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UWSP-MS4-BMP MODELING

STORM WATER QUALITY MANAGEMENT REPORT

PROJECT 19F3E (AMENDMENT 11)

University of Wisconsin at Stevens Point

Bloom Project No. BM1-3723

March 31, 2024

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TABLES

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APPENDICES

ACRONYMS AND ABBREVIATIONS

Bloom ..... Bloom Companies, LLC
BMP ..... Best Management Practice
WDNR ..... Wisconsin Department of Natural Resources
UWSP ..... University of Wisconsin at Stevens Point
EPA ..... Environmental Protection Agency
TMDL ..... Total Maximum Daily Load
TSS ..... Total Suspended Solids
MS4 ..... Municipal Separate Storm Sewer System
NPDES ..... National Pollutant Discharge Elimination System

1.0 EXECUTIVE SUMMARY

The purpose of this Storm Water Quality Management Report is to update the status of the Total Suspended Solids (TSS) reduction efforts by the University of Wisconsin at Stevens Point (UWSP).

The University of Wisconsin at Stevens Point is located in the City of Stevens Point, Wisconsin. The campus is generally located between Isadore Street and Michigan Avenue south of Maria Drive and north of Clark Street (except for the Maintenance and Materials site and the Waste Education site). The location map in Figure 1 shows the campus property boundary.

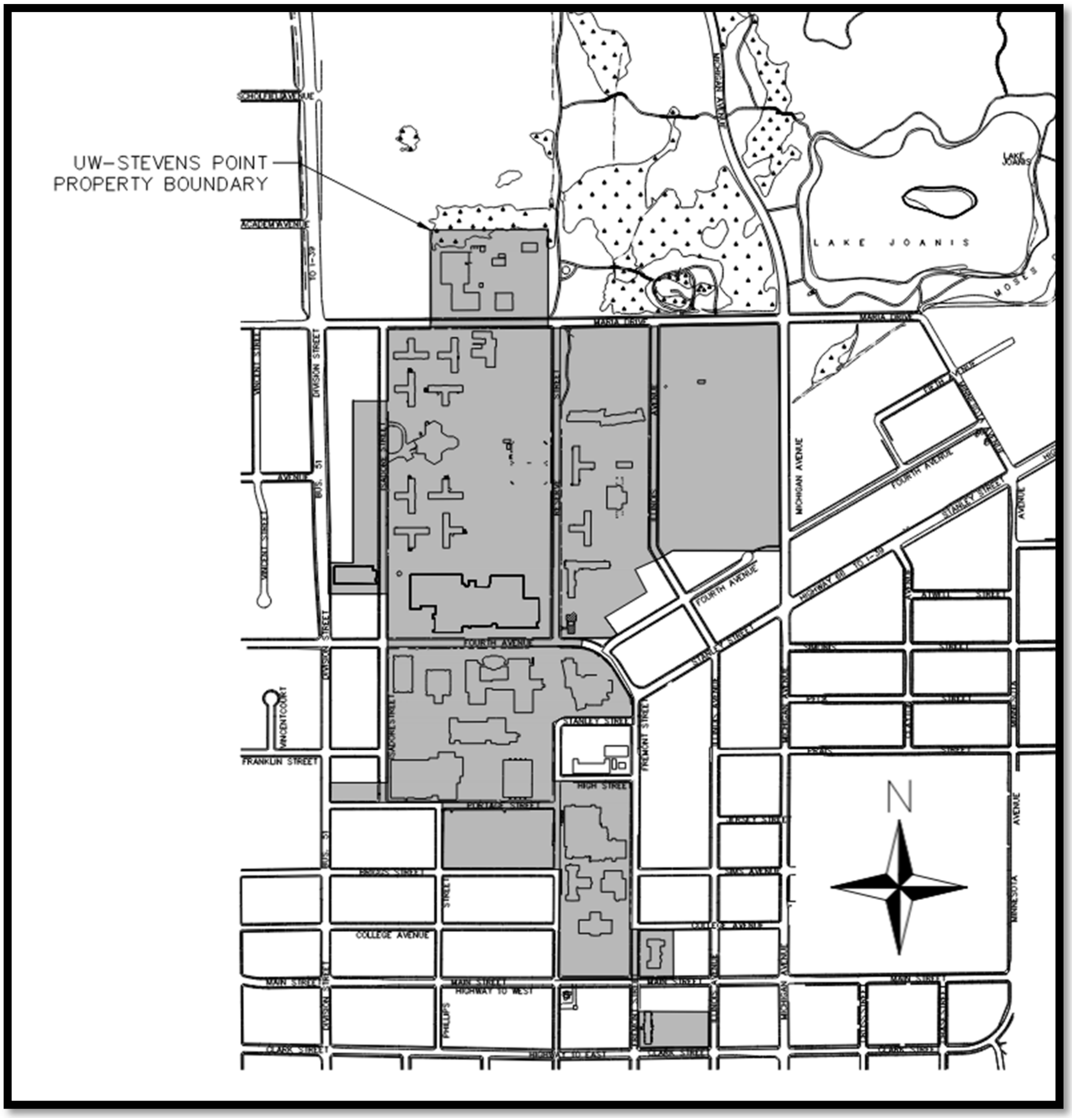


Figure 1 - Location Map

The City of Stevens Point operates a storm sewer system that collects stormwater from the campus. Stevens Point is covered by a general Municipal Separate Storm Sewer System (MS4) Permit that is managed by the Wisconsin Department of Natural Resources (WDNR). The UWSP campus has been excluded from the coverage area under that permit as can be seen in Appendix C.

As the campus has been excluded in the Stevens Point MS4, this means that UWSP must have its own coverage under the general MS4 permit. One of the requirements of this permit is for the permittee, UWSP, to provide proof that the Total Maximum Daily Load (TMDL) goals, as approved by the Environmental Protection Agency (EPA) and WDNR, are being achieved. For UWSP, located in the Central Wisconsin Watershed Basin, all of the stormwater runoff ultimately flows into the Wisconsin River and therefore is subject to reduction requirements for total suspended solids (TSS) and total phosphorus (TP).

The campus was analyzed in 2009 to see what kind of reductions were being achieved. A technical memo was prepared listing the assumptions that were made and indicating that the campus had achieved 6.3% TSS reduction.

It was noted in the 2009 technical memo that pursuant to s. NR 151.13(2), Wisconsin Administrative Code, the total suspended solids reduction requirement increases to 40% by March 10, 2013. However, Bloom was informed by Teagan Wagner of WDNR that that requirement no longer is enforceable due to provisions of state budget bill 2011 Wisconsin Act 32.

The university has implemented various stormwater best management practices (BMP) in an effort to meet these reduction goals. Bloom consulted with UWSP staff and WDNR to identify these BMPs. Bloom has now analyzed the campus to include the BMPs that have been implemented since 2009, modeled the various sites, using WinSLAMM software. UWSP has reached a TSS reduction of 16.2% to date.

2.0 PURPOSE STATEMENT

The purpose of this Storm Water Management Report is to update the status of the Total Suspended Solids (TSS) reduction efforts by the University of Wisconsin at Stevens Point (UWSP).

3.0 BACKGROUND

Municipalities, and other units, that operate a storm sewer system must be covered by a National Pollutant Discharge Elimination System (NPDES) permit to discharge the storm sewer. The permit that covers most units is called a Municipal Separate Storm Sewer System (MS4) permit. The City of Stevens Point is covered by an MS4 permit. This permit requires Stevens Point to account for the TSS reduction they are achieving to conform with TMDL requirements. There are several areas within the city of Stevens Point that are excluded from the overall area that Stevens Point is responsible for. These areas are shown in Appendix C, and are often identified as sections for which the municipality cannot be responsible. Because the UWSP campus is identified as one of these excluded areas, UWSP must be covered under its own MS4 permit. As mentioned above, one of the requirements of the MS4 permit is that the permittee (UWSP) demonstrate how they have complied with the TMDL requirements as mentioned above for Stevens Point.

A study was performed in 2009 that showed the university had reduced the TSS by 6.3%. Bloom is continuing this evaluation to determine the current level of TMDL compliance for TSS reduction.

4.0 BASIS OF MODELING

In January 2024, Bloom Companies, LLC (Bloom) was hired to model areas of the UWSP campus that have changed significantly since the 2009 technical memo was completed. The information from the technical memo completed in 2009 is being used as the starting point for this report. The assumptions made in that technical memo were accepted in 2009 and Bloom is modeling the changes that have taken place since then to determine what level of total suspended solids (TSS) reduction the campus has achieved to date. Some changes have reduced the TSS loading, while others have caused it to increase. The TSS modeling effort included these steps:

- Evaluate the campus and communicate with UWSP staff to determine areas that have changed or been added since 2009.
- Identify all drainage basins that were impacted by these changes.
- Model these basins as they existed in 2009 to calculate the individual baseline TSS loading.
- Determine and make all necessary boundary revisions to reflect the changes.
- Model the changed or new basins as they currently exist to calculate the individual current TSS loading.
- Record the change in TSS loading for each revised basin and use this to determine the total percent reduction.
- Submit the results to WDNR for review and concurrence.

5.0 BASE CONDITIONS

As mentioned earlier, the study that was performed in 2009 modeled the TSS that discharges annually from the campus to the MS4 owned by the City of Stevens Point. The university provided the drainage basins and land uses for the entire campus and that information was used to model each basin with and without controls. The technical memo states that the base loading from the campus is 17.0 tons. A reduction of 1.0 ton was calculated by applying the disconnection parameters to the appropriate basins. At the time of that technical memo, there were three locations employing BMPs; Schmeeckle Reserve

Visitor Center, Dreyfus University Center, and Old Main building. Modeling those basins with the controls yielded another 0.2 tons of TSS reduction, which brought the total TSS reduction for the university to 6.3%. A copy of the 2009 technical memo is included in Appendix A of this report.

Since 2009, the university has purchased more property so the campus size has increased. Two new drainage basins have been created to represent these additions to the UWSP campus. Basin 87 is located just west of Isadore Street on the north side of Portage Street as seen below.

Aerial Image Date: 06/22/2008 (Google Earth™)

The university developed this property to create a new parking lot (Parking Lot Y) which is described in more detail in the next section of this report. Just south of Parking Lot R, is another residential area that has been purchased and is now part of the UWSP campus. This area has been added to the campus total as Basin 88, and is shown in the image below.

Aerial Image Date: 06/22/2008 (Google Earth™)

By modeling basins 87 and 88, an additional 0.16 tons of TSS must be added to the base total of 17.0 tons that was determined in the 2009 technical memo, giving a new base value of 17.16 tons.

Bloom used this revised data in continuing this evaluation and to determine the current level of TMDL compliance for TSS reduction.

6.0 CHANGES

Since 2009, there have been several changes in the land use of various basins. Bloom compared historical imagery using Google Earth Pro™ (version 7.3.6.9796) in an effort to locate areas of significant change. Seven areas were identified that have changed significantly since the 2009 technical memo. These areas include the Schmeeckle Reserve Visitor Center, the Maintenance and Materials / Waste Education site, the Suites @ 201 site, the new Chemistry / Biology building, Parking Lot Y, Parking Lot R and the Albertson Hall Renovation site.

6.1 SCHMEECKLE RESERVE VISITOR CENTER

UWSP owns the property northeast of the campus proper known as Schmeeckle Reserve. There is a visitor center located on the south side of North Point Drive, just east of Michigan Avenue, that is used to educate the general public on the benefits of preserving the natural environment. The image below shows this area as it was when included in the 2009 technical memo. At the time it contained a parking lot with a bioretention basin to offset the impervious area.

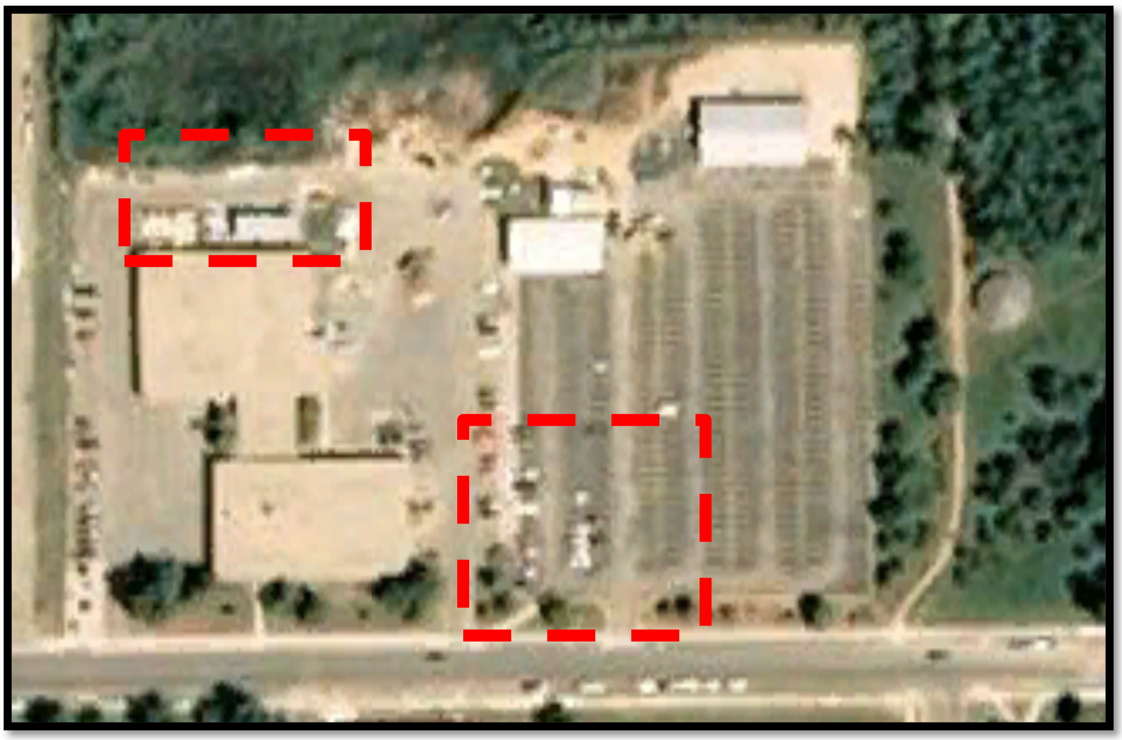
Aerial Image Date: 06/22/2008 (Google Earth™)

In 2020 two small buildings and an amphitheater were added to the area. The visitor center is used for outdoor classrooms, weddings and other group events. Another biofilter device was added east of the existing parking lot, as can be seen in the image below. Bloom discussed these developments with Ethan McGowan of the WDNR and it was decided that these new developments are classified as internally-draining, and therefore, excluded from the MS4 and TMDL requirements.

