OCONOMOWOC WATERSHED PROTECTION PROGRAM

CITY OF OCONOMOWOC
WAUKESHA COUNTY, WISCONSIN

DECEMBER 2015

RUEKERT/MIELKE
W233 N2080 Ridgeview Parkway
Waukesha, Wisconsin 53188-1020

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LIST OF ABBREVIATIONS

AEA	Agricultural Enterprise Areas
AM	Adaptive Management
CSA	Critical Source Areas
EPA	Environmental Protection Agency
GIS	Geographical Information Systems
HUC	Hydrologic Unit Code
LWC	Land and Water Conservation
MGD	Million Gallons Per Day
MS4	Municipal Separate Storm Sewer System
NLCD	National Land Use Database
NRCS	National Resource Conservation Service
OWPP	Oconomowoc Watershed Protection Program
R/M	Ruekert & Mielke, Inc.
RCPP	Regional Conservation Partnership Program
RUSLE	Revised Universal Soil Loss Equation
SEWRPC	Southeastern Wisconsin Regional Planning Commission
SLAMM	Source Loading and Management Model
STEPL	Spreadsheet Tool for Estimating Pollutant Load
SWAT	Soil and Water Assessment Tool
SWIMS	Surface Water Integrated Monitoring System
TMDL	Total Maximum Daily Load
TP	Total Phosphorus
TSS	Total Suspended Solids
USGS	United States Geological Survey
USLE	Universal Soil Loss Equation
UW	University of Wisconsin Extension
WAC	Wisconsin Administrative Code
WDATCP	Wisconsin Department of Agriculture, Trade and Consumer Protection
WDNR	Wisconsin Department of Natural Resources
WPDES	Wisconsin Pollutant Discharge Elimination System
WQC	Water Quality Criterion
WWTF	Wastewater Treatment Facility

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INTRODUCTION AND BACKGROUND

The City of Oconomowoc received its Wisconsin Pollutant Discharge Elimination System (WPDES) permit renewal for its Wastewater Treatment Facility (WWTF) in March of 2014. The permit contains final mass-based limits for Total Suspended Solids (TSS) and Total Phosphorus (TP). The mass-based limits are derived from the Rock River Total Maximum Daily Load (TMDL) rule-making approved by the Environmental Protection Agency (EPA) in September of 2011 (The Cadmus Group, Inc., 2011).

The Rock River TMDL was created as a requirement of Section 303(d) of the Federal Clean Water Act for impaired water bodies. The TMDL determines the maximum amount of pollutant that a water body is capable of assimilating while continuing to meet the existing water quality standards. After this maximum load was established for the Rock River Basin as a whole, mass loads were established for both point and nonpoint sources in the watershed (The Cadmus Group, Inc., 2011). For more specific information on the mass loading breakdown in the Oconomowoc River Watershed, see Appendix E.

The Rock River TMDL affects both WWTFs and Municipal Separate Storm Sewer Systems (MS4s). In this way, the Oconomowoc MS4 will be required to achieve compliance with similar pollutant limits as the WWTF in the future. Both entities will be able to meet the future limits for TSS without any significant facility or infrastructure improvements. Therefore, the compliance effort for the City will be limited in scope to meeting future TP limits.

The WWTF cannot meet the final TP limits without significant facility improvements. The monthly average TP limits expressed as concentrations at the design flow of 4.0 Million Gallons Per Day (MGD) range from 0.17 mg/L in August and September to 0.30 mg/L in February. The City anticipates an effective limit of 0.12 mg/L to safely meet the final TP permit limits in August. The City has an interim monthly average TP limit of 0.95 mg/L that is effective immediately, which can be met with its existing treatment process.

The Oconomowoc WWTF uses an activated sludge treatment process. The treatment processes include influent screening, influent pumping, aerated grit removal, primary clarification, aeration using submerged ceramic diffusers, final clarification, tertiary filters, ultraviolet light disinfection, and dissolved oxygen uptake. Biosolids are wasted from the return activated sludge wet well, stored in a tank, thickened using an air flotation thickener, anaerobically digested, thickened again with a gravity belt thickener and stored. Biosolids are spread on farmland for soil conditioning. Effluent from the WWTF flows in a channel approximately 800 feet westward to the Oconomowoc River. The Oconomowoc River flows into the Rock River in eastern Jefferson County. The Rock River flows west towards the Mississippi River and eventually reaches the Gulf of Mexico.

The WWTF mainly uses ferrous chloride for phosphorus removal. Influent TP levels range from 4 to 6 mg/L. The City adds an average of 130 gallons of ferrous chloride per day to reduce TP in the effluent to 0.7 to 0.8 mg/L. The current dosing point is just upstream of the two primary clarifiers. WWTF staff have experimented in the past with different dosing locations and configurations with limited success in increasing TP removal efficiency. However, based on this experimentation they have confirmed that higher chemical doses can be applied to safely reach the interim and final limits of 0.6 mg/L and 0.5 mg/L, respectively. Additional information regarding the optimization of phosphorus removal at the WWTF was compiled in the Operational Evaluation Report submitted to the WDNR earlier this year.

The current WPDES permit contains a compliance schedule for meeting the TP limits with a final compliance date of April 1, 2022. The City is in the first step of the permit phosphorus compliance schedule, the Operational Evaluation Report. As part of this report, the City is gathering historical WWTF influent and effluent TP data, summarizing past operational studies to reduce phosphorus levels through the use of it tertiary membrane filters, coordinating with industrial TP sources for reductions, and conducting a pilot study on a rare earth phosphorus-removing chemical that may be more efficient than ferrous chloride.

