman Coulter Operator's Manual for detailed directions for creating and/or changing an SOM (15.2).

10.1.2 Although the size settings can be altered at any time, it is helpful to configure the SOM for the desired size breaks in the *Cumulative % <* format for Volume, Number and Surface Area.

10.1.2.1 Check the ***Cumulative, %<*** data table at the end of each run report. If only "<100%>" shows for each size break on the table, extra digits after the decimal point are needed. In the chart window, select <Analyze>, <Convert Pulses to Size Settings>; select <2% to 60%> to expand the *x* axis on the chart

window to the maximum resolution of the aperture. Turn off the "Multisizer II" edit box, then select <ok>.

10.1.2.2 Check the data table again to view the cumulative, %< size breaks on the data table. You should now have values less than 100% for each size break. These percentages are recorded on a *Worklist* (*WL*) and used by LIMS to estimate the overall percent distribution of particles below 32 μm.

10.2 Pipette an aliquot of sample into the cuvette.

10.2.1 The volume of sample may range from one to 15 mL, at the analyst's discretion. Samples containing noticeably large amounts of particles should be diluted approximately 1:20 with diluent prior to analysis to minimize clogging of aperture.

10.3 Dilute the volume of sample to the 20-mL mark on the cuvette with diluent (6.2).

10.4 Mix the cuvette by inversion.

10.5 Modify the sample and batch information as appropriate under the Sample Information section of the Status Panel.

10.5.1 *Group ID*: Enter the WSLH batch ID.

10.5.2 *Sample ID*: Enter the WSLH sample ID.

10.5.3 *Control Sample*: Check this box whenever a QC sample is being analyzed.

10.5 4 NOTE: If the concentration of particles in the sample (i.e., counts) is a desired result, the following data fields must be completed:

10.5.4.1 Sample volume or mass (weight or volume of sample used for the analysis; the volume or mass combined with electrolyte).

10.5.4.2 Electrolyte volume (volume of electrolyte used).

10.5.4.3 Analytical volume (volume of sample suspension being analyzed, where: *suspension = sample + electrolyte*).

10.6 Open the door to the sample compartment on the M3 and lower the sample platform.

10.7 Secure the cuvette into the platform. Raise the platform carefully until the electrode and aperture are submerged into the sample solution. Note: When using the 20-mL cuvette for sample analysis, the glass stirrer should always be adjusted with the stirrer knob such that the paddles are moved to the right of the cuvette; i.e., the stirrer does not fit in the cuvette.

10.8 Check the concentration level of the suspension by selecting ***Preview*** from the left-hand status panel. The concentration index bar will be displayed and notify the analyst if the concentration is ok. Although the manufacturer recommends a concentration of 10% for best results, previous work at WLSH demonstrates that samples prepared at 3 to 5% concentration level perform best (i.e., higher concentration levels tend to clog the aperture).

11. Calculations

11.1 The raw instrument data for each size break is entered on a *Worklist, WL* (15.15). These results are estimates of the percent size distribution in water samples that have been sieved down to 32 μm.

11.2 Once the raw data has been entered into LIMS, the data is processed automatically and mathematically converted to yield both concentration (i.e., mg/L) and percent distribution (i.e., "% <") for the entire sample, based upon the total mass received.

12. Data Management

12.1 The *WL* (15.15) and the *QAWRKSHT* (15.14), where all quality control is calculated for pass/fail criteria, will be reviewed for quality control prior to accepting results (see section 8) by an experienced chemist who did not run the original analysis (15.13). The reviewer must initial and date the cover sheet as an indication of the run's acceptable results.

12.2 Final QC-reviewed results will be submitted for manual data entry into LIMS (15.14).

12.3 Whenever possible, data will be electronically exported to LIMS.

13. Definitions

13.1 Definitions of terms in this SOP may be found in the reference method (15.2). General definitions of other terms that may be used in this method are found in Section 19 of the WSLH Quality Assurance Manual (15.8).

14. Method Performance

14.1 Where applicable, the laboratory's initial accuracy and precision data (LOD's and DOC's) were generated in compliance with the reference method and the Inorganic Chemistry Department's standard operation procedures: ESS INO QA 115 (15.9) and ESS INO QA 116 (15.10). Supporting data will be retained according to the applicable Records Disposition Authority (RDA). Data generated within the last two years will be kept on file within the Inorganic Chemistry Department. Data older than two years may be archived in the basement.