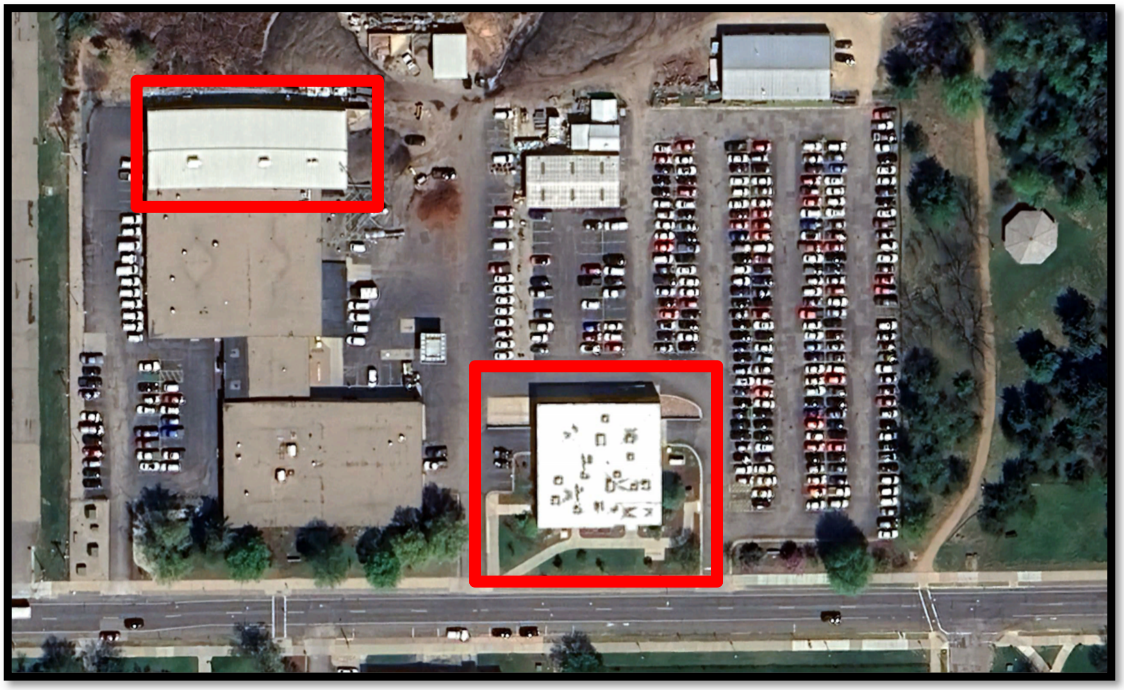
Aerial Image Date: 05/14/2023 (Google Earth™)

6.2 MAINTENANCE & MATERIALS/WASTE EDUCATION

The Maintenance and Material building area which is located just east of Isadore Street on the north side of Maria Drive, was modified in 2012 with a building addition on the north side. The new roof is pitched, with an east-west oriented ridgeline. The stormwater runoff from north half of the roof discharges at-grade to the north, and the runoff from the south half discharges onto the existing building to the south. This resulted in reducing the "parking" land use for Basin 4 by the total new roof area, and increasing the "roof" land use by only the north half. The "roof" land use for Basin 5 was increased to account for the south half of the new roof. The Waste Education building was constructed in 2011 in the southwest corner of the existing parking lot located adjacent to and just east of the Maintenance and Materials site. This development resulted in the reduction of "parking" land use for Basin 4 while increasing the land use areas for "roof" and "landscaping". The images below show these sites in their "base conditions" for the 2009 technical memo, and in their "current conditions" which have been modeled for this status update report.



Aerial Image Date: 06/22/2008 (Google Earth™)



Aerial Image Date: 05/14/2023 (Google Earth™)

6.3 SUITES@201/TENNIS COURTS

In 2010, a new residential building, known as the Suites @ 201, was constructed just south of Zimmermann Baseball Field between Reserve Street and Illinois Avenue. This building replaced the smaller residence hall that can be seen in the image below.

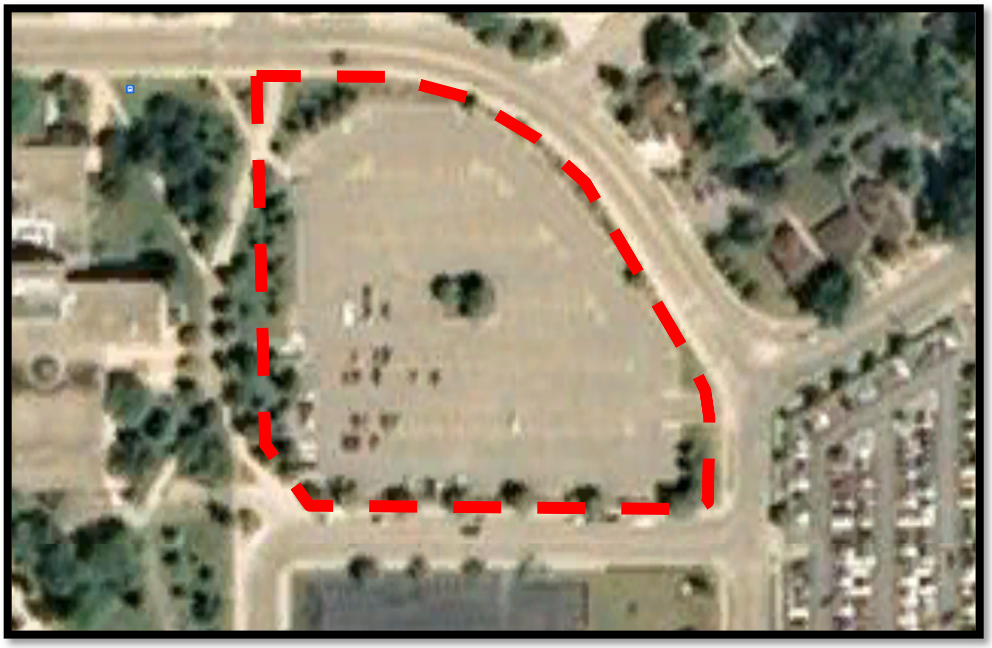
Aerial Image Date: 06/22/2008 (Google Earth™)

Just south of this new building the land use was more recently changed (2021) by removing the tennis courts and replacing them with a student-led sustainability garden. The new residential building and the sustainability garden can be seen in the image below.

Aerial Image Date: 05/14/2023 (Google Earth™)

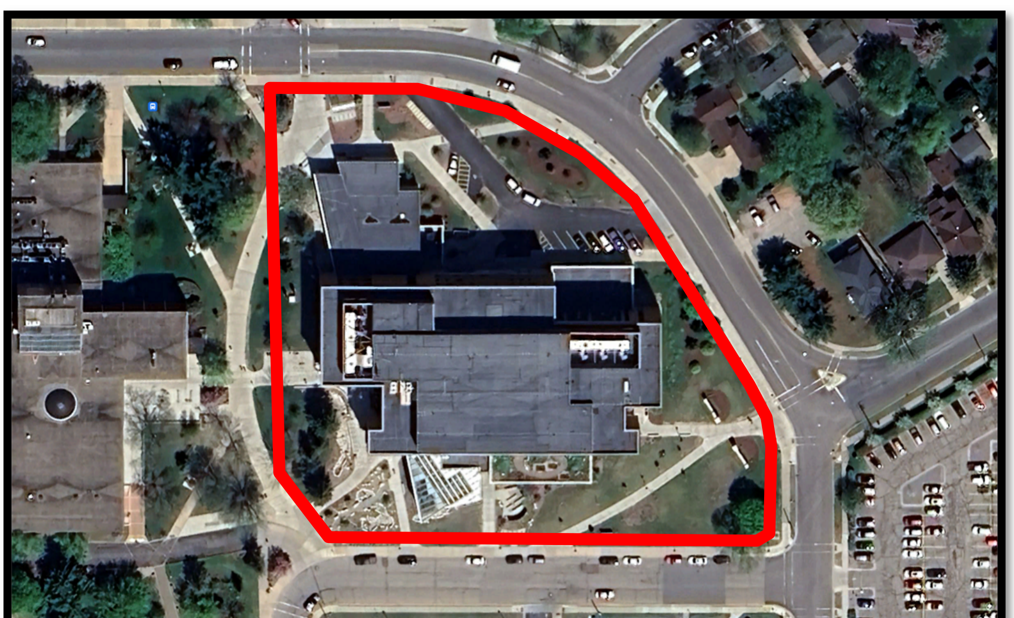
Basins 10, 23 and 27 were modified to reflect the new land uses in this area and the models were run to determine the changes in TSS loading.

6.4 CHEMISTRY/BIOLOGY BUILDING



Aerial Image Date: 06/22/2008 (Google Earth™)

The Chemistry / Biology building was constructed in 2016 just north of Stanley Street on the west side of Fremont Street. This building was constructed on basins 53 and 61, on what previously was the site of an asphalt parking lot, shown in the image above. Those basins have been revised based on the new land use which consists of a new academic building surrounded by landscaping. This site contains new BMPs, and the changes are shown in the image below.



Aerial Image Date: 05/14/2023 (Google Earth™)

6.5 PARKING LOT Y

The area located just west of Isadore Street and north of Portage Street was once a residential area, as seen in the image below.

Aerial Image Date: 06/22/2008 (Google Earth™)

UWSP purchased the homes that once stood on that block and constructed Parking Lot Y, in 2015, as shown below.

Aerial Image Date: 05/14/2023 (Google Earth™)

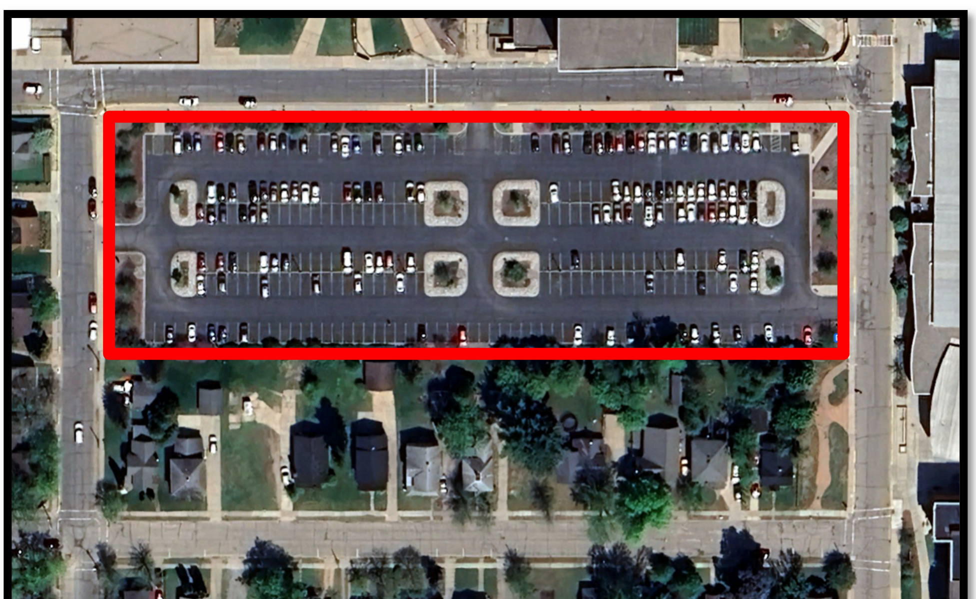
This is one of the campus additions mentioned earlier in this report. The limits of the campus have been revised to include this new area. Basin 87 has been created to account for this development. The parking lot was constructed with a bioretention facility that has been modeled as part of this effort. This BMP consists of a vegetated area along the west end of this property. The stormwater is collected in this biofiltration area and the overflow is contained in an underground storage facility.

6.6 PARKING LOT R

Parking Lot R, located just south of Portage Street between Phillips Street and Reserve Street was revised in 2010. The footprint that existed in 2009 is shown in the image below.

Aerial Image Date: 06/22/2008 (Google Earth™)

The revised footprint of the parking lot, shown below, changed a little, requiring in the revision of basins 71 and 62.

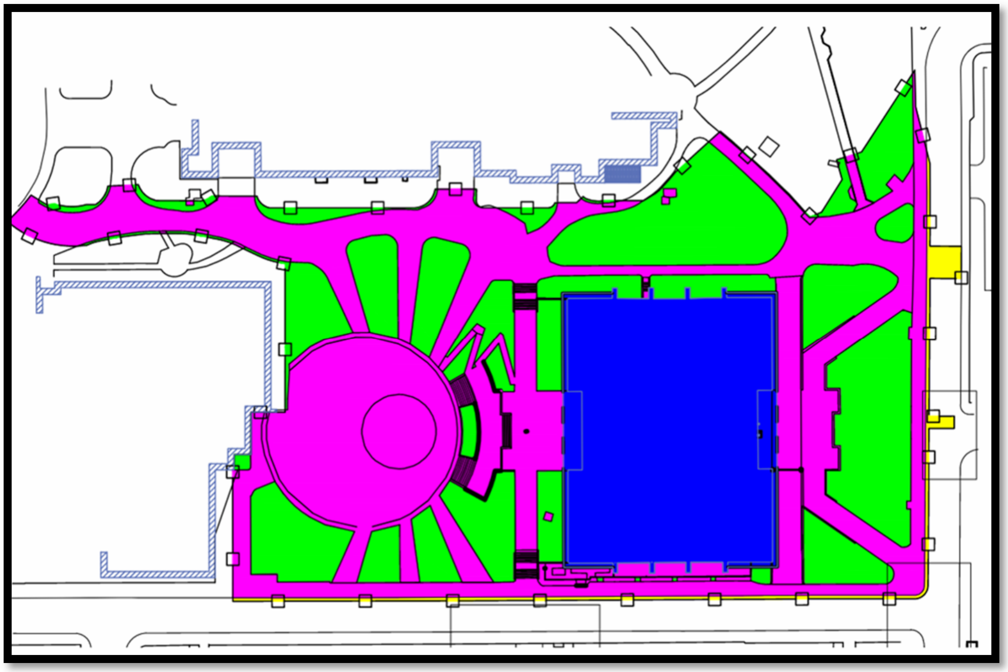


Aerial Image Date: 05/14/2023 (Google Earth™)

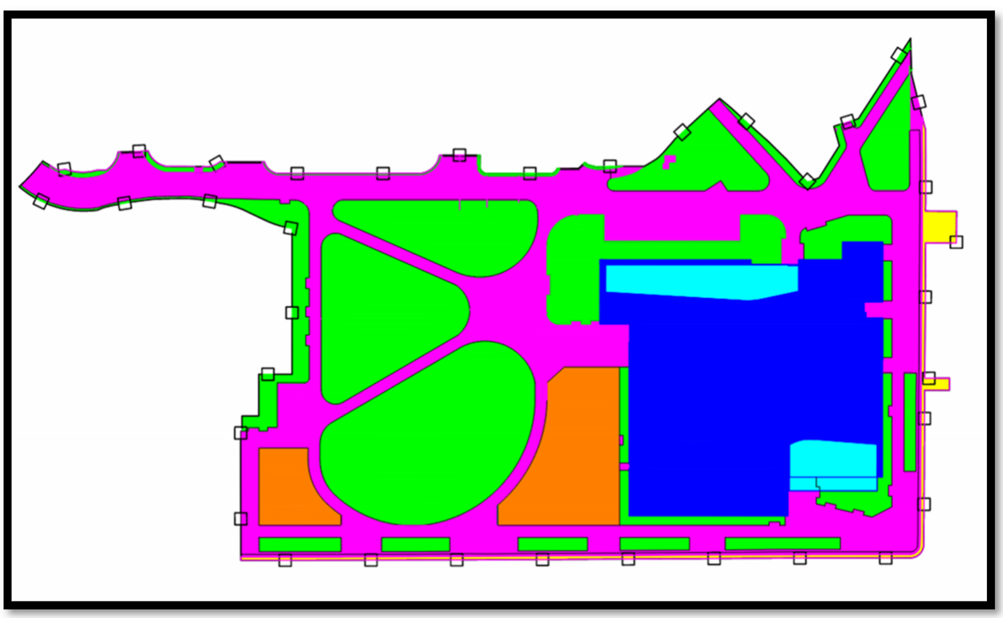
A small area of land, located at the southeast corner of Portage Street and Reserve Street, that used to drain into the ROW is now part of the expanded parking lot and is contained within basin 71. In addition to the revised land use, parking lot R incorporates various bioretention facilities similar to the one described above for Parking lot Y.