The City has identified Adaptive Management (AM) as the preferred compliance alternative for the WWTF and MS4 under Wisconsin Administrative Code (WAC) Chapters NR 217 and 216, respectively. The City submitted a preliminary Watershed Adaptive Management Request Form 3200-139 on February 23, 2015. The final Watershed Adaptive Management Request Form is in Appendix A.

The City meets the three eligibility conditions of AM as outlined below:

1. **The receiving water does not meet water quality criteria for TP:** The Oconomowoc River at the point of compliance has an approximate median TP concentration (May - Oct.) of 0.096 mg/L which is above the standard of 0.075 mg/L.

2. **The watershed is non-point source dominated:** Based on the WDNR's Pollutant Load Ratio Estimation Tool, the TP loading in the watershed upstream of the WWTF is 70 percent non-point source and 30 percent point source.

3. **The WWTF needs filtration or an equivalent technology to meet the Water Quality Based Effluent Limit:** The lowest monthly limit Oconomowoc has in its WPDES permit is 0.17 mg/L. The facility can only reach a lower level of 0.4 mg/L with the existing removal process. Filtration or an equivalent removal technology is necessary to reach the lower limit.

The City feels AM is the best alternative for several reasons. First, the overall point of compliance for the project is at an advantageous location just upstream of the confluence of the Oconomowoc and Rock Rivers. The Oconomowoc WWTF outfall is approximately nine river miles upstream, providing opportunities for urban and agricultural Management Measures both upstream and downstream of the treatment facility. Improvements made to reduce pollutant loading upstream of the WWTF should be noticeable at the confluence. In addition, there are several opportunities to reduce pollutant loading downstream of the WWTF, which will theoretically lead to the greatest TP reductions at the point of compliance. Additional discussion on the point of compliance is included in the following sections of the report.

Second, historical monitoring data indicates that relatively achievable reductions are required in the Oconomowoc River. Sampling from both the Wisconsin Department of Natural Resources (WDNR) and the City indicate median TP concentrations near the confluence of 0.072 mg/L (WDNR SWIMS data from 2007-2008, May-Oct.) and 0.096 mg/L (City data from 2014-2015, May-Oct.), respectively. City monitoring data from a point near the outlet of Reach 25 yielded a median value of 0.037 mg/L, and monitoring from a point just downstream of the WWTF yielded a median value of 0.063 mg/L. These data sets will be described in more detail later in this report when establishing load reduction goals. Assuming an annual average flow of the Oconomowoc River at the confluence of 76.99 MGD (See Table 7 below) and a TP concentration of 0.096 mg/L, the annual TP load reduction required is 9,750 pounds. In light of this achievable pollutant loading reduction goal, the City feels that an AM program can be successful.

In addition, there are several opportunities for beneficial partnerships in the Oconomowoc River Watershed. As mentioned previously, one important partner will be the City of Oconomowoc MS4. A successful AM program led by the wastewater utility will provide significant benefits to the storm water utility as a path for TP compliance. The rest of the project partners and their roles will be described in the next section.

There are five other MS4 permittees in the watershed. These other MS4s will not participate in the AM program initially. After storm water modeling is completed for the other MS4s, each community will determine if it is advantageous for them to join the AM program.

Lastly, the AM program is the most cost effective approach to achieving the WQC for the Oconomowoc River. The City understands that with the AM approach, the root source of the pollutant loading is addressed. There is technology available to remove phosphorus to required levels at the WWTF. However, this technology uses more energy, water, and chemicals compared to the AM approach. The City recognizes the long term sustainability and environmental benefits of the AM approach. This approach will also help achieve specific TP and TSS reduction goals established in the Rock River TMDL by implementing Management Measures in the Oconomowoc River Watershed.

The City would have to invest in significant upgrades to WWTF in order to achieve the required reduction in TP. The City currently has membrane disc filters designed to remove TSS before disinfection, but these filters were not designed to remove TP to the levels required to meet the final permit. As mentioned previously, the City has experimented with adding greater doses of ferrous chloride to the treatment processes; however, at a level below 0.4 mg/L the filters clog with chemical and take on a distinctive orange color associated with the ferrous chloride. To retrofit the filters to remove TP to a greater degree, chemical coagulation and polymer addition would have to take place immediately before the filtration process. In addition, supplementary filters may be necessary because the hydraulic loading rates would be less than used now. The total estimated capital cost of WWTF modifications to achieve lower effluent TP levels is $1,500,000 to $2,000,000.

For the storm water utility, the cost advantages of the AM approach are even more apparent. It is estimated that without an AM program the City's cost to achieve TP reductions approaches $10,000,000.

In order to obtain supplemental financial assistance for the AM program, the City completed a grant proposal for the National Resource Conservation Service (NRCS) known as the Regional Conservation Partnership Program (RCPP) in the summer of 2014. The RCPP program combined existing NRCS programs into a larger, streamlined program. Examples of existing programs under the RCPP include the Environmental Quality Incentive Program, Agricultural Conservation Easement Program, and the Conservation Stewardship Program. The purpose of the RCPP is to promote conservation practices and to leverage federal grant funds with matching non-federal partner funds. The RCPP program is an aggressive conservation program which is limited to a five year period. The money for the conservation practices is for fiscal years 2015 through 2019. Practices where federal money is requested must be in place by and completed by November 1, 2019. The City was awarded the RCPP grant early in 2015, and intends to include this funding as part of the larger AM program.

The City has named the combined effort of the AM program and the RCPP the Oconomowoc Watershed Protection Program (OWPP). Through the RCPP proposal process, the City has formed a network of partnerships and outlined the roles and responsibilities of each partner. This existing organization will be applied to the AM program and developed further as a part of the OWPP.

IDENTIFY PARTNERS

In light of the numerous partners involved in the OWPP, they are categorized as non-point source partners, county groups, and other partners. There are currently no non-MS4 permitted urban source partners in the OWPP besides the MS4's in the action area.