15. References

15.1 American Society of Testing and Materials (ASTM), 2002. *Standard Test Method for Particle-Size Analysis of Soils*, D 422-63.

15.2 Beckman Coulter® *Multisizer 3*™ Particle Size Counter, Operator's Manual. Beckman Coulter, Inc. Fullerton, CA 92835.

15.3 Wisconsin State Laboratory of Hygiene, ESS INO 355.1. *Particle-Size Determinations by Sieving and Microfiltration.*

15.4 Wisconsin State Laboratory of Hygiene, EHD GENOP 026. *Chemical Hygiene Plan for the Environmental Health Division, State Laboratory of Hygiene, Agriculture Drive*.

15.5 University of Wisconsin-Madison, Chemical Radiation Protection Office, Safety Department (262-8769). 2004. *Laboratory Safety Guide*. http://www.fpm.wisc.edu/safety.

15.6 Wisconsin State Laboratory of Hygiene, ESS GENOP 202. *Calibration, Maintenance, and Accuracy Verification Procedure for Balances*.

15.7 Wisconsin Department of Natural Resources Lab Certification Program, July 1997 PUBL-TS-007-97.

15.8 Wisconsin State Laboratory of Hygiene. *Quality Assurance Procedures and Policies*.

15.9 Wisconsin State Laboratory of Hygiene. ESS INO QA 115, Initial DOC and Annual Continued Proficiency Check Procedures.

15.10 Wisconsin State Laboratory of Hygiene. ESS INO QA 116, *LOD Procedures*.

15.11 Wisconsin State Laboratory of Hygiene. ESS INO GENOP 200, *Pipette Performance Checks*.

15.12 Wisconsin State Laboratory of Hygiene. ESS INO QA 101, Bottle Check Procedure.

15.13 Wisconsin State Laboratory of Hygiene. ESS INO QA 107, *Q.C. Audits of Analytical Runs for ESS Wet Chemistry Area*.

15.14 Wisconsin State Laboratory of Hygiene. ESS INO QA 114, *LIMS Quality Assurance Worksheet Procedures*.

15.15 Wisconsin State Laboratory of Hygiene. ESS INO GENOP 108. *Procedure for Creating a WL Worklist*.

16. Tables, Figures, Diagrams, Charts, Checklists, Appendices, Definitions

16.1 **Table 1.** Recommended scale of particle size breaks for sediment analysis (15.1).

Description	Size (μm)
Sands:	
Very coarse	1000-2000
Coarse	500-1000
Medium	250-500
Fine	125-250
Very fine	62-125
Silts:	
Coarse	31-62
Medium	16-31
Fine	8-16
Very fine	4-8
Clay:	
Coarse	2-4
Medium	1-2
Fine	0.5-1
Very fine	0.24-0.5

Written by: Lorrine D. Edwards Date: 06/2007

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Title: _____

Unit: _____

Accepted by: _____ Date: _____

Title: _____

Unit: _____

Certification Statements received from:

Note: Please confirm that this printed copy is the latest revision.

INTERIM TURF NUTRIENT MANAGEMENT

(1100)

Wisconsin Department of Natural Resources Technical Standard

I. Definition

Managing the amount, method, timing, and source of nutrient applications on turf.

II. Purpose

This standard establishes the criteria and documentation requirements for a nutrient management plan that addresses the application of nutrients to establish, maintain and renovate turf areas. These criteria are intended to minimize nutrient entry into surface and groundwater resources through proper application of nutrient inputs while maintaining turf density of 70% or greater.

Note: See Section VIII.H for methods to measure density.

III. Conditions Where Practice Applies

This standard applies to parcels that have *five or more total acres*[1] of turf that receive nutrients. This includes municipally owned parcels within an incorporated municipality and non-municipally owned parcels regardless of location.

This standard does not apply to agricultural operations, sod farms, or community gardens. This standard may be beneficial for turf management on any sized parcel.

IV. Federal, State and Local Laws

Users of this standard shall be aware of potentially applicable federal, state and local laws, rules, regulations or permit requirements governing the placement of nutrients. This standard does not contain the text of federal, state, or local laws.