6.7 ALBERTSON HALL RENOVATION

Albertson Hall is located on the northwest corner of Portage Street and Reserve Street. The existing building was demolished in 2023 so that a new building could be constructed in its place. Bloom Companies served as the Civil Design for this project which has been designed with several BMPs that will be incorporated into this new construction starting in 2024. As this project was already underway at the time of this report, the stormwater quality management efforts were modeled and included in the TSS reduction results.



Existing Conditions as of 2008



Proposed Conditions under construction in 2024

7.0 METHODS

WinSLAMM version 10.4.1 was used to model the campus subbasins to determine the reduction in total suspended solids (TSS) achieved. WinSLAMM is a robust planning tool that offers insights into urban runoff pollutant sources and runoff quality, enabling effective evaluation of stormwater management practices. Developed since the late 1970s, the model has evolved to predict pollutant concentrations and loadings across diverse source areas. It encompasses a wide array of control practices, such as infiltration techniques, wet detention ponds, and porous pavements, to address runoff issues comprehensively. By calculating mass balances for both particulate and dissolved pollutants, as well as runoff volumes, WinSLAMM provides valuable data tailored to various development scenarios and rainfall conditions. Notably, the model draws on field observations, prioritizing empirical evidence over unverified theoretical processes. For more information on WinSLAMM's components, users can refer to the resources available at http://winslamm.com/.

8.0 MODELING

The delineation of the various basins on campus were provided by UWSP along with the individual land use areas within the basins. The 2009 technical memo used the disconnected areas to account for 1 ton of TSS removal. This was determined by modeling the impervious areas that discharge to pervious areas before draining to the sewer system. More detail on this can be found in the 2009 technical memo which is located in Appendix A.

For each identified area of significant change, the differences in land use were quantified and a comprehensive list was compiled using the WinSLAMM software. Bloom was then able to input the models for each affected basin and assess the potential impact on stormwater management. Additionally, the university provided valuable information regarding known areas with new building developments. For these areas, we modeled any associated Best Management Practices (BMPs) to account for their impact on stormwater runoff and water quality.

Information on the assumptions made during this modeling effort can be found in Appendix B.

9.0 RESULTS

The drainage basins that were impacted by the changes have been modeled for both the "Base Conditions" that existed when the 2009 technical memo was completed, and the "Current Conditions" as they exist today. The Base Conditions results are shown below in Table 9-1, and the Current Conditions results are shown in Table 9-2. The total TSS Loading generated from the impacted basins as they were in 2009 was 4.06 tons. Accounting for the changes that have taken place since 2009, those basins are now generating only 2.48 tons. Combining this reduction of 1.58 tons (4.06 - 2.48 = 1.58) with the 1.20 tons identified in the 2009 technical memo brings the campus total for reduced TSS to 2.78 tons, which represents a TSS reduction of 16.2%. These results can be seen in Table 9-3.

Table 9-1 TSS Loading for Base Conditions										
Area	Drainage Basin	Total Acres	Driveway	Other Impervious	Other Pervious	Parking	Sidewalk	Landscape	Roof	TSS Loading
Maintenance & Materials	5	1.17	0.01	0.00	0.00	0.20	0.00	0.10	0.86	0.13
Waste Education	4	5.24	0.01	0.00	0.00	4.33	0.02	0.70	0.17	1.33
Suites @ 201	23	0.42	0.00	0.00	0.00	0.00	0.02	0.18	0.21	0.02
Suites @ 201	10	10.96	0.01	0.01	3.51	0.04	0.60	6.80	0.00	0.07
Tennis Courts	27	2.46	0.00	0.59	0.00	0.25	0.28	1.34	0.00	0.34
Chemistry / Biology	53	1.47	0.00	0.00	0.00	1.23	0.01	0.24	0.00	0.37
Chemistry / Biology	61	1.23	0.03	0.00	0.00	1.02	0.00	0.17	0.02	0.32
Chemistry / Biology	55	1.11	0.00	0.00	0.00	0.05	0.20	0.85	0.01	0.01
Parking Lot Y	87	0.77	0.00	0.00	0.00	0.09	0.01	0.54	0.13	0.03
Parking Lot R	71	2.57	0.00	0.00	0.00	1.49	0.00	1.08	0.00	0.46
Albertson Hall	63	8.60	0.11	0.00	0.00	0.80	2.02	1.89	3.77	0.95
Albertson Hall	62	2.74	0.17	0.00	0.00	0.04	0.74	1.77	0.02	0.01
TOTAL		38.74	0.34	0.60	3.51	9.54	3.89	15.66	5.19	4.06

Table 9-2 TSS Loading for Current Conditions										
Area	Drainage Basin	Total Acres	Driveway	Other Impervious	Other Pervious	Parking	Sidewalk	Landscape	Roof	TSS Loading
Maintenance & Materials	5	1.28	0.01	0.00	0.00	0.20	0.00	0.10	0.97	0.14
Waste Education	4	5.13	0.01	0.00	0.00	3.58	0.11	0.90	0.52	1.16
Suites @ 201	23	0.84	0.00	0.00	0.00	0.00	0.02	0.18	0.63	0.06
Suites @ 201	10	10.54	0.01	0.01	3.09	0.04	0.60	6.80	0.00	0.07
Tennis Courts	27	2.46	0.00	0.00	0.59	0.25	0.28	1.34	0.00	0.14
Chemistry / Biology	53	1.52	0.00	0.03	0.00	0.20	0.30	0.43	0.57	0.04
Chemistry / Biology	61	1.61	0.00	0.00	0.00	0.00	0.23	0.75	0.64	0.03
Chemistry / Biology	55	0.85	0.00	0.00	0.00	0.05	0.20	0.59	0.01	0.00
Parking Lot Y	87	0.77	0.00	0.00	0.04	0.55	0.01	0.17	0.00	0.01
Parking Lot R	71	2.83	0.00	0.00	0.00	2.32	0.01	0.50	0.00	0.06
Albertson Hall	63	9.30	0.11	0.00	0.30	0.80	1.49	2.53	4.06	0.77
Albertson Hall	62	1.61	0.17	0.00	0.00	0.04	0.64	0.76	0.00	0.01
TOTAL		38.74	0.31	0.04	4.02	8.03	3.89	15.05	7.40	2.48

Table 9-3 TSS Reduction Achieved				
	TSS Load (Tons/Yr)	BMP Reduction		
		Individual (Tons/Yr)	Individual (%)	Cumulative (%)
Base Conditions	17.00	-	-	-
Adding New Property	17.16	-	-	-
Adjustment for Disconnection	16.16	1.00	5.83%	5.83%
BMPs from 2009	15.96	0.20	1.17%	6.99%
BMPs and other changes since 2009	-	1.58	9.21%	16.20%
TOTAL	-	2.78	16.20%	-

Bloom agrees with the assessment mentioned in the 2009 technical memo that retrofitting the existing parking lots around campus with BMPs is an efficient and effective way to reduce the total suspended solids that are leaving campus and discharging into Stevens Points MS4, which ultimately discharges to the Wisconsin River. UWSP is a good steward when it comes to environmental sustainability, and they will continue implementing BMPs in new development, which will also help them comply with the TMDL requirements of the Wisconsin River.

Appendix A

2009 Technical Memorandum (AECOM)

UWSP – Urban Stormwater

Pollution Loading Analysis

AECOM

AECOM
200 Indiana Avenue, Stevens Point, Wisconsin 54481
T 715.341.8110 F 715.341.7390 www.earthtech.aecom.com

Memorandum

Date: June 16, 2009

To: Carl Rasmussen, UW Stevens Point
Don Popoff, P.E., Director of Public Works, City of Stevens Point

From: Kurt Schoen, P.E., P.H.
Joe Hanson, EIT

Subject:: **University of Wisconsin – Stevens Point: Urban Stormwater Pollution Loading Analysis**
Stevens Point, Wisconsin
AECOM Project No. 105408

Background/Scope of Work

The analysis described in this memorandum was conducted in partial fulfillment of the University of Wisconsin-Stevens Point (UWSP) Campus Municipal Separate Storm Sewer System (MS4) General Permit. This report documents the stormwater pollution analysis conducted for the area of the UWSP campus regulated under the MS4 permit. The permit requires an estimate of the annual stormwater pollution loadings (sediment and phosphorus) for all storm sewer outfalls that meet the regulatory definition of an "MS4". This pollution loading analysis establishes the base pollution load and the pollution reduction resulting from the existing stormwater best management practices (BMPs) on the campus.

The analysis used the Windows™ version of an urban pollution loading model "Source Loading and Management Model" (WinSLAMM) to model annual pollution loadings under the following two scenarios:

1. Base Conditions: October 1, 2004, land use conditions with no BMPs applied.

2. Existing Conditions: October 1, 2004, land use conditions with the BMPs as of January 2009 applied. The existing BMPs are described later in this memorandum.

If under scenario 2, the existing BMPs were not sufficient to meet the required 20 percent and 40 percent Total Suspended Solids (TSS) reduction requirements, additional BMPs would be evaluated to achieve this goal.

Summary of Methods for Pollution Loading Model – Base and Existing Conditions

This section summarizes the analysis conducted for UWSP to determine the base conditions pollution load and the amount of pollution load reduction currently being achieved by UWSP's existing BMPs. The pollution loads are established using the policies and procedures set forth by the Wisconsin Department of Natural Resources (WDNR) to analyze pollution loading in developed urban areas were followed throughout the process. These policies can be found at the WDNR website: http://www.dnr.state.wi.us/runoff/stormwater/muni.htm.

Pollution Loading Model Input Information

A GIS database was created characterizing the UWSP campus in terms of urban stormwater pollution generation. Information in the database includes:

1. Subbasin delineations (delineations by campus staff)
2. Hydrologic soil groups (USDA NRCS soil data)
3. Land use conditions as of October 2004
4. Biofilter locations (provided by campus staff)
5. Connected or disconnected impervious surfaces (based on storm sewer mapping)

Note: Campus staff delineated drainage basins captured by the university storm sewers, primarily directly connected impervious roofs and parking lots. All campus areas not draining into storm sewers were grouped into several subbasins by AECOM. This process was reviewed with Brad Johnson, WDNR West Central Region Stormwater Specialist.

Area of Analysis

All of the lands within the campus boundary of UWSP as of October 1, 2004, were analyzed with the exceptions as described below. The following list summarizes the lands excluded from the analysis in accordance with WDNR policies:

1. Undeveloped land greater than 5 acres (the entire Schmeeckle Reserve).

2. City of Stevens Point owned right-of-way for all streets intersecting and surrounding the campus lands.

Stormwater Model Description

WinSLAMM version 9.3.1 was used to conduct the analysis. The following supporting parameters files were used:

1. WisReg – Madison Five year Rainfall.ran WI_GEO01.ppd
2. WI_SL06 Dec06.rsv
3. WI_AVG01.psc
4. WI_DLV01.prr
5. WI_Res and Other Urban Dec06.std
6. WI_Com Inst Indust Dec06.std

WinSLAMM data files were created specifically to represent each source area present on the campus. Source areas in WinSLAMM consist of rooftop, parking, driveway, sidewalk, and landscaped areas. The different source areas and their coverage on the campus are shown on Figure 1 following this memorandum. The source areas present on the UWSP campus are summarized by drainage basin in Table A-1.

<u>Existing Stormwater BMPs</u>

UWSP currently has two types of existing BMPs in place. These practices are:

1. Biofilters
2. Disconnected impervious source areas

The existing BMPs are described below.

1. Biofilters: Biofilters are specially constructed landscaped depressions in the ground surface. During rain events, stormwater enters the biofilter and soaks into an area with a mixture of sand, compost and top soil before being allowed to either infiltrate into the ground or exit through one or more under drain pipes. Biofilters also feature landscaping of various plant species which contribute with aesthetic value and enhance the infiltration rate of the soil.

   UWSP has constructed biofilters during renovations in recent years. In addition to the newly constructed facilities, some of these treatment devices service lands that were fully or partially developed prior to October 1, 2004. The pollution control from these existing developed lands was applied to the equivalent land area as of October 1, 2004. The pollution control effectiveness of three biofilter areas was modeled using data provided by UWSP. Another biofilter area, Parking Lot R, was designed by AECOM. Therefore, a designed efficiency of 92 percent TSS removal was used for this analysis. A summary of the biofilter characteristics used for input into the WinSLAMM model is found in Table 1.

Table 1
Biofilter Characteristics for Modeling Purposes

BMP	Contributing Drainage Area (acres)	Total Bottom Surface Area (sq ft)	Total Depth (feet)	Outlet Structure
Parking Lot R Biofilter	3.3	2,865	1.6	4" dia underdrain & 5' wide broad-crested weir
Schmeeckle Visitors Center Lot Biofilter	0.5	50	6.0	62’ long broad-crested weir
Building 1 Biofilter	2.5	135	1.7	18” vertical stand pipe & 5 wide broad-crested weir
Building 40 Biofilter	0.4	312	1.0	5' wide broad-crested weir

Note: With the exception of the Parking Lot R biofilter (designed by AECOM), all biofilter characteristics for modeling purposes were provided by UWSP staff. The Parking Lot R biofilter project is scheduled for construction during the summer of 2009.

2. Disconnection: This refers to impervious surfaces, such as rooftops or parking lots, which drain directly onto pervious (vegetated) surfaces and allow for some stormwater infiltration before runoff enters the conveyance system. Directly connected source areas are those impervious surfaces that drain into a stormwater conveyance system without passing over pervious surfaces.

   In accordance with WDNR policies, the analyzed base condition used a fixed connection factor for impervious source areas. Upon investigation of the UWSP campus and based on feedback from campus staff, it was estimated that certain drainage basins on the campus had a higher degree of "disconnection" than the fixed base condition. Thus the higher disconnection factor was taken into account when modeling the campus under the existing managed condition.

The BMPs on campus were modeled for the TSS reduction capabilities.

The approximate locations of the existing BMPs are shown on Figure 2. The BMPs were modeled to determine the pollution reduction of the load generated by contributing drainage areas under the October 1, 2004, land use conditions.

Table 2
BMP Descriptions and Drainage Area Characteristics

Location	BMP Type	Site Description	Subbasin Name	BMP Drainage Area	Total BMP Drainage Area	BMP Surface Area	Treatment Efficiency
				(acres)	(acres)	(sq. ft.)	(%)
Portage St. & Phillips St.	Biofilter	Parking Lot R	71	3.33	3.33	2,865	92
North Point Dr.	Biofilter	Schmeekle Visitors Center Lot	3	0.51	0.51	50	95
College Ave.	Biofilter	Building 1	81	2.46	2.46	135	79
Briggs St.	Biofilter	Building 40	72	0.39	0.39	312	88

Results - Base and Existing Conditions

The results of the WinSLAMM modeling analysis are shown in Table 3. This table shows the annual TSS and Total Phosphorus (TP) loadings under the base and existing conditions (see definitions on page one of this memo).