In order to effectively engage non-point sources, the City has formed a Farmer Leadership Group. This is a group of several landowners and farmers who will lead the effort in working with the agricultural community to implement phosphorus Management Measures. This group will be the point group in making local farmers aware of the AM program and its objectives, promoting the program, coordinating with the agricultural community to identify opportunities for pollutant reduction, and implementing specific reduction practices. The group is comprised of farmers from Jefferson, Waukesha and Washington Counties who understand field-scale conservation practices and the benefits of the OWPP to the larger community.

The county Land and Water Conservation (LWC) Departments will be an important asset to the AM program. The counties represented in the Oconomowoc River Watershed are Jefferson, Waukesha, Dodge, and Washington Counties. Since the watershed area in Dodge County is very small, this county will not be an initial partner. If in the future it is evident that significant pollutant reduction could take place in this small area, Dodge County will be included as a partner in the plan. The City has already coordinated with LWC Department staff in putting together a list of Critical Source Areas (CSAs), determining appropriate Management Measures for those areas, and estimating pollutant reduction levels for the RCPP grant proposal.

The counties will provide in-kind and paid technical assistance for City of Oconomowoc. They will provide technical assistance on identifying CSAs and appropriate Management Measures in their respective watershed areas. They will also provide some modeling support and work with the Farmer Leadership Group directly.

The largest group of partners consists of those that are not farmers, landowners, or county groups. These include engineering consulting firms, lake management districts, MS4's, government bodies, private landowners, land conservation and environmental groups, and universities.

The roles and responsibilities of all OWPP partners are summarized in Table 1.

Table 1. OWPP Partner Roles and Responsibilities

Party	Roles/Responsibilities
American Farmland Trust	American Farmland Trust will work with farmers via education and outreach. Also they will collaborate with the Tall Pines Conservancy in the ACEP program to preserve farmland in the watershed.
Camp Whitcomb/Mason	This camp owns a significant amount of land on Lake Keesus in Waukesha County and is eager to implement Management Measures on their property. They will provide Technical Assistance for services, equipment, and tools.
Carmelites of Holy Hill	The Carmelites of Holy Hill will provide Financial and Technical Assistance to Oconomowoc for identified projects.
City of Oconomowoc Wastewater Utility	The wastewater utility is the lead partner. The City of Oconomowoc will have the contract with the NRCS for the RCPP grant, and will submit the AM Plan to the WNDR. All project components will be driven by and approved by the City. The City will provide annual progress reports to the NRCS and the WNDR. The City will be the direct recipient of Financial Assistance from NRCS. The City will collect Financial Assistance from other partners for partial reimbursement to support projects. The City will also contract out and pay for Technical Assistance as needed for the project. The City will provide the administration, reporting, and record keeping for this project.
City of Oconomowoc MS4	The MS4 will provide phosphorus reductions through incorporating practices and structures that reduce runoff from urban areas.
Clean Water Association	This group will provide public education and outreach as well as Technical Assistance.
Clean Wisconsin	Clean Wisconsin will provide Technical Assistance through public education and outreach and will provide strategic planning for the WDNR AM program.

Party	Roles/Responsibilities
Erin Meadows Farms	This farm will initiate the Farmer Leadership Group and provide Technical Assistance among the agricultural community.
Farmer Leadership Group	The Farmer Leadership Group will provide Technical Assistance, education, training, and outreach for the agricultural community.
Friess Lake Advancement Association	This lake group may provide Technical Assistance to Oconomowoc for identified projects. They may assist with upstream and downstream water quality monitoring alongside lake monitoring.
Greener Oconomowoc	Greener Oconomowoc will provide Technical Assistance, education and outreach, publicity, and coordination with the Farmer Leadership Group.
Jefferson County	Jefferson County will provide in-kind and paid Technical Assistance for Oconomowoc. They will provide Technical Assistance for field-scale Management Measures and modeling. The County will also serve as a liaison to local farmers.
Lac La Belle Lake Management District	The Lac La Belle Lake Management District will provide Technical Assistance to Oconomowoc for identified projects. They will provide upstream and downstream water quality monitoring alongside lake monitoring. Lac La Belle will also provide completion of a streambank restoration project and enforcement of buffer strips with municipalities near streams entering the lakes.
Mid Kettle Partners	Mid Kettle Partners will provide Technical Assistance, education and outreach, publicity, and coordination with the Farmer Leadership Group.
North Lake Management District	The North Lake Management District will coordinate and implement the Mason Creek Improvement Project.
NRCS	The NRCS will have a contract with the City of Oconomowoc and provide Financial Assistance and other assistance related to the RCPP grant. The NRCS will receive RCPP annual progress payments from Oconomowoc. The NRCS will provide standards to be followed for Management Measures and other technical assistance outside of the RCPP.
Okauchee Lake Management District	The Okauchee Lake Management District will provide Technical Assistance to Oconomowoc for identified projects. They will provide upstream and downstream water quality monitoring alongside lake monitoring.
Ozaukee Washington Land Trust	The Ozaukee Washington Land Trust will coordinate with other partners in the watershed to provide education and outreach.
Pabst Farms	This landowner will serve as an example for storm water infiltration basins in the watershed. Several large basins of this type were part of their large development. The basins could serve as a model for similar basins in the watershed to reduce runoff.