V. Criteria

This section establishes requirements for soils and data collection, application, and management requirements for nutrient management plan development and implementation related to the establishment, maintenance and renovation of turf. Nutrient management plans shall be prepared according to all of the Criteria, Plans and Specifications, and Operation and Maintenance sections.

A. Turf Establishment – When establishing turf, the steps listed below shall be followed.

Note: Further guidance is located in UWEX Publication A3434 Lawn Establishment and Renovation.

1. Soil Test – Soil samples shall be obtained, and the test results made available prior to seeding or sodding. Allow two to three months to obtain results from the lab.

   a. Identify variations in *representative areas* across the site. To provide a representative sample of the soil in each representative area, collect a minimum of ten uniformly distributed sub-samples.

   b. Collect sub-samples of soil (0.5 to 1 inch in diameter) in a uniform manner to a minimum depth of five inches and maximum depth of seven inches. Remove any turf or plant matter prior to compiling and mixing the sub-samples.

   c. Compile the sub-samples collected from each representative sampling area, mix thoroughly, and place approximately 0.5 quart of soil in a clearly labeled bag.

   d. Submit the sample to a soil testing lab for analysis to determine pH, available phosphorus (P) using Bray P1 analysis or Mehlich III for golf turf, and available potassium (K) levels in the soil. Test results shall be in parts per

[1] Words in the standard that are shown in italics are described in X. Definitions. The words are italicized the first time they are used in the text.

million (ppm) or pounds per acre (lbs/ac).

e. In the event that soil testing is not practical prior to establishment, apply no more than one lb N/1000 ft^2 using a *starter fertilizer.* In accordance with Section VII.A, document reasons why test results were not obtained and rates applied.

Note: For further guidance, see UWEX Publication A2166 Sampling Lawn and Garden Soils for Soil Testing.

2. The amount of P from all sources shall not exceed the soil test recommendations contained in Table 1.

   a. If a soil amendment contains P as a fertilizer, the P shall be tilled into the root zone prior to establishment.

   b. Starter Fertilizer – If starter fertilizer is used, the amount of Nitrogen (N) cannot be more than one lb N/1000 ft^2. Apply starter fertilizer to the surface of the soil prior to or immediately following seeding to ensure it will be in close proximity to the seed.

Note: There are different interpretations in Table 1 for turf establishment, whether establishment is by seeding or sodding.

3. N Fertilizer – A maximum of six lbs N/1000 ft^2 may be applied during the first 12 months of establishment. Apply no more than one lb N/1000 ft^2 per application. After establishment, N applications according to Section V.B can begin.

4. Specific criteria for establishment of turf on sand-based root zones, putting greens, and athletic fields.

   a. Nitrogen fertilization – A maximum of 10 lbs N/1000 ft^2 may be applied during the first 12 months of establishment. Apply no more than one lb N/1000 ft^2 per application.

   b. Phosphorus fertilization

      i. Non-calcareous and acidic root zones – The amounts shall not exceed the soil test recommendations contained in Table 1.

      ii. *Calcareous* sand based root zones – Apply a P fertilizer monthly until soil test P levels stabilize in the range of 38-50 ppm (i.e. three soil test P levels in this range over at least a three month period indicate stabilization).

5. Erosion Control – Appropriate erosion control methods shall be installed in accordance with Wisconsin Department of Natural Resources (WDNR) construction site erosion and sediment control technical standards to minimize transport of sediment offsite.

Note: WDNR technical standards are available at: http://dnr.wi.gov/org/water/wm/nps/stormwater

B. Turf Maintenance – Fertilizer Recommendations for *Established Turf.*

1. Soil Test – Soil samples shall be obtained once every five years for areas receiving P. For sites requiring multiple P applications, the five year period shall start after the final P application. Follow directions for collecting samples based on the type of area being fertilized as described below.

   Note: More frequent testing may be beneficial. Guidance is located in UWEX Bulletin A2166 Sampling Lawn and Garden Soils for Soil Testing.

   a. General Turf Areas

      i. Identify variations in representative areas across the site. To provide a representative sample of the soil in each representative area, collect a minimum of ten uniformly distributed sub-samples.

      ii. Collect sub-samples of soil (up to one inch in diameter) in a uniform

manner to whichever is less, a minimum depth of five inches and a maximum depth of seven inches, or to the depth of the root system. Remove any turf or plant matter prior to compiling and mixing the sub-samples.

iii. Follow steps in Sections V.A.1.c and V.A.1.d for compiling and submitting the samples.

b. Golf course putting greens and tees

i. Identify variations in representative areas across the site. To provide a representative sample of the soil in each representative area, collect a minimum of ten uniformly distributed sub-samples.

ii. Collect sub-samples of soil (up to one inch in diameter) in a uniform manner to whichever is less, a minimum depth of the root system or a minimum of two inches, and a maximum depth of seven inches. Remove any turf or plant matter prior to compiling and mixing the sub-samples.

iii. Follow the steps described in Section V.A.1.c and V.A.1.d for compiling and submitting the samples.