Table 3
Annual Base and Existing Conditions Pollution Loads

Scenario	TSS Load (tons/yr)	BMP Reduction			TP Load (lbs/yr)
		Individual (tons/yr)	Individual (%)	Cumulative (%)	
Base Conditions	**17.0**	**0.0**	**0.0**	**0.0**	**107**
Adding disconnection	16.0	1.0	5.8	5.8	99
Counting existing biofiltration	15.8	0.2	0.5	6.3	98
Sum of Existing Conditions	**15.8**	**1.2**	**----**	**6.3**	**98**
Adding Parking Lot R biofiltration	14.8	1.0	6.6	12.9	94
Expected Conditions, Fall 2009	**14.8**	**2.2**	**----**	**12.9**	**94**

The campus annual base conditions TSS load is 17.0 tons per year. After accounting for the TSS control from the existing BMPs analyzed, the existing conditions TSS load is 15.8 tons per year, which represents a TSS reduction of 6.3 percent. The Parking Lot R biofilters have been designed and approved; construction is planned for the summer of 2009. With the operation of these new biofilters, the campus expected conditions TSS load will be 14.8 tons per year, which represents a TSS reduction of 12.9 percent.

Two figures showing information relevant to the modeling effort can be found at the end of this memo:

1. Figure 1: UWSP campus WinSLAMM Source Area Map: These maps divide the campus into three areas and show the source areas for each drainage system within the modeled campus area that was used in the WinSLAMM input (data) files.

2. Figure 2: Existing Best Management Practices: These maps divide the campus into three areas and show the approximate locations of the existing BMPs and the current campus parcel boundaries.

Proposed Management

Since the existing BMPs do not achieve the 20 percent or 40 percent TSS control required under the MS4 permit, additional stormwater BMPs were investigated. The campus needs to reduce its TSS loading by an additional 2.2 tons per year to achieve a 20 percent reduction and 5.8 tons per year to achieve a 40 percent reduction.

Load per Source Area

The first step in determining the location and size of the proposed BMPs is to conduct an analysis that characterizes the project area based on relative pollution load generation. BMPs that are applied to areas with a relatively large pollution load are generally more cost effective.

The no-controls condition pollution loading for each impervious source area identified on the UWSP campus was calculated. The cumulative load for each impervious source area is listed in

Table 4. Note: There are other pervious source areas not shown on Table 4 which account for the base loading difference between 17.0 and 14.6 tons/yr.

Table 4
Sediment (TSS) Loading by Source Area

Source Area	Area (acres)	TSS Load (tons / yr)
Roof	20.8	1.9
Parking Lot	29.4	9.9
Driveway	1.8	0.7
Sidewalk	9.9	2.0

As shown in the table, parking lots account for the highest sediment loading for impervious surfaces on campus. Sidewalks account for the next highest sediment loading on campus. Even if 100 percent of the sediment from rooftops and sidewalks were treated, the 40 percent reduction goal (reduce the sediment load by an additional 5.8 tons/yr) could not be achieved.

Therefore, the conceptual application of new best management practices would be best used in treatment of the parking lot runoff. Because the parking lots are scattered throughout the campus, a centralized treatment approach (wet detention ponds) was deemed to be not feasible.

UWSP has previously added biofilters to existing parking lots during reconstruction projects. It is recommended that the campus continue this practice until the 40 percent TSS reduction goal has been met. Table 5 shows the pollution control results that these proposed biofilters would yield when applied to certain parking lots. The table includes a list of some of the existing parking lots that have not yet been reconstructed to feature biofilter treatment devices.

Table 5: Proposed Best Management Practices: Pollution Control

Parking Lot ID	Area (acres)	Proposed Treatment	TSS Base Load (tons/yr)	TSS Control (tons/yr)	Cumulative TSS Control (tons/yr)	Cumulative Percent TSS Control (%)
R	3.33	Biofilter	1.20	1.00	1.00	13%
Q	7.18	Biofilter	2.44	2.20	3.20	25%
P	2.91	Biofilter	0.99	0.89	4.09	30%
X	2.47	Biofilter	0.84	0.76	4.84	35%
J	2.31	Biofilter	0.79	0.71	5.55	39%
T	1.53	Biofilter	0.52	0.47	6.02	42%
W	1.22	Biofilter	0.41	0.37	6.39	44%
E	0.96	Biofilter	0.33	0.29	6.69	46%
H	0.67	Biofilter	0.23	0.21	6.89	47%
Z	0.64	Biofilter	0.22	0.20	7.09	48%
D	0.58	Biofilter	0.20	0.18	7.26	49%
Total:	**23.80**		**8.16**	**7.26**	**7.26**	

As shown in Table 5, the proposed biofilter treatment of the parking lots listed would provide an additional 7.26 tons of TSS control per year, which exceeds the 40 percent goal of 5.8 tons. The first parking lot listed in Table 5 is Parking Lot R which is scheduled for reconstruction in the summer of 2009. The table shows the treatment of parking lot areas beyond the 40 percent goal so that UWSP can choose an appropriate combination of parking lots to reconstruct.

Conclusions

As stated in the UWSP MS4 Permit, the campus must provide:

> ***"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 stormwater pollution modeling evaluation conducted for the UWSP followed the guidelines provided by the WDNR for compliance with the MS4 Permit. As a result of this evaluation the following conclusions are made:

1. After accounting for all of the existing BMPs, UWSP is currently reducing its pollution load by about 1.2 tons of TSS per year (a 6.3% reduction). Therefore, the campus has not met the TSS reduction requirements of their MS4 Permit for the 2008 goal (20 percent). The 2013 goal (40 percent) also has not been met.
2. Since both the 20 and 40 percent TSS removal goals have not been met, additional best management practices are necessary for UWSP to gain MS4 compliance. Proposed BMPs include new biofilter design and construction to treat approximately 15 acres of existing parking lots.
3. The UWSP should review these results with the WDNR to finalize their MS4 permit compliance for the TSS reduction requirements.

Attachment A: Supporting Documentation

Table A-1
Drainage Basin & Source Area Summary

BASIN ID	TOTAL ACRES	DRIVEWAY	OTHER_IMPERVIOUS	OTHER_PERVIOUS	PARKING	SIDEWALK	LANDSCAPE	ROOF
2	3.02	0.05	0.00	0.00	0.07	0.00	2.79	0.12
3	0.51	0.00	0.00	0.00	0.51	0.00	0.00	0.00
4	5.24	0.01	0.00	0.00	4.33	0.02	0.70	0.17
5	1.17	0.01	0.00	0.00	0.20	0.00	0.10	0.86
6	12.84	0.01	0.00	12.65	0.10	0.00	0.08	0.00
7	0.71	0.00	0.00	0.00	0.00	0.14	0.33	0.24
8	0.46	0.00	0.17	0.24	0.00	0.06	0.00	0.00
9	0.59	0.00	0.00	0.09	0.08	0.05	0.11	0.27
10	10.96	0.01	0.01	3.51	0.04	0.60	6.80	0.00
11	0.10	0.00	0.00	0.10	0.00	0.01	0.00	0.00
12	6.90	0.00	1.02	5.65	0.01	0.07	0.14	0.02
13	0.61	0.12	0.00	0.08	0.30	0.01	0.10	0.00
14	0.76	0.00	0.00	0.00	0.00	0.09	0.67	0.00
15	0.50	0.00	0.00	0.00	0.00	0.07	0.19	0.24
16	0.40	0.00	0.00	0.00	0.00	0.08	0.32	0.00
17	2.24	0.05	0.00	0.01	0.04	0.43	1.47	0.24
18	0.46	0.00	0.00	0.00	0.00	0.06	0.16	0.24
19	0.18	0.00	0.00	0.00	0.00	0.02	0.16	0.00
20	3.04	0.01	0.00	0.00	2.73	0.00	0.13	0.17
21	0.70	0.10	0.00	0.00	0.00	0.00	0.60	0.00
22	1.87	0.14	0.00	0.00	0.00	0.19	0.82	0.71
23	0.42	0.00	0.00	0.00	0.00	0.02	0.18	0.21
24	3.58	0.00	0.00	1.18	0.00	0.66	1.50	0.24
25	1.24	0.00	0.97	0.19	0.00	0.00	0.07	0.00
26	5.15	0.18	0.02	4.63	0.00	0.10	0.21	0.01
27	2.46	0.00	0.59	0.00	0.25	0.28	1.34	0.00
28	0.60	0.00	0.00	0.00	0.00	0.03	0.31	0.27
29	0.50	0.10	0.00	0.00	0.00	0.03	0.37	0.00
30	3.64	0.03	0.00	0.18	3.33	0.00	0.11	0.00
31	3.97	0.00	0.00	0.07	3.90	0.00	0.00	0.00
32	1.40	0.16	0.00	0.00	0.00	0.22	0.78	0.24
33	0.86	0.00	0.00	0.00	0.00	0.13	0.49	0.24
34	0.31	0.00	0.00	0.00	0.00	0.06	0.25	0.00
35	0.77	0.00	0.00	0.00	0.01	0.06	0.33	0.37
36	1.67	0.11	0.00	0.00	0.00	0.12	1.44	0.00
37	0.44	0.00	0.00	0.00	0.00	0.03	0.17	0.24
38	0.51	0.00	0.00	0.00	0.00	0.03	0.23	0.24
39	1.90	0.17	0.00	0.04	0.00	0.05	0.32	1.33
40	1.99	0.01	0.00	0.00	1.62	0.13	0.23	0.00
41	0.59	0.11	0.00	0.10	0.32	0.03	0.03	0.00
42	1.17	0.01	0.00	0.00	0.00	0.15	0.61	0.39
43	0.78	0.00	0.00	0.00	0.37	0.00	0.02	0.39

Table A-1 (cont.)
Drainage Basin & Source Area Summary

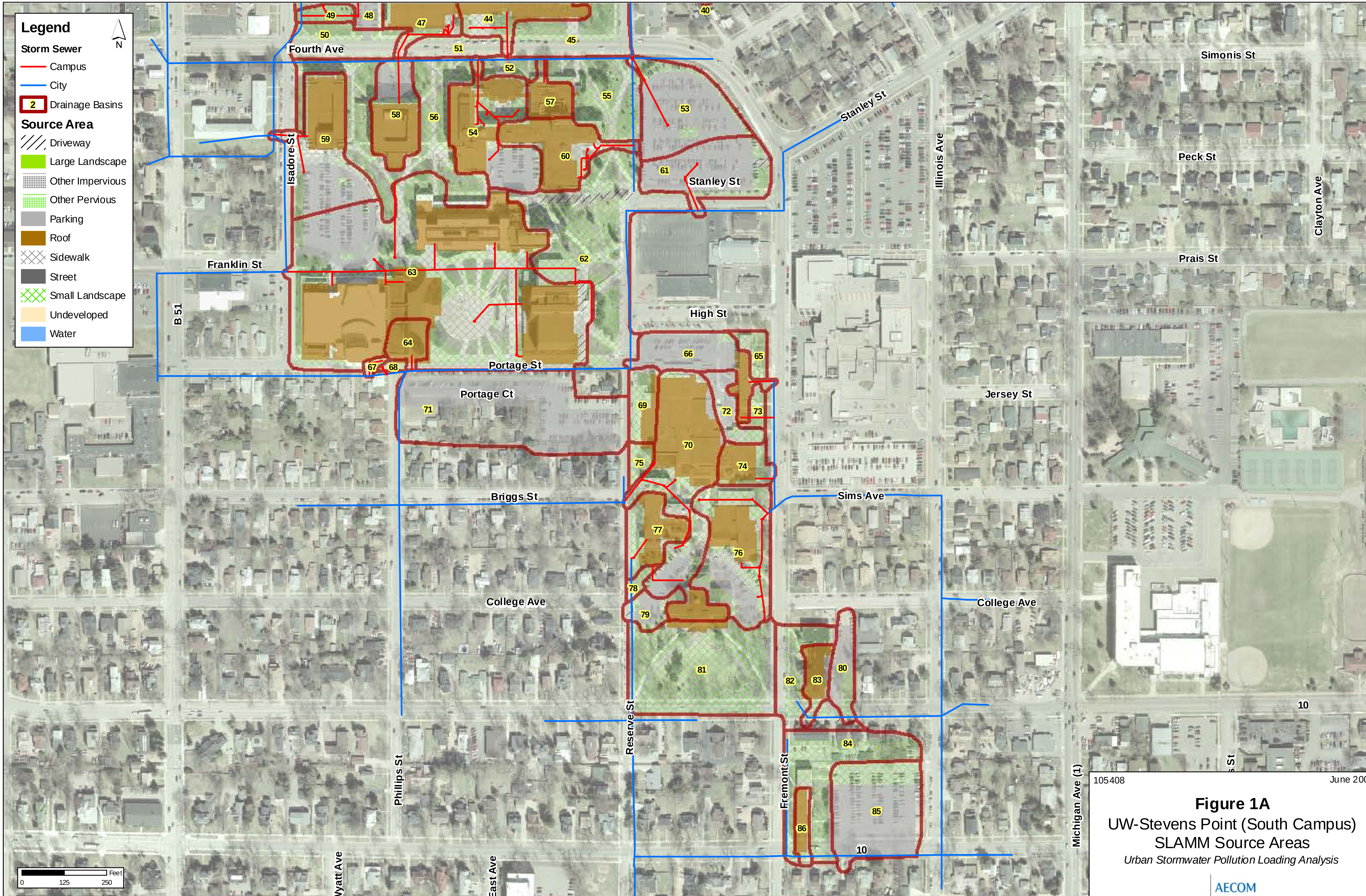
BASIN ID	TOTAL ACRES	DRIVEWAY	OTHER_IMPERVIOUS	OTHER_PERVIOUS	PARKING	SIDEWALK	LANDSCAPE	ROOF
47	0.89	0.00	0.00	0.00	0.00	0.07	0.17	0.65
48	0.44	0.00	0.00	0.00	0.31	0.04	0.09	0.00
49	0.20	0.00	0.00	0.00	0.00	0.00	0.20	0.00
50	0.33	0.00	0.00	0.00	0.02	0.02	0.28	0.00
51	0.07	0.00	0.00	0.00	0.00	0.03	0.04	0.00
52	0.18	0.00	0.00	0.00	0.00	0.04	0.14	0.00
53	1.47	0.00	0.00	0.00	1.23	0.01	0.24	0.00
54	1.57	0.00	0.00	0.00	0.41	0.08	0.36	0.73
55	1.11	0.00	0.00	0.00	0.05	0.20	0.85	0.01
56	2.25	0.00	0.00	0.00	0.01	0.69	1.51	0.04
57	0.37	0.00	0.00	0.00	0.00	0.01	0.06	0.30
58	0.86	0.00	0.00	0.00	0.21	0.06	0.08	0.51
59	1.47	0.01	0.00	0.00	0.50	0.22	0.21	0.53
60	1.01	0.00	0.00	0.00	0.01	0.12	0.14	0.73
61	1.23	0.03	0.00	0.00	1.02	0.00	0.17	0.00
62	2.74	0.17	0.00	0.00	0.04	0.74	1.77	0.02
63	8.60	0.11	0.00	0.00	0.80	2.02	1.89	3.77
64	0.34	0.00	0.00	0.00	0.00	0.00	0.01	0.33
65	0.20	0.00	0.00	0.00	0.00	0.02	0.18	0.00
66	0.94	0.01	0.00	0.00	0.65	0.04	0.06	0.18
67	0.03	0.00	0.00	0.00	0.00	0.00	0.02	0.01
68	0.03	0.00	0.00	0.00	0.00	0.00	0.02	0.01
69	0.38	0.00	0.00	0.00	0.02	0.02	0.19	0.14
70	2.49	0.00	0.00	0.00	0.27	0.35	0.45	1.41
71	3.33	0.00	0.00	0.00	3.33	0.00	0.00	0.00
72	0.39	0.00	0.00	0.00	0.21	0.07	0.11	0.01
73	0.14	0.00	0.00	0.00	0.00	0.03	0.10	0.00
74	0.40	0.00	0.00	0.00	0.00	0.02	0.10	0.27
75	0.15	0.00	0.00	0.00	0.00	0.01	0.12	0.02
76	1.69	0.01	0.00	0.00	0.32	0.34	0.60	0.43
77	0.64	0.00	0.00	0.00	0.00	0.05	0.20	0.39
78	0.09	0.00	0.00	0.00	0.00	0.00	0.09	0.00
79	0.28	0.01	0.00	0.00	0.13	0.02	0.12	0.00
80	0.37	0.00	0.00	0.00	0.26	0.01	0.10	0.00
81	2.46	0.00	0.00	0.00	0.00	0.17	2.18	0.11
82	0.56	0.01	0.00	0.00	0.04	0.06	0.45	0.01
83	0.32	0.00	0.00	0.00	0.01	0.04	0.04	0.23
84	1.33	0.00	0.00	0.00	0.04	0.06	1.22	0.01
85	1.62	0.01	0.00	0.00	1.20	0.00	0.40	0.00
86	0.21	0.00	0.00	0.00	0.00	0.00	0.04	0.16
TOTAL	**134.04**	**1.80**	**2.78**	**28.70**	**29.42**	**9.91**	**40.64**	**20.79**