Party	Roles/Responsibilities
Rock River Coalition	This organization will provide Technical Assistance through coordination with the Rock River TMDL.
Ruekert & Mielke, Inc.	Ruekert & Mielke, Inc. (R/M) will provide Technical Assistance for Oconomowoc on the AM program. R/M will serve as the regulatory specialist for the TMDL and NR 217 rules. R/M will coordinate with MS4's.
Sand County Foundation	Sand County Foundation will assist with public education and outreach. They will also help with flow monitoring throughout the watershed.
SEH Consulting Engineers	SEH Consulting Engineers will coordinate with other partners in the watershed to provide education and outreach.
Silver Lake Management Group	This lake group will provide Technical Assistance to Oconomowoc for identified projects. They will provide upstream and downstream water quality monitoring alongside lake monitoring.
Southeastern Wisconsin Regional Planning Commission (SEWRPC)	SEWRPC will help coordinate and implement the Mason Creek Improvement Project. They will model streambank improvements upstream of Mason Creek. Working with the North Lake Management District, they will provide direct Technical Assistance to the project.
Tall Pines Conservancy	Tall Pines will provide in-kind and paid Technical Assistance for the City of Oconomowoc on watershed issues, resource restoration, education and outreach, its land trust program, and legal issues. Tall Pines will coordinate with farmers and lake management groups. Specifically, it will coordinate with the North Lake Management District and its partners for the Mason Creek Improvement Project. They have estimated a Technical Assistance level of $270,000 for this project. Approximately $200,000 of this assistance will be for matching funds for implementation of agricultural land easements under the Agricultural Conservation Easement Program (ACEP).
Town & Country Resource Conservation & Development, Inc.	Town and Country will provide links to Technical Assistance on filter strips and grazing rotation practices.
University of Wisconsin (UW) Extension	UW-extension will provide education and outreach as well as Technical Assistance for project. UW-extension is interested in assisting in nutrient management program implementation.
Village of Oconomowoc Lake	This Village will provide Technical Assistance to Oconomowoc for identified projects.
Washington County	Washington County will provide in-kind and paid Technical Assistance for Oconomowoc. They will provide Technical Assistance for field-scale Management Measures and modeling. The County will also serve as a liaison to local farmers.

Party	Roles/Responsibilities
Waukesha County	Waukesha County will provide in-kind and paid Technical Assistance for Oconomowoc. They will provide Technical Assistance for field-scale Management Measures and modeling. The County will also serve as a liaison to local farmers.
WDNR	The WDNR will coordinate with the City on the AM program for compliance with NR217 as well as efforts to comply with the TMDL for TP and TSS. The WDNR's WisCALMs testing methodology will be followed to access project results. The WDNR existing fish survey and wetland information will be used. The WDNR is responsible for enforcing phosphorus compliance for all parties seeking compliance through this AM Plan.
Wisconsin Department of Agriculture, Trade and Consumer Protection (WDATCP)	WDATCP will provide Technical Assistance for nutrient management planning, farmland preservation program zoning and agreements, farm succession aid, and other general support for farmers.

Communication in the OWPP will depend on the type of information to be conveyed and the scale to which it will be communicated. On a broad scale, the City, with help from UW-Extension, Tall Pines Conservancy, R/M, Clean Wisconsin, Mid Kettle Partners, and Greener Oconomowoc, will lead the effort to promote public awareness and education of the OWPP and its objectives. The City will have bi-annual meetings to share updates with the OWPP. In addition, a website will be created to share basic information on the OWPP development to the general public and partners.

For more specific information, a document management platform such as Microsoft Office 365 Business Premium will be used. This is a software turnkey type product where storage, servers, troubleshooting, and maintenance is done by a third party. The service is renewable annually, expandable as the partners grow, and allows multiple tiers of information access and manipulation ability. This service will also allow partners to collaborate through document sharing, review, and development.

Communication associated with Management Measure implementation will be led by the City working in conjunction with the Farmer Leadership Group. Communication at this level will include targeted CSAs, specific Management Measure implementation, and project timelines. Communication will also include the status of annual compliance activities for Management Measures already implemented. Using the document management software, this detailed information will be available to the Farmer Leadership Group and other designated partners. Monthly meetings will take place for this set of partners, with more frequent meetings as an option if needed. When appropriate, guests will be invited to these meetings. For example, landowners, farmers, and county LWC Department staff would be invited to meetings covering details of specific Management Measure implementation projects. The majority of the work in the OWPP will take place at this level.

Communication for practices such as wetland restoration and streambank stabilization will be led by the City in conjunction with participating engineering consulting firms, lake management districts, the City of Oconomowoc MS4, government bodies, private landowners, land conservation and environmental groups, and universities. Meetings will occur as needed for this set of activities. The attendees of these meetings will be determined by the type of activity involved. For example, for a wetland restoration project, the Wisconsin DNR and SEWRPC would both be included. This set of partners would also have access to project-document management software.

DESCRIBE THE WATERSHED AND SET LOAD REDUCTION GOALS

The action area in the OWPP is the Oconomowoc River Watershed. Most of the priority CSAs are in western Waukesha County and eastern Jefferson County due to their proximity to the point of compliance; however, Washington County also has several large areas where Management Measures will be effective in improving water quality. Improvements made to these areas will benefit the many lakes in the watershed, serve as examples of conservation practices to the surrounding community, and will help in the long term sustainability of reducing phosphorus.