2. Fertilizer Recommendations for *low-traffic turf areas.*

a. P Recommendations – The recommendations for P in Table 1 shall be used.

b. N Recommendations – Do not apply more than one lb N /1000 ft^2 per application unless the fertilizer is entirely natural organic material (i.e. plant or animal derived substances) in which case N may be applied at rates up to two lbs N/1000 ft^2 but not to exceed four lbs N/1000 ft^2 annually.

Specific annual N recommendations are as follows:

i. General Areas – Do not exceed a maximum of four lbs N/1000 ft^2 annually.

ii. Areas where clippings are returned – Do not exceed a maximum of three lbs N/1000 ft^2 annually beginning the third year after establishment.

Note: Clippings left on the lawn typically release about one lb N/1000 ft^2 annually.

iii. Areas with *high permeability soils* – Use a fertilizer containing at least 50% slow release N if greater than ¼ lb N/1000 ft^2 is applied at one time.

3. Fertilizer recommendations for *high traffic areas* (e.g., athletic fields, golf courses, some parks areas).

a. P Recommendations – The recommendations for P in Table 1 shall be used.

b. N Recommendations – The values listed below shall be used only when other cultural practices such as regular mowing and irrigation are in place. Otherwise, the N fertility program should be the same as for low traffic turf areas.

Do not apply more than one lb N/1000 ft^2 per application unless the fertilizer is entirely natural organic material (i.e. plant or animal derived substances) in which case it may be applied at rates up to two lbs N/1000 ft^2 not to exceed the maximums listed below.

i. Athletic fields and tee boxes with native soil root zones – A maximum of eight lbs N/1000 ft^2 may be applied.

ii. Athletic fields and tee boxes with sand-based root zones (≥ 70% sand) – A maximum of ten lbs N/1000 ft^2 may be applied.

iii. Fairways or putting greens with native soil root zones – A maximum of five lbs N/1000 ft^2 may be applied.

iv. Fairways or putting greens (root zone ≥ 70% sand) – A maximum of eight lbs N/1000 ft^2 may be applied.

C. Turf Renovation – One of the following methods shall be used:

1. Tilling – When renovation involves tilling, follow the turf establishment criteria located in Section V.A. The balance of fertilizer remaining from the current soil test recommendations from Table 1 shall not be exceeded.

2. *Interseeding / overseeding* – A maximum of six lbs N/1000 ft^2 may be applied during the first 12 months of establishment unless otherwise allowed under Section V.B.3. Apply no more than one lb N/1000 ft^2 per application unless a natural organic fertilizer is used, in which case N may be applied at rates up to two lbs N/1000 ft^2 but not to exceed four lbs N/1000 ft^2 annually. The balance of fertilizer remaining from the current soil test recommendations from Table 1 shall not be exceeded. After establishment, N applications according to Section V.B can begin.

D. Criteria to Minimize Entry of Nutrients to Groundwater

1. Do not apply fertilizer on *saturated soils*.

2. Do not apply nutrients to frozen soils unless the fertilizers are used to melt snow or ice on high traffic turf areas (i.e. greens and athletic fields).

3. To minimize N leaching to groundwater on high permeability soils, or soils with less than 20 inches to bedrock, or soils with less than 12 inches to *apparent water table* use the following practices:

   a. Do not use fertilizer with greater than 50% water soluble N unless applying less than or equal to a ¼ lb N/1000 ft^2 at one time.

   b. Do not apply nutrients within 100 feet upslope of a direct conduit to groundwater such as fractured bedrock at the surface.

   c. Tile inlets, drain tiles, and similar stormwater infrastructure must be covered prior to fertilizer application, unless these devices outflow to on-site irrigation ponds disconnected from surface and groundwater.