Attachment B: Supporting Figures

- Figure-1: UWSP Campus Map showing SLAMM Source Areas
  - 1A: North Campus
  - 1B: South Campus
  - 1C: Schmeeckle Reserve Visitor Center

- Figure-2: UWSP Campus Map showing Existing BMP Locations
  - 2A: North Campus
  - 2B: South Campus
  - 2C: Schmeeckle Reserve Visitor Center

- Figure-3: UWSP Campus Map showing Potential BMP Treatment Areas
  - 3A: North Campus
  - 3B: South Campus



105408 June 2009

Figure 1A

UW-Stevens Point (South Campus)
SLAMM Source Areas

Urban Stormwater Pollution Loading Analysis

AECOM

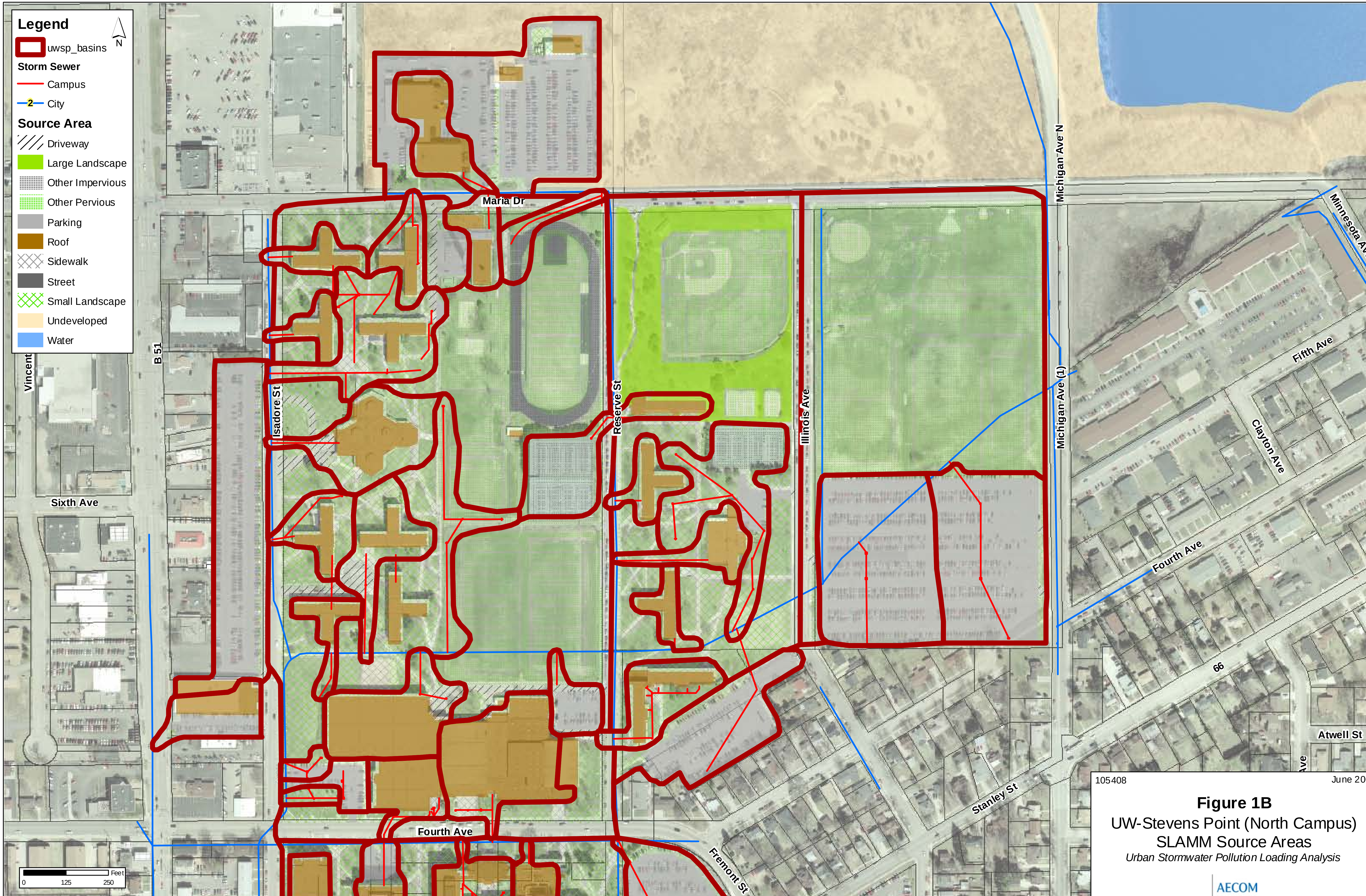


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Figure 1B

UW-Stevens Point (North Campus)