Map 1 in Appendix B shows the watershed as well as the surface water details, county boundaries, twelve digit Hydrologic Unit Code (HUCs) areas, impaired waters, major highways and interstates, municipal boundaries, the City monitoring points, dam locations, and WWTF locations in the proximity of the watershed. The WDNR Pollutant Load Ratio Estimation Tool indicates that 70 percent of the TP load in the Oconomowoc River Watershed is from non-point sources and 30 percent is from point sources – namely the Oconomowoc WWTF. The Oconomowoc WWTF is the only treatment facility WPDES permittee in the watershed. There are multiple MS4 WPDES permitees in the watershed. The watershed includes a number of municipalities including the Town of Erin, Town of Merton, Village of Richfield, Town of Oconomowoc, Town of Concord, Village of Slinger, Village of Hartland, Village of Nashotah, Village of Merton, Village of Chenequa, Village of Lac La Belle, Village of Oconomowoc Lake, City of Oconomowoc, and the Village of Summit. Tables 2 through 5 describe each HUC-12 area in the action area. Note that HUC-12 areas were adjusted to agree with the total area of the watershed layer given in the WDNR Surface Water Data Viewer. In light of this, the HUC-12 areas given in Table 2 are approximate and do not reflect the acreages associated with the HUC-12 layer in the Surface Water Data Viewer.

Table 2. AM Action Area Description for Plan Development

HUC and Watershed Name	**Total Area of Watershed**	
070900010501 Oconomowoc River	**Acres**	**Square Miles**
	36,003	56.2
County	**Area of Watershed in the County**	**Percentage of Watershed Within the County**
Washington	28,646	80%
Waukesha	7,357	20%
What watershed scale was used to develop the action area? ☒ Full HUC 12 ☐ Portion of the HUC 12 ☐ Based on TMDL Reach ☐ Other		

Table 3. AM Action Area Description for Plan Development

HUC and Watershed Name	**Total Area of Watershed**	
070900010502 Oconomowoc River	**Acres**	**Square Miles**
	19,059	29.8
County	**Area of Watershed in the County**	**Percentage of Watershed Within the County**
Waukesha	16,229	85%
Washington	2,427	13%
Dodge	403	2%
What watershed scale was used to develop the action area? ☒ Full HUC 12 ☐ Portion of the HUC 12 ☐ Based on TMDL Reach ☐ Other		

Table 4. AM Action Area Description for Plan Development

HUC and Watershed Name	**Total Area of Watershed**	
070900010503 Oconomowoc River	**Acres**	**Square Miles**
	11,953	18.7
County	**Area of Watershed in the County**	**Percentage of Watershed Within the County**
Waukesha	11,621	97%
Jefferson	332	3%

What watershed scale was used to develop the action area?
☒ Full HUC 12 ☐ Portion of the HUC 12 ☐ Based on TMDL Reach ☐ Other

Table 5. AM Action Area Description for Plan Development

HUC and Watershed Name	Total Area of Watershed	
070900010504 Oconomowoc River	**Acres**	**Square Miles**
	16,735	26.1
County	**Area of Watershed in the County**	**Percentage of Watershed Within the County**
Waukesha	9,360	56%
Jefferson	7,375	44%
What watershed scale was used to develop the action area? ☒ Full HUC 12 ☐ Portion of the HUC 12 ☐ Based on TMDL Reach ☐ Other		

The Oconomowoc River Watershed is a sub-watershed of the Rock River Watershed, both of which are located in the Mississippi River basin. The Oconomowoc River Watershed has a large amount of lakes. Waukesha County contains all or portions of 33 major lakes with a combined surface area of approximately 14,000 acres (21.9 square miles), or about 3.8% of the total area of the County. This area represents about 38% of the combined surface area of the 101 major lakes in the seven-county Southeastern Wisconsin Region, which is larger contribution than any other county in the region. In addition, much of the Oconomowoc River Watershed is considered a high ground water recharge area designated by the SEWRPC. The Oconomowoc River generally flows in a southwesterly direction and passes through six lakes and two mill ponds. West of the City of Oconomowoc, the river flows west and north to the confluence with the Rock River. The Rock River eventually joins the Mississippi River through the State of Illinois.

The Rock River is impaired and identified on the EPA 303 (d) list for both TSS and TP. The Oconomowoc River Watershed also contains several surface waters which are impaired for either TSS or TP including Flynn, Battle, and Mason Creeks. In addition, WDNR's 2014 impaired waters list includes three lakes impaired with excess TSS or TP: North Lake, Friess Lake, and Okauchee Lake.

Several of the lakes within the action area have lake management districts or some public organization with a mission to protect and rehabilitate a specific inland lake; for example, the North Lake Management District. These lake management groups will serve as partners in Management Measure implementation in order to support the OWPP objectives of improved water quality and a reduction of soil loss. Public inland lake protection and rehabilitation districts are bodies governed by a Board of Commissioners and a voting membership. These organizations are created for the purpose of undertaking lake protection programs in the surrounding area. These organizations may sue or be sued, make contracts, accept gifts, purchase, lease, devise or otherwise acquire, hold, maintain or dispose of property, disburse money, contract debt, and do any other acts necessary to carry out a program of lake protection and rehabilitation.

The watershed also includes an Agricultural Enterprise Areas (AEA). The AEA program is a voluntary program supported by the State of Wisconsin, Department of Agriculture, and WDATCP. The program is open to farmers who implement and maintain good land use practices. In return, farmers receive assurance that surrounding land will be protected from development. Approximately 27,000 acres in the watershed in Waukesha and Dodge Counties are already in this program.

Per recommendation of the WDNR, it was assumed that the overall point of compliance for the City of Oconomowoc WWTF and MS4 will be at the confluence of the Oconomowoc and Rock Rivers. This point will be monitored near the bridge at Northside Drive (Site 18) for ease of accessibility. Also, there are no river offshoots that contribute to the Oconomowoc River between Site 18 and the confluence, allowing for a representative sample that is not influenced by mixing and backflow of the Rock River. The Oconomowoc River flows from east to west at this location. Northside Drive runs in the north-south direction. A WDNR-operated electric fence is located at the north side of the bridge.