E. Criteria to minimize the Entry of Nutrients to Surface Water

1. Do not apply fertilizer on saturated soils, wetlands, surface water, or impervious surfaces (i.e. pavement, sidewalks). Do not apply nutrients to frozen soils unless the fertilizers are used to melt snow or ice on high traffic turf areas (i.e. greens and athletic fields).

2. Take action to avoid drift of fertilizer into waterbodies.

3. To minimize entry of nutrients to surface water in *surface water quality management areas* the following apply.

   a. Use products with at least 50% water soluble N on slopes steeper than 10%.

   b. Do not apply water soluble fertilizers when a runoff event is expected within 24 hours, such as an intense short duration rainfall event, unless irrigation is used shortly after the fertilizer is applied.

   c. Areas adjacent to a waterbody or waterway – Within 20 feet of a waterbody or waterway's *ordinary high watermark* only *foliar* applications of N and P are allowed. On golf course greens and surrounds within the 20 foot area drop spreaders may be used. Do not exceed two lbs N/1000 ft^2 per year.

Table 1. Phosphorus Soil Test Interpretations and Recommendations

Bray P1 Soil Test	Nutrient Concentrations			Phosphorus Recommendations [Note 1]			
	Soil Test P		Concentration Interpretation	lb P_2O_5/1000 ft^2		lb P_2O_5/acre	
	ppm P	lbs/acre					
Turf Establishment From Seed	0-15	0-30	Very Low	3		131	
	16-30	31-60	Low	2		87	
	31-45	61-90	Medium	1		44	
	46-50	91-100	Optimal	0		0	
	> 50	> 100	Very High	0		0	
Turf Establishment From Sod	0-10	0-20	Very Low	3		131	
	11-20	21-40	Low	2		87	
	21-30	41-60	Medium	1		44	
	31-40	61-80	Optimal	0		0	
	> 40	> 80	Very High	0		0	
Established Turf, Low Traffic Areas	0-5	0-10	Very Low	3		131	
	6-10	11-20	Low	2		87	
	11-15	21-30	Medium	1		44	
	16 -20	31-40	Optimal	0		0	
	> 20	> 40	Very High	0		0	
Established Turf, High Traffic Areas [Note 2]				**High Traffic Areas** [Note 4]	**Fairway**	**Tees and Greens**	
						Sand [Note 5]	**Push-up** [Note 6]
				lb P_2O_5/1000 ft^2	lb P_2O_5/acre	lb P_2O_5/1000 ft^2	
	0-12	0-24	Very Low	5	200	3	5
	13-25	25-50	Low	3.5	150	2	3.5
	26-37	51-74	Medium	2	100	1	2
	38-50	75-100	Optimal [Note 3]	1	50	0.5	1
	> 50	> 100	Very High	0	0	0	0

Mehlich III Soil Test

	Nutrient Concentrations			Phosphorus Recommendations [Note 1]			
Established	Soil Test P		Concentration	**Sand** [Note 5]		**Push-up** [Note 6]	
Golf Turf [Note2]	ppm P	lbs/acre	Interpretation				
Fairways				lb P_2O_5/1000 ft^2		lb P_2O_5/1000 ft^2	lb P_2O_5/acre
	0-12	0-25	Very Low	NA		6	260
	13-24	26-49	Low	NA		4	175
	25-37	50-75	Medium	NA		2.5	100
	38-50	76-100	Optimal [Note 3]	NA		1.5	50
	> 50	> 100	Very High	NA		0	0
Established				**Sand** [Note 5]		**Push-up** [Note 6]	
Golf Turf [Note2]				lb P_2O_5/1000 ft^2	lb P_2O_5/acre	lb P_2O_5/1000 ft^2	lb P_2O_5/acre
Tees and Greens	0-5	0-11	Very Low	3	130	5	220
	6-10	12-21	Low	2	90	3.5	150
	11-19	22-39	Medium	1	45	2	90
	20-30	40-60	Optimal [Note 3]	0.5	20	1	45
	> 30	> 60	Very High	0	0	0	0

Note 1 Recommendations provide the maximum amount of fertilizer that can be applied between soil tests. When soils require phosphorus, one of two approaches may be taken. Option one is to make what is known as a corrective application. This is a one-time application of the amount of phosphorus recommended. The second option is that of gradual buildup, and then re-testing of the soil to check if the desired level of phosphorus was achieved. Gradual buildup of phosphorus is accomplished by selecting the proper type or grade of fertilizer to apply at different times during the year. Use either the ppm or lbs/acre column for the soil test, and either the lbs/1000 ft^2 or lbs/acre column for the recommendation.