SLAMM Source Areas

Urban Stormwater Pollution Loading Analysis

AECOM

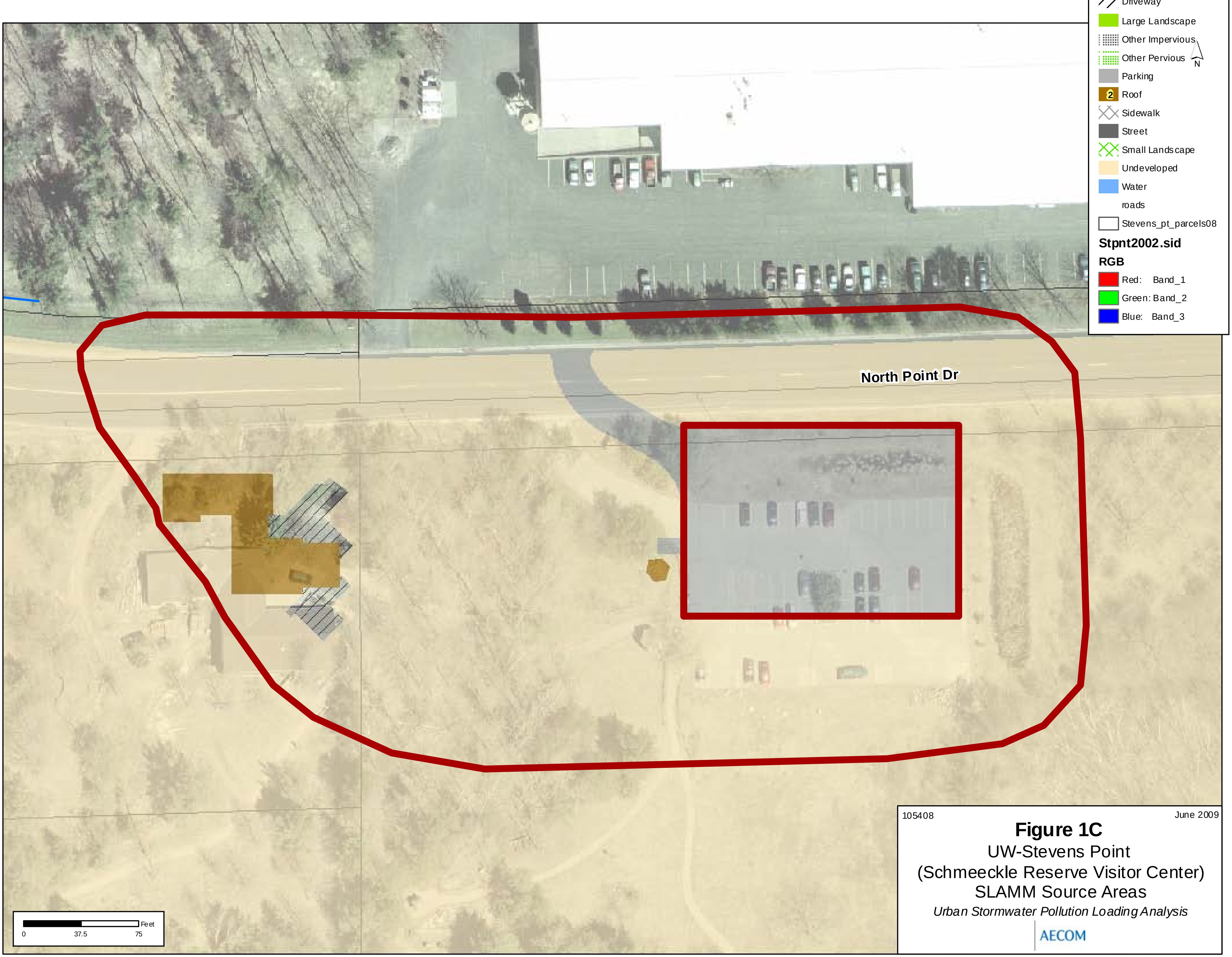

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Figure 1C

UW-Stevens Point
(Schmeeckle Reserve Visitor Center)
SLAMM Source Areas

Urban Stormwater Pollution Loading Analysis

AECOM

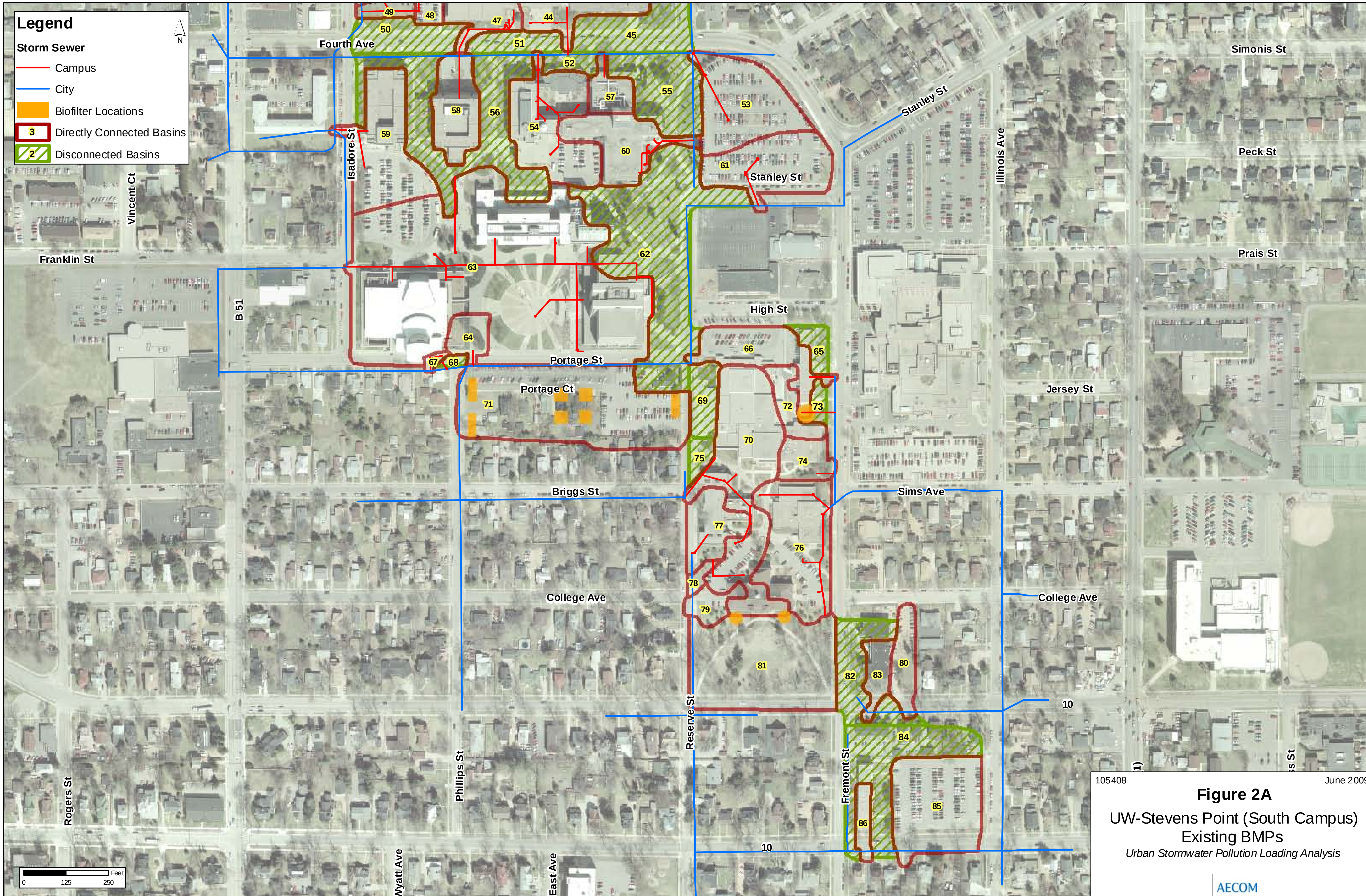

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Figure 2A

UW-Stevens Point (South Campus)
Existing BMPs

Urban Stormwater Pollution Loading Analysis

AECOM

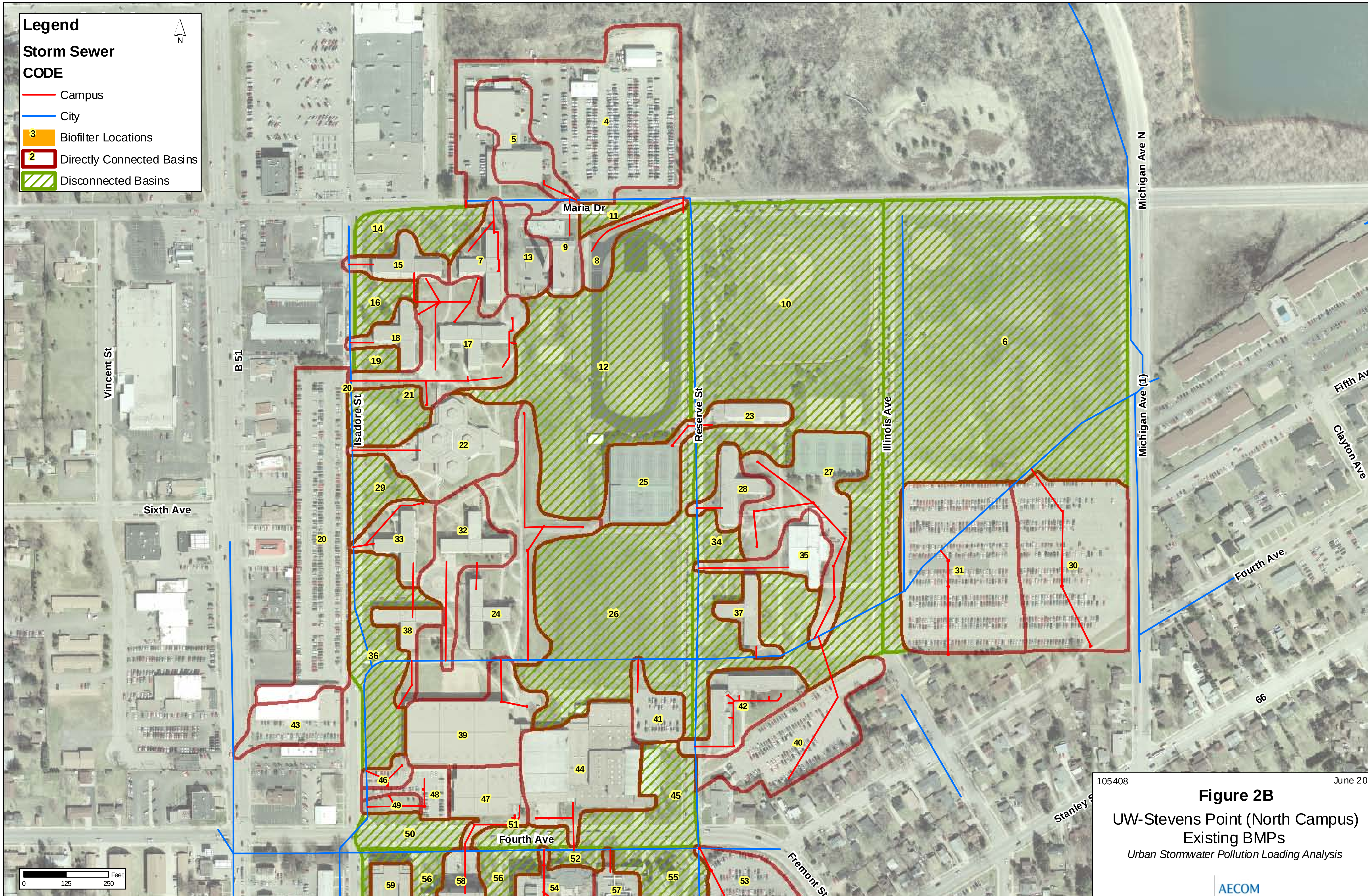

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Figure 2B

UW-Stevens Point (North Campus)
Existing BMPs

Urban Stormwater Pollution Loading Analysis

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Figure 2C

UW-Stevens Point

(Schmeeckle Reserve Visitor Center)

Existing BMPs

Urban Stormwater Pollution Loading Analysis

AECOM

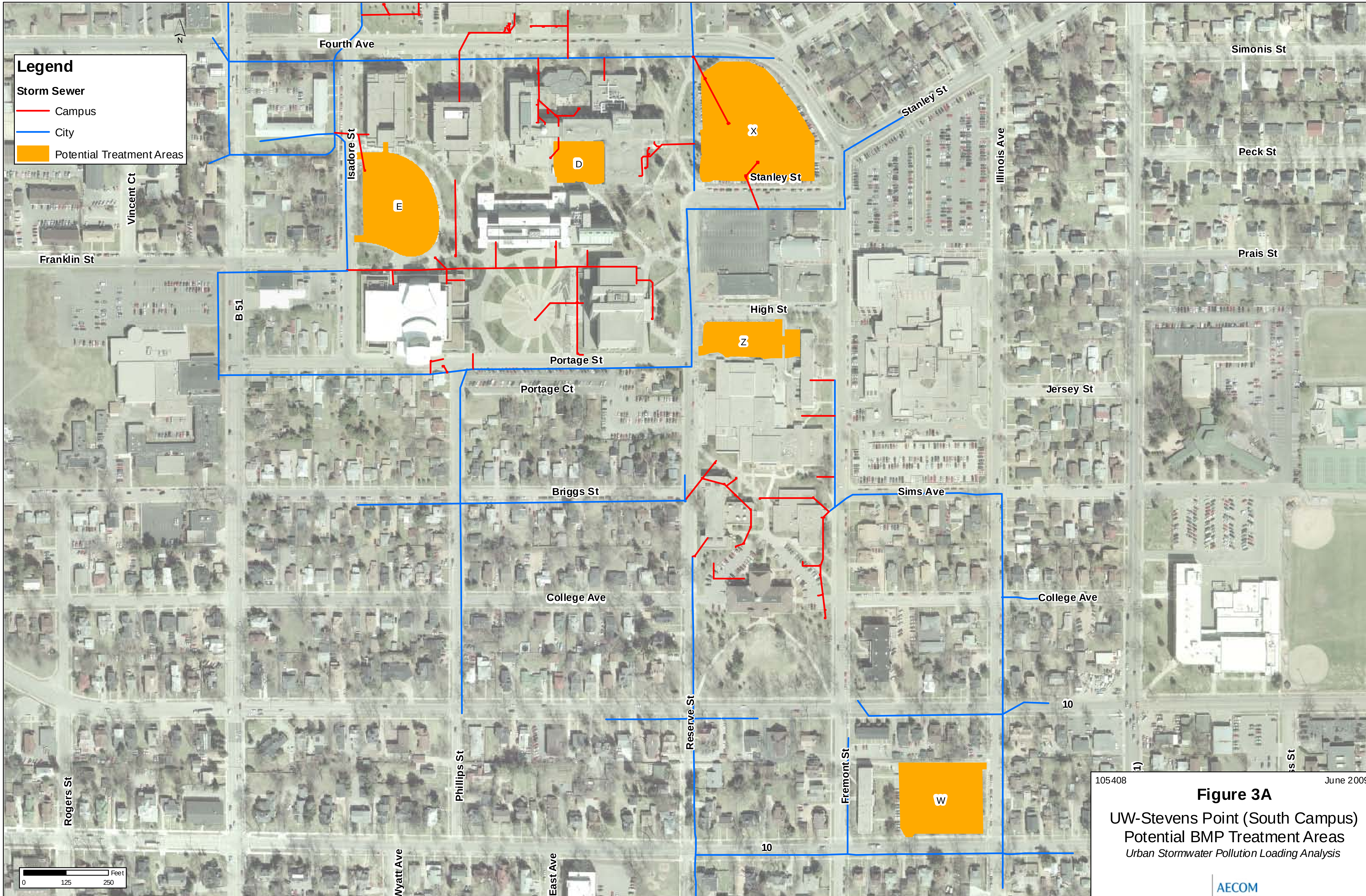

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Figure 3A

UW-Stevens Point (South Campus)
Potential BMP Treatment Areas

Urban Stormwater Pollution Loading Analysis

AECOM

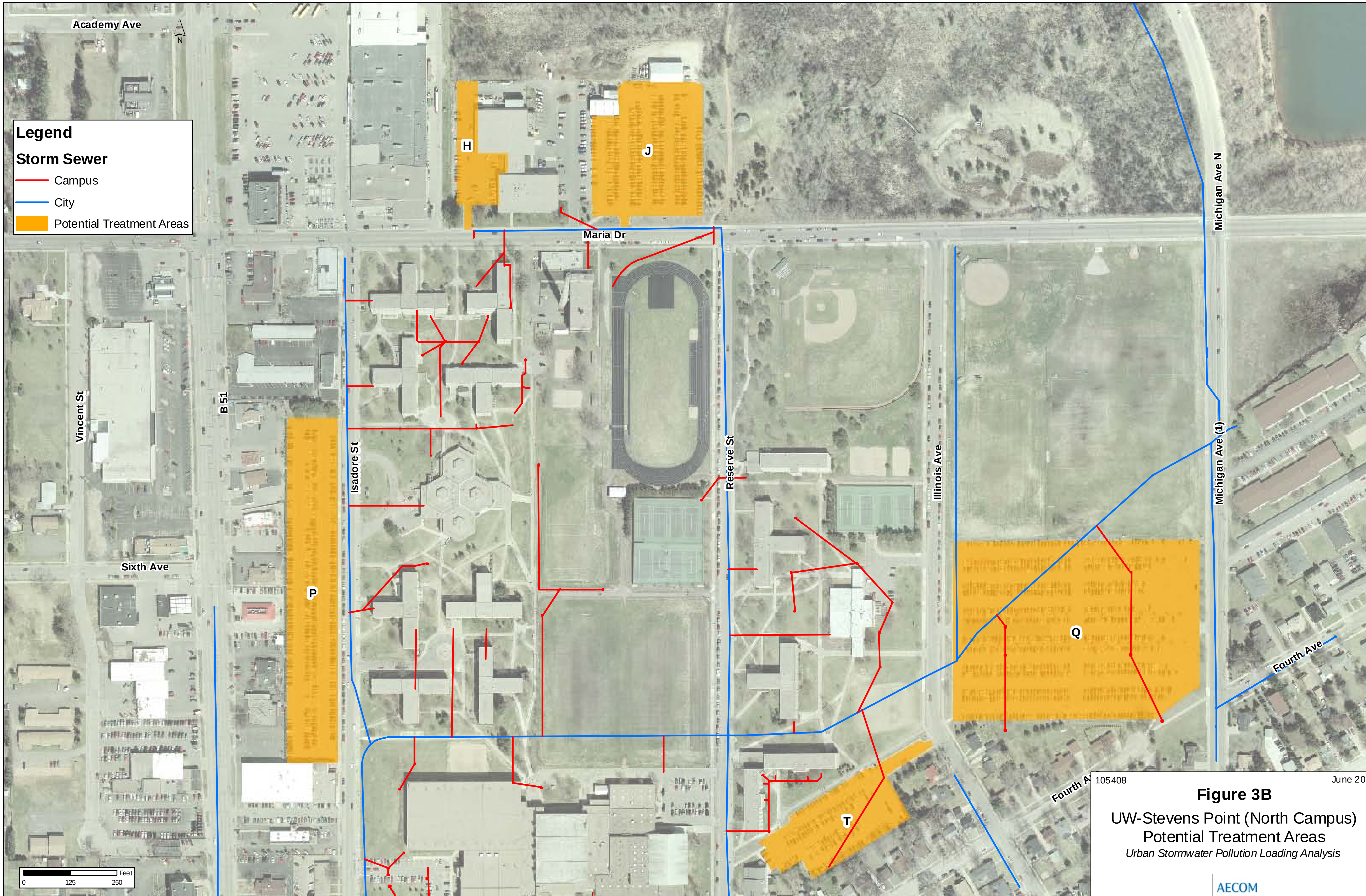
Legend
Storm Sewer
Campus
City
Potential Treatment Areas
Academy Ave
Maria Dr
Sixth Ave
Fourth Ave
Vincent St
B 51
Isadore St
Reserve St
Illinois Ave
Michigan Ave N
Michigan Ave (1)
H
J
P
Q
T
Feet
0
125
250
105408
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Figure 3B
UW-Stevens Point (North Campus)
Potential Treatment Areas
Urban Stormwater Pollution Loading Analysis
AECOM

Appendix B

WinSLAMM Procedure Report

WinSLAMM Procedure Report

UW Stevens Point Campus

3/31/2024

Bloom Companies LLC

Introduction

This appendix contains assumptions, parameters and model setups that were employed in the WinSLAMM software version 10.4.1.

Definitions

Here are definitions for each of the terms:

Best Management Practice

BMP stands for Best Management Practice. In the context of stormwater management and environmental protection, BMPs refer to a set of practices, techniques, or measures designed to mitigate the adverse impacts of urban and agricultural runoff on water quality and natural resources. BMPs aim to minimize the discharge of pollutants, control erosion, reduce runoff volume and peak flow rates, and promote sustainable land use practices.

Vegetated Swales

Shallow, vegetated channels are designed to convey, treat, and infiltrate stormwater runoff.

Permeable Pavements

Pavement surfaces are designed to allow stormwater to infiltrate into the ground, reducing runoff volume and improving water quality.

Green Roofs

Vegetated roof systems that capture and retain rainfall, reducing stormwater runoff and providing insulation.

Constructed Wetlands

Engineered wetland systems designed to mimic natural wetlands, providing habitat, and treating stormwater runoff.

Erosion Control Measures

Techniques such as erosion blankets, silt fences, and vegetative stabilization to prevent soil erosion and sedimentation.

Infiltration Basin

An infiltration basin, also known as a recharge basin or retention basin, is a stormwater management facility designed to capture, store, and infiltrate runoff from precipitation events. It consists of a shallow depression or basin lined with permeable materials such as gravel or engineered soil, allowing stormwater to percolate into the ground. The primary function is to promote groundwater recharge and reduce stormwater runoff volume. Usually employed in large areas.

Biofiltration

Biofiltration is a stormwater treatment practice that employs vegetation and soil media to remove pollutants from stormwater runoff. It typically involves the use of vegetated swales, bioretention basins, or infiltration trenches to filter runoff and improve water quality through biological and physical processes.

Rain Garden

A rain garden is a landscaped depression or shallow basin planted with native vegetation designed to capture, absorb, and filter stormwater runoff from impervious surfaces such as roofs, driveways, and sidewalks. Rain gardens enhance infiltration, reduce runoff volume, and improve water quality by removing pollutants and promoting groundwater recharge.

Bioretention Swale

A bioretention swale, also known as a vegetated swale or bioswale, is a linear stormwater management feature designed to convey, treat, and infiltrate runoff from paved surfaces. It consists of a vegetated channel or depression with engineered soils and vegetation that help remove pollutants and promote infiltration through biological and physical processes.

Tree Boxes

Tree boxes, also referred to as tree pits or tree wells, are structural stormwater management devices that incorporate vegetation and soil media to capture, treat, and infiltrate runoff from paved surfaces. They are typically installed around the base of trees in urban areas to provide stormwater management benefits while enhancing tree health and aesthetics.