There are several TMDL reaches represented in the action area that contain areas where the City of Oconomowoc MS4 operates or drains. These reaches will be monitored as a part of the OWPP in order to ensure that the appropriate TP reductions are achieved. The outlet of Reach 27 coincides with the overall point of compliance described above, and does not contain any portion of the MS4 system. Existing city monitoring near the outlet of Reach 26 which contains a portion of the MS4 shows that the Water Quality Criterion of 0.075 mg/L TP is being met (Site 15 in Appendix C). This site will continue to be monitored to ensure that this reach remains in compliance, but the OWPP will not include the implementation of any Management Measures in this area for the time being. Reach 55 also contains a portion of the Oconomowoc MS4, but this area will not be included in the OWPP as it is outside of the project action area. Therefore the AM program will only be used to help the City MS4 reach TP compliance in TMDL Reach 25. Any necessary reductions for Reaches 26, 27, and 55 will be met by the City Oconomowoc MS4 outside of the AM Plan using the percent reduction method.

An additional monitoring point will soon be added to the intersection of the bridge on North Morgan Street and the Oconomowoc River per recommendation by the WDNR. This monitoring point, denoted as Site 14b, will serve to provide historical data near the outlet of Reach 25. There are no other river offshoots that contribute to the Oconomowoc River between Site 14b and the true outlet of Reach 25. This location is downstream of an unnamed tributary to the Oconomowoc River located about 1/2 mile west of Silver Lake Street. Morgan Road runs in the north-south direction. The river at this location flows southwesterly at the bridge. If, at the end of the adaptive management project, in-stream compliance has not been met at the end of Reach 27, the MS4 can still be compliant with the goals of the TMDL if the in-stream monitoring data at this site shows water quality goals have been met in Reach 25. If the in-stream monitoring at both Reach 25 and Reach 27 does not show compliance with the goals of the TMDL, the modeling can still be used to show the percent reduction for phosphorus has been met in Reach 25 for the MS4 system.

The City has already been proactive in establishing baseline monitoring information. The United States Geological Survey (USGS) was contracted to estimate the flow rates at the WWTF outfall and at the confluence with the Rock River (Waschbusch, 2015). The flow data is shown in Tables 6 and 7 below.

Table 6. Flow Characteristics at the WWTF Outfall from Waschbusch, 2015

	Flow (cfs)	**Flow (MGD)**
Annual Average Flow	97	62.76
7Q10	2.1	1.36
7Q2	7.7	4.98

Table 7. Flow Characteristics at the Confluence with the Rock River from Waschbusch, 2015

	Flow (cfs)	**Flow (MGD)**
Annual Average Flow	119	76.99
7Q10	2.7	1.75
7Q2	9.6	6.21

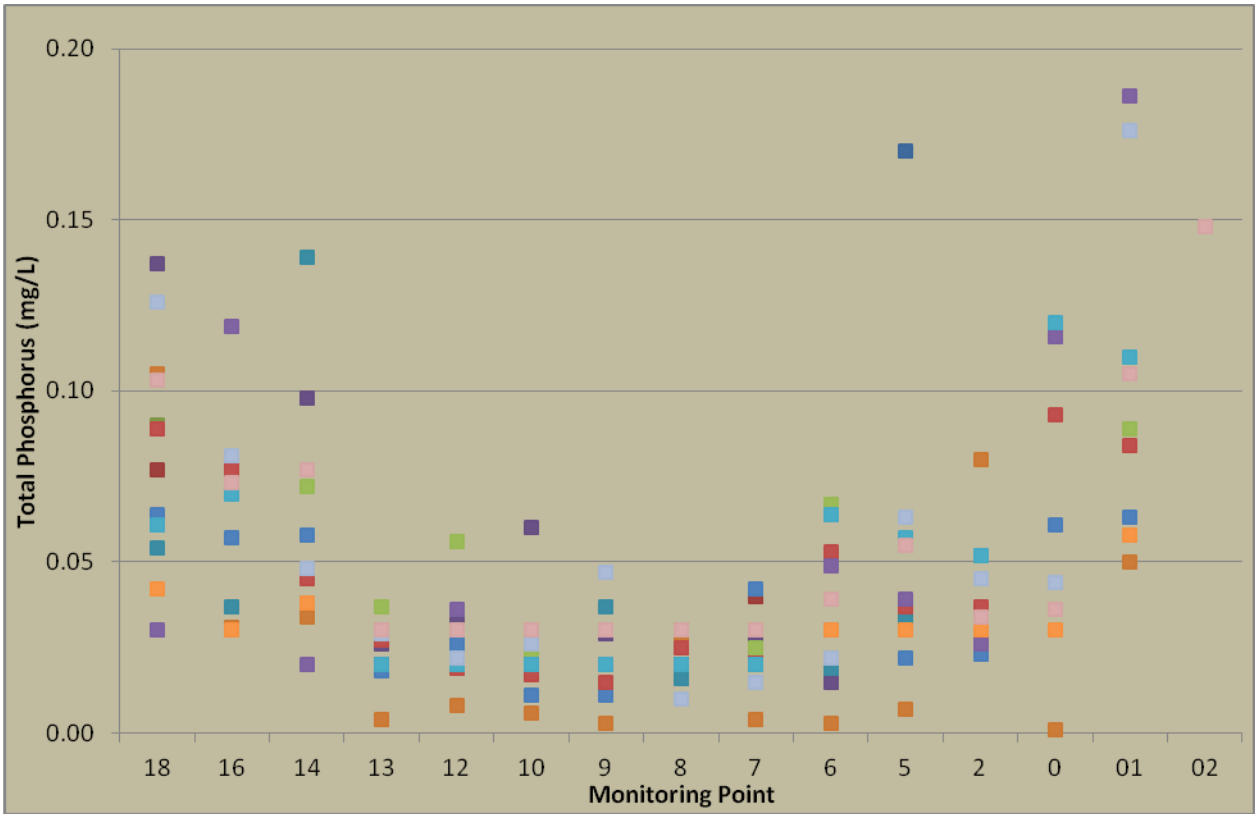
WWTF staff have also monitored numerous points in the watershed in recent years for TP. This data is shown in Appendix C. The site numbers in Appendix C correspond to the monitoring locations shown in Map 1 in Appendix B. Note that several new monitoring locations were recently added in the northernmost area of the watershed in order to better understand the TP loading from the headwaters of the Oconomowoc River in the area north of Highway 167 and the tributary Coney River system.