Note 2 Low maintenance turf and roughs shall follow recommendations for established turf, low traffic areas.

Note 3 The application recommendation is to maintain the level at the ppm which is considered the optimal range for turf that receives high traffic.

Note 4 Areas including but not limited to athletic fields, intensively used paths in low traffic areas, and high use park areas

Note 5 50% or more of the root zone by depth is sand.

Note 6 More P needs to be applied to pushup greens in order to increase the soil test P. This is because native soils have a greater capacity to bind P, thus making it less available than in sand based greens.

VI. Plans and Specifications

The requirements for a nutrient management plan are specified in the previous sections of this standard. The nutrient management planner shall review the plan with the landowner or designee to assure an understanding of the requirements. Include the following:

A. Narrative description (site description, land use, etc.).

B. A site map showing topography, designated uses, soil test locations, *sensitive areas* and surface water.

C. Application restrictions (Section V.D, & E).

D. Soil sample/test location and results, and type of soil test (Bray P1 or Mehlich III).

E. Recommended nutrient application rates.

F. The nutrient management planner shall be a certified sports turf manager, certified golf course superintendent, an individual with a bachelor's degree in turf and grounds management, or having equivalent experience or training in turf management.

G. Turf species and soil types present.

H. Response plan for dealing with fertilizer spills.

VII. Operation and Maintenance

A. Document the actual nutrient application including the rate, fertilizer grade, timing, and method of application. Revise the plan a minimum of every five years or as needed to reflect changes in vegetation and/or management objectives.

B. The applicator shall wear protective clothing appropriate to the material being handled.

C. The application equipment shall be calibrated to achieve the desired application rate.

D. Protect fertilizer from the weather, and from accidental leakage or spillage. See Wisconsin administrative rules and county or local ordinances concerning regulations on handling fertilizers.

E. If a spill occurs, take appropriate cleanup actions. Spills involving over 250 lbs of dry or 25 gallons of liquid fertilizer must be immediately reported to the WDNR (24-Hour Spills Hotline 1-800-943-0003). Spills of lesser amounts are exempt from the reporting requirement unless the spill has adversely impacted or threatens to adversely impact the air, lands, or waters of the state either as a single discharge or when accumulated with past discharges.

F. Take the appropriate environmental precautions when cleaning equipment after applications. If the application equipment system is flushed, use the rinse water in the following batch of nutrient mixture where possible or dispose of according to state and federal regulations. Always avoid cleaning equipment near high runoff areas, ponds, lakes, streams, and other waterbodies. Extreme care must be exercised to avoid contaminating water wells.

VIII. Considerations

Additional recommendations relating to nutrient management planning that may enhance the use of, or avoid problems with, this practice but are not required to ensure its basic conservation functions are as follows:

A. Consult UW Publication A2303 for additional fertilization recommendations to maintain turf quality (>70% turf density).

B. Potassium (K) Recommendations – K plays an important role in the plant's ability to manage stress but is not a known environmental contaminant. The K values presented in Tables 2 and 3 are recommendations to help maintain turf density.

Table 2. Bray P1 Potassium Soil Test Interpretations and Recommendations for Golf Turf

Nutrient Concentrations Soil Test Interpretation			K Recommendation		
			Established Tees and Greens		Fairway
			Sand	Pushup	
ppm	lbs / acre	Concentration Interpretation	lb K_2O/1000 ft^2		lb K_2O/acre
0-50	0-100	Very Low	4.0	5.0	200
51-100	101-200	Low	3.0	4.0	150
101-150	201-300	Medium	2.0	3.0	100
151-175	301-350	Optimal	1.0	2.0	50
>175	> 350	Very High	0	0	0

Table 3. Bray P1 Potassium Soil Test Interpretations and Recommendations for General Turf Areas

Nutrient Concentrations Soil Test Interpretation			K Recommendation Established Turf	
ppm	lbs / acre	Concentration Interpretation	lb K_2O/1000 ft^2	lb K_2O/acre
0-20	0-40	Very Low	4.0	174
21-40	41-80	Low	3.0	131
41-60	81-120	Medium	2.0	87
61-80	121-160	Optimal	1.0	44
>80	> 160	Very High	0	0

C. Cultural Practices

1. Soil – A productive soil has good texture, structure (aerate if compacted), sufficient nutrients (N, P, K) and the right pH for the grass type. Loam type soils are often the preferable soil type for turf. Most soil textures may benefit from the addition of organic matter like compost or grass clippings.