BMPs are selected based on site-specific conditions, regulatory requirements, and project goals. They are often implemented as part of stormwater management plans, watershed management programs, or development regulations to minimize the impacts of land development and urbanization on water resources and ecosystems. Properly designed and maintained BMPs can help protect water quality, enhance aquatic habitats, and sustainably manage stormwater in urban and rural landscapes.

WinSLAMM concepts

Within the context of WinSLAMM (Stormwater Management Model), here are definitions for each term:

Area

In WinSLAMM, "area" refers to the spatial extent of a land parcel or watershed being modeled. It represents the geographic area over which stormwater runoff, land use characteristics, and pollutant loadings are analyzed and simulated.

Land Use

Land use in WinSLAMM refers to the categorization of different types of land cover within the modeled area. Common land use categories include residential, commercial, industrial, agricultural, and open space. Land use data is used to characterize the distribution of impervious and pervious surfaces, which influence stormwater runoff and pollutant generation.

Precipitation / Temperature Data

Precipitation and temperature data in WinSLAMM refer to meteorological inputs used to simulate rainfall events and temperature conditions over the modeling period. This data includes rainfall intensity, duration, frequency, and temperature variations, which are critical for estimating stormwater runoff volumes, infiltration rates, and pollutant wash-off.

Pollutant Probability Distribution

The pollutant probability distribution in WinSLAMM represents the statistical distribution of pollutants (e.g., nutrients, heavy metals, bacteria) within stormwater runoff. It defines the probability of pollutant concentrations occurring within a given range during rainfall events. Different probability distributions may be used to model various pollutants based on their characteristics and behavior in runoff.

Runoff Coefficient

The runoff coefficient in WinSLAMM is a dimensionless parameter that represents the fraction of rainfall that becomes surface runoff. It accounts for the influence of land cover, soil type, slope, and other factors on stormwater runoff generation. Runoff coefficients are used to estimate the volume and timing of runoff from different land use areas within the watershed.

Particulate Solids Concentration

Particulate solids concentration in WinSLAMM refers to the concentration of suspended solids, sediments, or other particulate matter in stormwater runoff. It represents the mass of solids per unit volume of water and is used to estimate sediment transport, erosion potential, and pollutant loading in surface waters.

Particle Size Distribution

Particle size distribution in WinSLAMM describes the distribution of particle sizes within sediment or suspended solids in stormwater runoff. It characterizes the range of particle sizes present, from fine sediments to coarse aggregates, and influences sediment transport, settling velocities, and sediment-associated pollutant transport within the watershed.

Areas Connectivity

Within the context of stormwater management and modeling in WinSLAMM, the terms "connected," "disconnected," and "partially connected" areas refer to the degree of connectivity between impervious surfaces and stormwater drainage systems. Here are their definitions:

Connected Areas

Connected areas in WinSLAMM are those where impervious surfaces, such as roads, parking lots, and rooftops, are directly connected to the stormwater drainage network. Runoff generated from these surfaces flows directly into storm drains, culverts, or other conveyance systems without significant infiltration or treatment. Connected areas typically exhibit high runoff volumes and pollutant loads due to the rapid conveyance of stormwater runoff.

Disconnected Areas

Disconnected areas in WinSLAMM are those where impervious surfaces are not directly connected to the stormwater drainage network. Instead, runoff from these areas is managed onsite through infiltration, retention, or other decentralized stormwater management practices. Disconnected areas may include vegetated areas, pervious pavements, rain gardens, and bioretention basins, where stormwater runoff is allowed to infiltrate into the ground or be treated before entering the drainage system. Disconnected areas help reduce stormwater runoff volume, peak flows, and pollutant loads while promoting groundwater recharge and water quality improvement.

Partially Connected Areas

Partially connected areas in WinSLAMM are those with a mixture of connected and disconnected elements within the same land parcel or watershed. These areas may contain both impervious surfaces that directly contribute runoff to the drainage network and pervious surfaces or green infrastructure features that manage stormwater onsite. Partially connected areas exhibit varying degrees of connectivity depending on the distribution of impervious and pervious surfaces and the effectiveness of stormwater management practices in reducing runoff and pollutants.

Understanding the connectivity status of different areas within a watershed is essential for accurately modeling stormwater runoff, pollutant transport, and water quality impacts in WinSLAMM. It helps assess the effectiveness of various stormwater management strategies and prioritize interventions to mitigate flooding, erosion, and pollution in urban and suburban environments.

DATA INPUTS

For this analysis, we utilized parameters outlined in the 2009 report.

Table B-1 Parameters	
Parameter	Value / file
Rain file	WisReg - Madison Five Year Rainfall.ran
Winter Season	12/02 – 03/12
Pollutant Probability Distribution file	WI_GEO03.ppdx
Runoff Coefficient file	WI_SL06 Dec06.rsvx
Particulate Solids Concentration file	V10.1 WI_AVG01.pscx
Street Delivery file, Residential	WI_Res and Other Urban Dec06.std
Street Delivery file, Institutional	WI_Com Inst Indust Dec06.std
Street Delivery file, Commercial	WI_Com Inst Indust Dec06.std
Street Delivery file, Industrial	WI_Com Inst Indust Dec06.std
Street Delivery file, Other Urban	WI_Res and Other Urban Dec06.std
Street Delivery file, Freeways	Freeway Dec06.std
Source Area PSD and Peak average Flow Ratio file	NURP Source Area PSD file.csv

The only parameter that differed from the original report was the Pollutant Probability Distribution, which varies between WinSLAMM versions. The 2009 report used the parameter WI_GEO01.ppd in WinSLAMM version 9.3.1, while for this analysis, we utilized WI_GEO03.ppdx in WinSLAMM version 10.4.1.

The land use characterization is detailed in table B-2 for base conditions and in table B-3 for current conditions, and the soil data used was downloaded from the Natural Resources Conservation Service webpage.

Additional model configuration involved considering the winter span time, which encompassed the dates of December 2nd to March 12th. According to DNR guidance, Total Phosphorus (TP) was included in the models but not in the results for this analysis.

Other assumptions made during the modeling effort include:

- What land use category to select
- The “connection” or “disconnection” status of the impervious land use areas
- Rainfall Parameter
- The soil type of the pervious areas
- The details of any BMPs, if present

More information on each of these is given below:

Land Use Category

Within each basin, there can be a variety of land uses, each necessitating identification and subsequent modeling. The specifics of this characterization are elaborated in tables B-2 and B-3.

Table B-2

TSS Loading for Base Conditions

Area	Drainage Basin	Total Acres	Driveway	Other Impervious	Other Pervious	Parking	Sidewalk	Landscape	Roof	TSS Loading
Maintenance & Materials	5	1.17	0.01	0.00	0.00	0.20	0.00	0.10	0.86	0.13
Waste Education	4	5.24	0.01	0.00	0.00	4.33	0.02	0.70	0.17	1.33
Suites @ 201	23	0.42	0.00	0.00	0.00	0.00	0.02	0.18	0.21	0.02
Suites @ 201	10	10.96	0.01	0.01	3.51	0.04	0.60	6.80	0.00	0.07
Tennis Courts	27	2.46	0.00	0.59	0.00	0.25	0.28	1.34	0.00	0.34
Chemistry / Biology	53	1.47	0.00	0.00	0.00	1.23	0.01	0.24	0.00	0.37
Chemistry / Biology	61	1.23	0.03	0.00	0.00	1.02	0.00	0.17	0.02	0.32
Chemistry / Biology	55	1.11	0.00	0.00	0.00	0.05	0.20	0.85	0.01	0.01
Parking Lot Y	87	0.77	0.00	0.00	0.00	0.09	0.01	0.54	0.13	0.03
Parking Lot R	71	2.57	0.00	0.00	0.00	1.49	0.00	1.08	0.00	0.46
Albertson Hall	63	8.60	0.11	0.00	0.00	0.80	2.02	1.89	3.77	0.95
Albertson Hall	62	2.74	0.17	0.00	0.00	0.04	0.74	1.77	0.02	0.01
TOTAL		38.74	0.34	0.60	3.51	9.54	3.89	15.66	5.19	4.06

Table B-3 TSS Loading for Current Conditions										
Area	Drainage Basin	Total Acres	Driveway	Other Impervious	Other Pervious	Parking	Sidewalk	Landscape	Roof	TSS Loading
Maintenance & Materials	5	1.28	0.01	0.00	0.00	0.20	0.00	0.10	0.97	0.14
Waste Education	4	5.13	0.01	0.00	0.00	3.58	0.11	0.90	0.52	1.16
Suites @ 201	23	0.84	0.00	0.00	0.00	0.00	0.02	0.18	0.63	0.06
Suites @ 201	10	10.54	0.01	0.01	3.09	0.04	0.60	6.80	0.00	0.07
Tennis Courts	27	2.46	0.00	0.00	0.59	0.25	0.28	1.34	0.00	0.14
Chemistry / Biology	53	1.52	0.00	0.03	0.00	0.20	0.30	0.43	0.57	0.04
Chemistry / Biology	61	1.61	0.00	0.00	0.00	0.00	0.23	0.75	0.64	0.03
Chemistry / Biology	55	0.85	0.00	0.00	0.00	0.05	0.20	0.59	0.01	0.00
Parking Lot Y	87	0.77	0.00	0.00	0.04	0.55	0.01	0.17	0.00	0.01
Parking Lot R	71	2.83	0.00	0.00	0.00	2.32	0.01	0.50	0.00	0.06
Albertson Hall	63	9.30	0.11	0.00	0.30	0.80	1.49	2.53	4.06	0.77
Albertson Hall	62	1.61	0.17	0.00	0.00	0.04	0.64	0.76	0.00	0.01
TOTAL		38.74	0.31	0.04	4.02	8.03	3.89	15.05	7.40	2.48

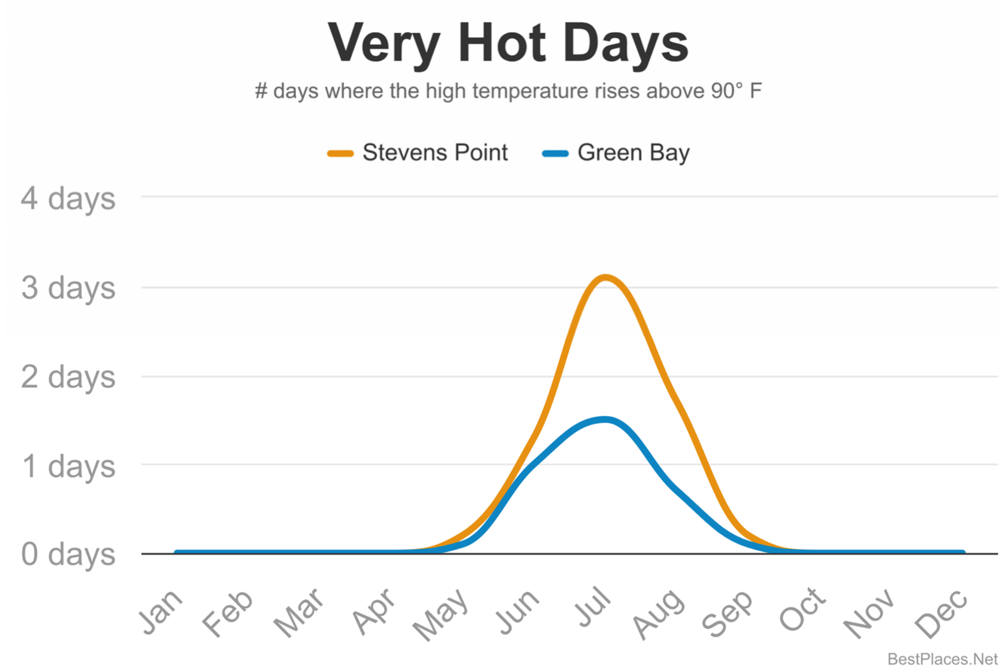
Connection/Disconnection

For every identified impervious land use, a determination must be made regarding whether to model the area as connected or disconnected. This decision was influenced by the 2009 report, deduced from aerial photographs, and guided by input from UWSP personnel.

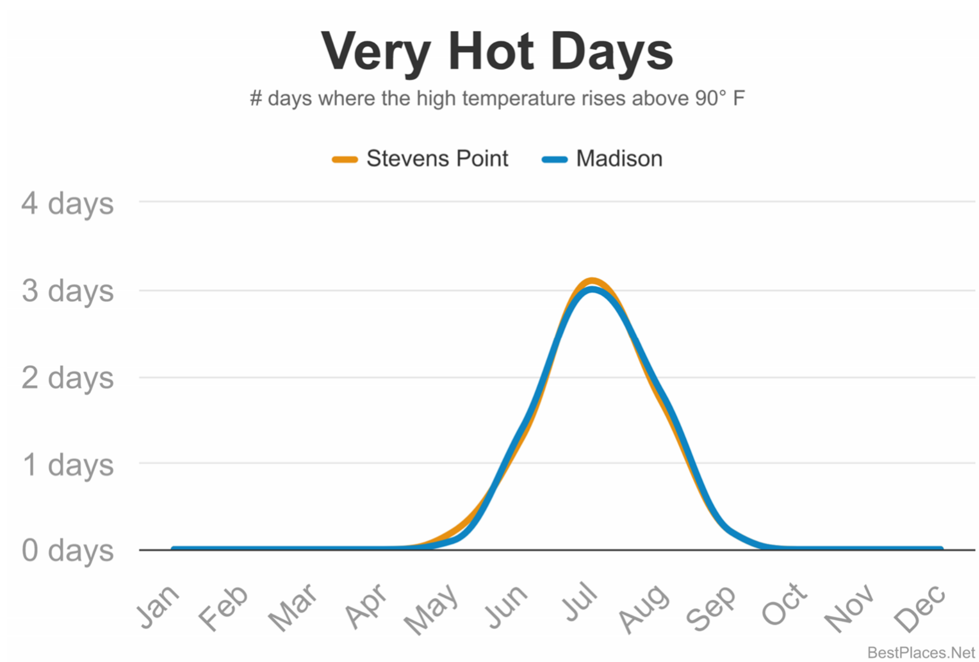
Rainfall

As there are no WinSLAMM parameters specifically for Stevens Point, Wisconsin, a decision had to be made for which parameters to use. With Stevens Point, Wisconsin being located north of Madison and west of Green Bay, the modeling parameters from those locations were considered for this effort. Comparing weather data from the BestPlaces.Net website, it was determined that the rainfall patterns in Madison are a closer match to those of Stevens Point than are the patterns in Green Bay. Although Green Bay and Stevens Point are closer in latitude, the proximity of Green Bay to Lake Michigan impacts the weather data more than the difference in latitude between Madison and Stevens Point.