Upstream of the WWTF, the TP concentration at the monitoring locations is generally less than 0.1 mg/L, with some higher values in the northern portion of the watershed. There is a noticeable increase in TP concentration just downstream of the WWTF outfall discharge (Site #14). The TP concentration at the confluence (Site #18) ranges from 0.03 to 0.137 mg/L in the 2014-2015 dataset. The median concentration at the confluence during the months of May through October is 0.096 mg/L. The results from the City sampling at the confluence are summarized in Table 8 below. The full set of year-round data is shown in Figure 1. This data is organized with the confluence on the left and upstream data to the right. Only monitoring results taken directly from the Oconomowoc River are shown.

Table 8. Official Results at the Confluence of the Oconomowoc River and the Rock River

Sampling Date	Result (mg/L)
06/11/2014	0.077
07/16/2014	0.090
08/12/2014	0.137
09/16/2014	0.054
10/16/2014	0.105
05/15/2015	0.042
06/15/2015	0.126
07/15/2015	0.103
Median	0.096

Figure 1. Year-Round Monitoring Data



The WDNR provided monitoring data for the Oconomowoc River from the Surface Water Integrated Monitoring System (SWIMS) database. The SWIMS data was collected at the West River Drive bridge approximately 2.6 river miles upstream of the confluence. There are nine TP monitoring data points at this location and they were all sampled from 2007 to 2008. The TP concentrations at this location ranged from a minimum value of 0.026 mg/L to a maximum value of 0.182 mg/L. The median value of these nine data points was 0.072 mg/L counting only the points taken from May through October.

Initially, TP will be the only pollutant considered in the OWPP. TSS will not be addressed directly. TSS allocations in the TMDL are already being met or are close to being met. However, further TSS reductions will be achieved in the process of reducing TP by reducing levels of particulate phosphorus in the action area. For the City of Oconomowoc MS4, it is anticipated that minimal efforts will be needed to reach the required TSS reduction levels in its storm water permit. The City has been very proactive in addressing storm water pollution in the last 10 to 15 years. Since the City can take credit for all storm water pollutant control activities and facilities implemented since 2004, the additional required TSS reductions are expected to be marginal. The soil in the watershed, especially the City of Oconomowoc area, is sandy and coarse and has a high infiltration rate. This soil characteristic helps reduce runoff from urban storm water. Future storm water modeling efforts will show exactly what the required amount of TSS reduction will be. If it is determined that TSS removal will be a benefit to all partners, it will be added to the OWPP plan.

The load reduction target for TP at the confluence of the Oconomowoc River and the Rock River is determined using the following procedure:

Qe - Flow from WWTF

Ce - WWTF Effluent Total Phosphorus Concentration

Qs - Flow of Oconomowoc River at Confluence

Cs - Total Phosphorus Concentration at Confluence

Current Point Source Load = Q_e x C_e x 8.34 x 365 days/year = 2.35 MGD x 0.75 mg/L x 8.34 x 365 days/year = 5,365 lb/year.

Current Load in Receiving Water = Q_s x C_s x 8.34 x 365 days/year = 76.99 MGD x 0.096 mg/L x 8.34 x 365 days/year = 22,499 lb/year.

Allowable Load Credit = (Q_s + Q_e) x WQC x 8.34 x 365 days/year = (76.99 + 2.35) MGD x 0.075 mg/L x 8.34 x 365 days/year = 18,114 lb/year.

Total Reductions Needed = 5,365+22,499-18,114 lb/year = 9,750 lb/year.

CONDUCT A WATERSHED INVENTORY

Conducting a watershed inventory is an important step in better understanding the action area to be affected by the AM program. This step will allow OWPP stakeholders to make informed decisions about specific actions to be taken in the watershed to improve water quality. The watershed inventory will help identify important and unique features of the Oconomowoc River Watershed and organize this information in way that summarizes a large amount of relevant data in a manageable format. Input from project partners and stakeholders as well as Geographic

Information System (GIS) software were used to obtain much of the data presented in this section, including the watershed boundary, streams, rivers, and surface water information, impaired waterways, TMDL reaches, soils data, land use statistics, zoning information, as well as other relevant information to the inventory. This information was then able to help identify sources of watershed impairment and direct efforts of water quality monitoring and remediation, as will be explained later in this document.

The Oconomowoc River Watershed is a relatively large action area for water quality improvements. The watershed is approximately 83,750 acres, or 131 square miles (WDNR Surface Water Data Viewer: Watershed Layer, 2015), which encompasses land distributed in four counties in southeast Wisconsin as shown in Table 9 below.

Table 9. Oconomowoc River Watershed Land Area Distribution by County

County	Approximate Land Area (acres)
Dodge	400
Jefferson	7,725
Washington	31,050
Waukesha	44,575

Map 2 in Appendix B shows an aerial view image of the Oconomowoc River Watershed with water body names. The watershed's northern boundary is near Slinger, WI in Washington County where the Coney River system flows south and joins with the Oconomowoc River. The Oconomowoc River then flows southwest through Friess Lake, Little Friess Lake, and Lowes Lake before being joined by Flynn Creek just north of the Washington County line. Other bodies of water in the Washington County portion of the Oconomowoc River Watershed include Hickey Lake, Beck Lake, McConville Lake, Malloy Lake, Murphy Lake, Werner Pond, and several other smaller lakes and ponds. In total, the Washington County portion of the action area has approximately 400 acres of surface water.