2. Grass Choice – Select a grass that is best suited to the area's climate, temperature, moisture and the intended function of the area where it is planted. Also consider whether the location is sunny or shady. Grass that is well adapted to its location will be able to resist pests and diseases better. For further guidance see UWEX Publication A3434.

3. Mowing Height – The ideal height may vary somewhat with the type of grass. Frequent mowing will result in short clippings that can easily be left on the lawn. Ideally, cut no more than one-third of the height of the grass blades. Mowing blades should be kept sharp to prevent tearing. Immediately after mowing, sweep clippings off impervious surfaces.

4 Irrigation – Deep watering similar to a soaking rain is best. When irrigating, stagger the application schedule to meet the intended use of the area, and to prevent runoff.

5 Thatch Build-Up – If thatch buildup occurs that interferes with the intended use of the turf it may be necessary to remediate with core aeration. Excessive thatch build-up may be a sign of overuse of fertilizer, compaction of the soil or poor root development.

D. Utilization of Emerging Technologies – Consider maintaining flexibility in fertilizer

programs to take advantage of new products and grass types.

E. Application Timing – Many methods exist to properly apply N throughout the year. The following methods are examples.
   - Method A – possible application times are April 1-15, May 15-30, July 1-5, August 1-15, September 1-15, and late October/early November.
   - Method B – 1.5 lbs N/1000 ft^2 (no more than one lb can be water soluble N) applications a couple of weeks prior to spring and fall periods of play, and three 1.0 lb N/1000 ft^2 applications every 6 weeks between spring and fall.
   - Method C – 1.0 lb N/1000 ft^2 applications per growing month.
   - Method D, Rapid recovery areas – Light and frequent water-soluble N applications of 0.1 to 0.25 lb N/1000 ft^2 at 10 to 14 day intervals may be used as well as a strictly granular fertility program.

F. Fertilizer Products Containing Pesticides – The application rate cannot exceed the allowable amount of nutrients noted in the criteria of this standard or pesticide application restrictions established by DATCP.

G. It may be necessary for planners to take precautions beyond the minimums contained within the criteria to account for such concerns as site hydrology, turf quality, and the potential for nutrients to enter waterbodies.

H. Turf Density – Density is commonly evaluated by visual estimation, grids lines, digital analysis, or the transect method as described in the WI-DATCP-UWEX Integrated Pest Management for Wisconsin Schools publication (see Section IX).

I. Watering Recommendations – It is recommended to water in fertilizers placed on slopes. Use enough water to deliver the product without causing runoff.

J. Equipment Calibration – It is recommended to calibrate equipment prior to each use. For further guidance concerning equipment calibration see UWEX publication A2306.

IX. References

Healthy Lawn, Healthy Environment Caring for Your Lawn in an Environmentally Friendly Way EPA Handout, Prevention, Pesticides and Toxic Substances (H7506C), 735-K-04-001, September 2004. http://www.epa.gov/oppfead1/Publications/lawncare.pdf

Natural Resources Conservation Service, Field Office Technical Guide, Section IV, Standard 590 Nutrient Management. http://www.wi.nrcs.usda.gov/technical/

O.J.Noer Turfgrass & Research Facility, UWEX. 3103 County Hwy M, Verona, WI 53593. Integrated Turfgrass Management.

UWEX Publications are available online at: http://cecommerce.uwex.edu and hardcopy: Cooperative Extension Publishing 45 N. Charter St., Madison, WI 53715.

UWEX Publication A2306 Calibrating and Using Lawn Fertilizer and Lime Spreaders

UWEX Publication A3434 Lawn Establishment and Renovation

UWEX Publication A2303 Lawn Fertilization

UWEX Publication A3435 Lawn Maintenance

UWEX Publication A2166 Sampling Lawn and Garden Soils for Soil Testing

Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP) and University of Wisconsin Extension (UWEX). Integrated Pest Management for Wisconsin Schools. Monitoring Weed Populations, p. 150 of the appendix.