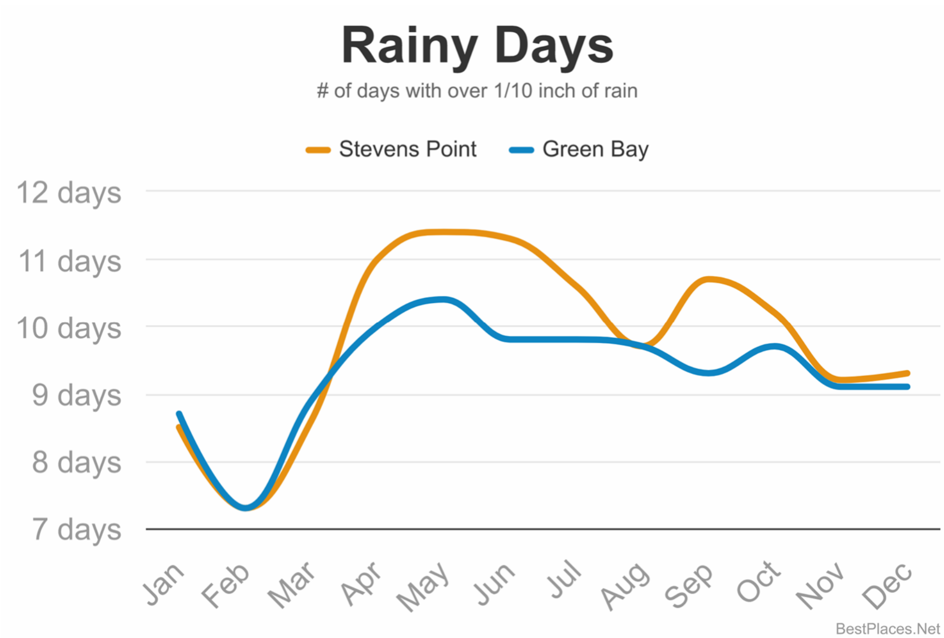
The comparison weather data that was used in making this determination can be seen in the figures below.



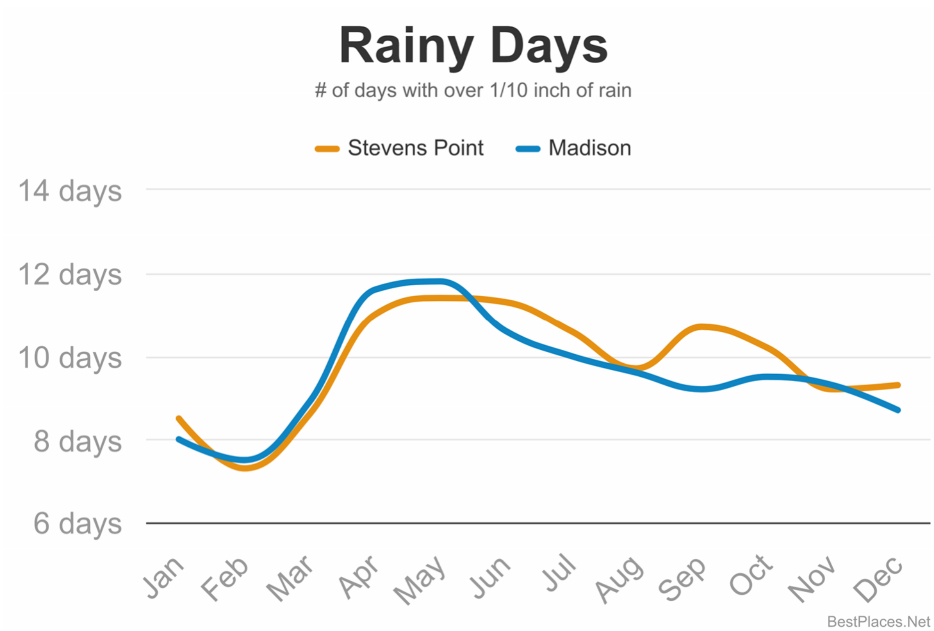
Stevens Point vs Green Bay



Stevens Point vs Madison



<u>Stevens Point vs Green Bay</u>

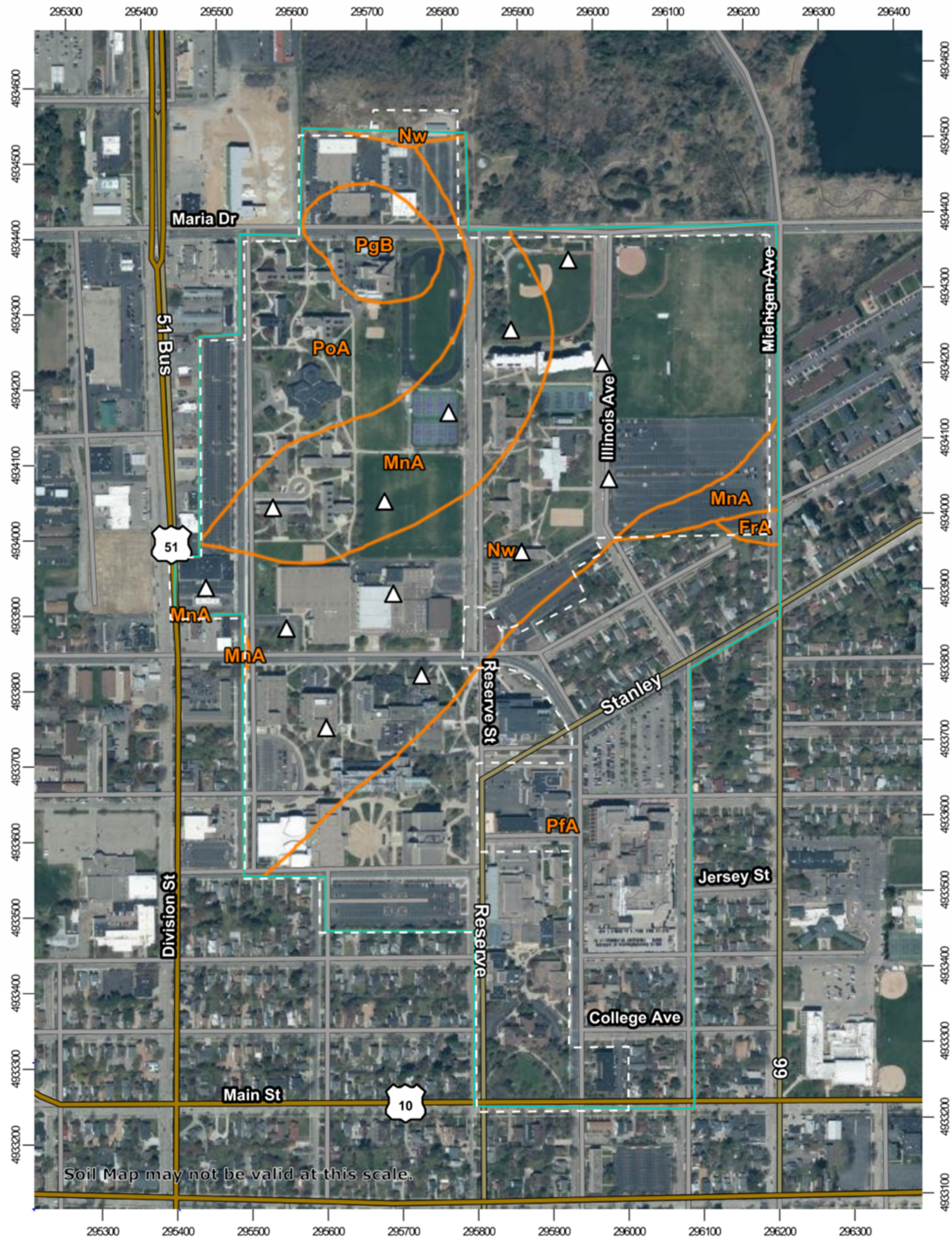


<u>Stevens Point vs Madison</u>

The rainfall parameter, along with the other parameters used for modeling UWSP are included in the table above.

Soil Type

For specific modeling endeavors, data must be inputted into the WinSLAMM program to designate the native soil type for different pervious land uses. Bloom retrieved this data for Stevens Point (Portage County) from the USDA Natural Resources Conservation Service website. Below is the Soil Map for Portage County, Wisconsin, along with the accompanying legend and table from the report.



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Portage County, Wisconsin
Survey Area Data: Version 20, Sep 8, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 12, 2020—May 15, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
FrA	Friendship loamy sand, 0 to 3 percent slopes	0.6	0.4%
MnA	Meehan loamy sand, 0 to 3 percent slopes	24.4	13.4%
Nw	Newson mucky loamy sand, 0 to 1 percent slopes	62.6	34.5%
PfA	Plainfield loamy sand, 0 to 2 percent slopes	67.0	36.9%
PgB	Plainfield loamy sand, granite substratum, 2 to 6 percent slopes	5.2	2.9%
PoA	Point sandy loam, 1 to 3 percent slopes	21.8	12.0%
Totals for Area of Interest		**181.6**	**100.0%**

BMPs

Parking Lot Y

A biofiltration control device was incorporated into this parking lot design, featuring a top area of 1920 sq. ft. and a bottom area of 420 sq. ft. It includes a vertical standpipe measuring 3 feet in height and a crested weir of 5 feet.

Furthermore, an underground storage feature was integrated into the design, utilizing a Wet Detention Control device in accordance with recommendations found on the specified website: https://www.winslamm.net/faq.html#:~:text=Pipes%20used%20for%20Water%20Quality,below%20the%20outlet%20invert%20elevation.

Parking Lot R

Parking Lot R is equipped with a biofiltration control device. The modeling of these features incorporates a top area of 2865 square feet, aligning with the bottom area. Key elements of this system include a 5-foot crested weir and a 6-inch perforated underdrain pipe.

Chemistry/Biology

The approach for this building was guided by data provided by the university, leveraging the specifications of a pair of bioswales and a rain garden. These green infrastructure elements were dimensioned, with a top area spanning 1972 sq. ft. and a bottom area of 423 sq. ft. Their integration into the landscape reflects sustainable stormwater management practices.

Albertson Hall

In Albertson Hall, which is part of Bloom's design effort, the stormwater management strategy revolves around the implementation of innovative BMPs. A porous pavement control device spanning 0.298 acres serves as a cornerstone of our approach, complemented by a biofiltration control device boasting a top area of 2699 sq. ft. and a bottom area of 272 sq. ft. This design includes a 6-inch perforated pipe, ensuring efficient water infiltration and pollutant removal.

MODEL SETUP

For each basin, a model was prepared. If that basin has a BMP it was included in the model. How much of the land was going through the BMP was inferred from the data given from the University or assumed based on the 2009 report.

The tables B-2 and B-3 summarize the land use employed in the basins that changed.

The table B-4 describes the data used to model the BMPs from the 2009 report, and table B-5 describes the BMPs modeled for this report.

Table B-4
Biofilter Characteristics

Basin	Name	Area (acres)	Bottom Surface (ft^2)	Depth (ft)	Outlet Structure
3	Schmeeckle Visitors Center	0.50	50.0	6.0	62' long broad-crested weir
71	Parking Lot R	3.3	2,865.0	1.6	4" diameter underdrain and 5' wide broad-crested weir
72	Building 40	0.4	312.0	1.0	5' wide broad-crested weir
81	Building 1	2.5	135.0	1.7	18" vertical standpipe and 5' wide broad-crested weir

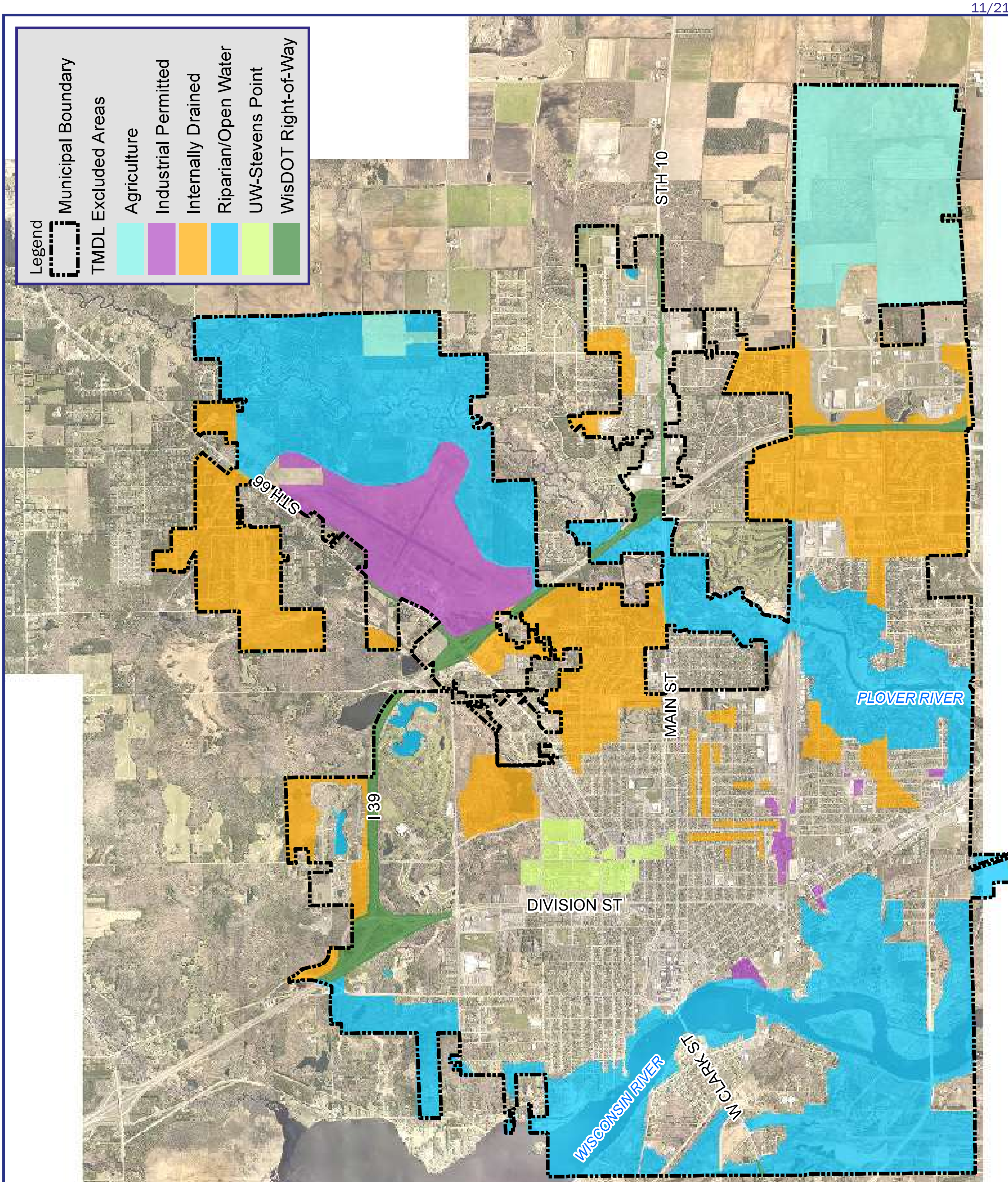
Table B-5 Biofilter Characteristics					
Basin	Name	Area (acres)	Bottom Surface (ft^2)	Depth (ft)	Outlet Structure
53/61	Chemistry	3.741	423.0	2.2	5’ wide broad-crested weir
63	Albertson Hall	9.3	272.0	3.0	6” underdrain perforated PVC and a 12” diameter pipe of 73’ long
87	Parking Lot Y	0.77	420.0	1.75	12” diameter pipe.

Appendix C

Excluded Areas from

City of Stevens Point MS4

11/21/2018



0 2,000 4,000
Feet

Figure 2-1
MS4 Area Excluded from TMDL Analysis
Stormwater Management Plan Update
City of Stevens Point, WI

N