Wisconsin Department of Natural Resources (WDNR) Construction Site Erosion & Sediment Control Technical Standards: http://dnr.wi.gov/org/water/wm/nps/stormwater/techstds.htm#Construction.

WDNR Spills Program: http://dnr.wi.gov/org/aw/rr/spills/

X. Definitions

Apparent water table (V.D.3) – Continuous saturated zone in the soil to a depth of at least six feet without an unsaturated zone below it.

Calcareous (V.A.4.b.ii) – An alkaline soil containing free $CaCO_3$ typically with a pH of 7 to 8.3.

Established turf (V.B) – Turf is considered established once it achieves a minimum density of 70%, the grass species is physically mature, and able to support the intended use.

Five or more total acres (III) – A parcel of land under one ownership where turf areas are receiving nutrient applications regardless of whether they are all contiguous. For example, a park may have shelters, sidewalks and parking lots that break up the pervious areas. All turf areas in the park that receive nutrients will be included in the five acre calculation.

Foliar (V.E.3.c) – Spray application of liquid nutrients to turf.

High permeability soils (V.B.2.b.iii) – Equivalent to drained hydrologic group A that meet both of the following criteria:

1. Permeability = 6 inches/hour or more in all parts of the upper 20 inches, and

2. Permeability = 0.6 inches/hour or more in all parts of the upper 40 inches.

High traffic turf area (V.B.3) – Typically an area used by ten or more people per acre per week. Examples of areas considered high traffic include but are not limited to athletic fields, golf courses, and high use park areas.

Interseeding / overseeding (V.C.2) – Application of seed to an existing turf area.

Low-traffic turf areas (V.B.2) – Typically an area used by ten or less people per acre per week.

Ordinary high-water mark (V.E.3.c) – Ordinary high-water mark is the point on the shore up to which the presence and action of the water is so continuous as to leave a distinct mark by one of the following: erosion, destruction of terrestrial vegetation, or other easily recognized characteristics.

Representative area (V.A.1.a) – Locations having similar management (i.e. all the sand based greens on a golf course), soil type, topography, and species of turf.

Saturated soils (V.D.1) – Soils where all pore spaces are occupied by water and where any additional inputs of water or liquid fertilizers cannot infiltrate into the soil.

Sensitive area (VI.B) – Areas of aquatic vegetation offering critical or unique fish and wildlife habitat, including seasonal or life stage requirements, or offering water quality or erosion control benefits to a body of water. For management purposes the area can be located above and/or below the ordinary high water mark.

Starter fertilizer (V.A.1.e) – The concept of a starter fertilizer in an agronomic context is the placement of small amounts of nutrients in close proximity to the seed, at the time of planting. For grass seed, this placement could be broadcast application of fertilizer since the seed is broadcast applied. The intent is to provide newly germinating seedlings with a supply of phosphate, until the seedlings have a better-developed root system. The starter fertilizer will have a higher P concentration than N. Given the typical make-up of a commercial starter fertilizer, applying no more than one lb N / 1000 ft^2 of a starter fertilizer will result in an application somewhere between 1.3 and 2 lbs of P_2O_5. Higher formulations of P are also acceptable, provided the nitrogen application does not exceed one lb N / 1000 ft^2.

Surface water quality management areas (V.E.3) – For the purposes of nutrient management planning surface water quality management areas are defined as follows:

1. The area within 1,000 feet from the ordinary high-water mark of navigable waters that consist of a lake, pond or flowage, except that for a navigable water that is a glacial pothole lake, "surface water quality management area" means the area within 1,000 feet from the high-water mark of the lake.

2. The area within 300 feet from the ordinary high-water mark of navigable waters that consist of a river or stream that is defined as:

- Perennial streams (continuous flow) identified on the NRCS soil survey and/or USGS 1:24,000 scale topographic map as solid lines,

- Otherwise determined through an onsite evaluation and documented in an approved plan.

About AECOM
AECOM (NYSE: ACM) is a global provider of professional technical and management support services to a broad range of markets, including transportation, facilities, environmental and energy. With more than 40,000 employees around the world, AECOM is a leader in all of the key markets that it serves. AECOM provides a blend of global reach, local knowledge, innovation, and technical excellence in delivering solutions that enhance and sustain the world's built, natural, and social environments.

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