The small portion of the watershed that is in Dodge County does not contain any significant streams, rivers, or bodies of water. After leaving Washington County, the Oconomowoc River continues to flow southwest across the Waukesha County line, through the Monches Millpond and into North Lake. Both the Little Oconomowoc River and Mason Creek similarly flow into North Lake from the north (Mason Creek is one of two Class 1 trout streams in the watershed, the other being Rosenow Creek). After flowing west out of North Lake, the Oconomowoc River flows through a series of lakes northeast of the City of Oconomowoc including Okauchee Lake, Upper Oconomowoc Lake, Oconomowoc Lake, Fowler Lake, and Lac La Belle (Rosenow Creek also flows into Lac La Belle from the east). Next, the river continues south and west out of the City of Oconomowoc and across the Jefferson County line. Other notable water bodies in the Waukesha County portion of the watershed include Lake Keesus, Silver Lake, Laura Lake, Tierney Lake, Cornell Lake, Beaver Lake, Grass Lake, Florence Lake, Forest Lake, Moose Lake, Pine Lake, Round Lake, Garvin Lake, Sybil Lake, Tamarack Lake, and Crystal Lake. This portion of the watershed contains approximately 5,900 acres of surface water, which is the largest amount in the Oconomowoc River Watershed.

After crossing the Jefferson County line, the Oconomowoc River is joined by Battle Creek from the south and continues to flow west. Near the crossing with Highway F, the Oconomowoc River turns northwest and eventually joins the Rock River at the outlet of the watershed. The confluence of the Rock and Oconomowoc Rivers is the point of compliance for the OWPP. Other bodies of water in the Jefferson County portion of the watershed include Mud Lake and Round Lake, with the surface water in this portion totaling 145 acres. According to the WDNR, 41% of the fish and aquatic life in the rivers and streams throughout the entire action area are considered in poor condition.

There are several documented dams in the action area. The table below shows information regarding these dams, which are in order from upstream to downstream. The data shown is provided by the WDNR Surface Water Data Viewer, and dam locations are indicated on Map 1 of Appendix B. Note that several monitoring stations are located at dam sites.

Table 10. Dam Information for the Oconomowoc River Watershed

No.	Dam	Adjacent River System	County	Key Seq. No.	Field File No.	Size	Hydraulic Height (ft.)
1	Richfield Dam	Coney River	Washington	4443	66.09	Small	24.0
2	Monches (Burgs) Dam	Oconomowoc River	Waukesha	326	67.14	Large	11.0
3	Lake Keesus Dam	Oconomowoc River	Waukesha	1568	67.34	Small	1.0
4	Beaver Lake Outlet	-	Waukesha	1567	67.32	Small	1.0
5	Okauchee Lake (Upper Oconomowoc) Dam	Oconomowoc River	Waukesha	220	67.42	Large	12.0
6	Oconomowoc Lake (Danforth) Dam	Oconomowoc River	Waukesha	1029	67.26	Large	1.0
7	Peacock (Fowler Lake) Dam	Oconomowoc River	Waukesha	650	67.17	Large	7.0
8	Lake Labelle Dam	Oconomowoc River	Waukesha	1570	67.39	Small	1.0

The topography of the Oconomowoc River Watershed generally slopes from higher elevations in the northeast to lower elevations near the confluence of the Oconomowoc and Rock Rivers. The headwaters of the Oconomowoc River in the Village of Richfield have an approximate elevation of 980 feet. The elevation drops to about 860 feet at the outlet of Lac La Belle in the City of Oconomowoc, 850 feet at the WWTF outfall, and 840 feet at the confluence with the Rock River. The greatest elevation change thus occurs from the northeast part of the watershed to the area near the City of Oconomowoc, which is a relatively low point in the watershed as reflected in the high density of surface water bodies.

Soils data for the watershed was obtained using the Soil Survey Geographic Database (SSURGO) in conjunction with GIS. Several relevant types of soil information were obtained from the database, including the total area occupied by each soil type, soil erosion characteristics of the soils, and soil drainage and flooding information. See Appendix D for the complete soil information table for the Oconomowoc River Watershed.

There are 167 varieties of soils at various slopes represented in the Oconomowoc River Watershed. Soils that populate over 2% of the total land area are listed in Table 11. Loams and silty loams are the most prevalent soil types in the area, with a considerable amount of poorly drained hydric soil (Houghton muck) typical of floodplains and lake plains.

Table 11. Largest Represented Soils by Area in the Oconomowoc River Watershed

Soil Symbol	Soil Name	Area (ac)	% Cover
FsB	Fox silt loam, 2 to 6 percent slopes	8688.9	10.4%
FsA	Fox silt loam, 0 to 2 percent slopes	6055.0	7.2%
ThB	Theresa silt loam, 2 to 6 percent slopes	4997.1	6.0%
HmC2	Hochheim loam, 6 to 12 percent slopes, eroded	4121.4	4.9%
ThB2	Theresa silt loam, 2 to 6 percent slopes, eroded	2995.4	3.6%
Hu	Houghton muck	2990.4	3.6%
CrE	Casco-Rodman complex, 20 to 30 percent slopes	2961.0	3.5%
CeC2	Casco loam, 6 to 12 percent slopes, eroded	2487.6	3.0%
HmD2	Hochheim loam, 12 to 20 percent slopes, eroded	2294.8	2.7%
HtA	Houghton muck, 0 to 2 percent slopes	2167.5	2.6%
MmA	Matherton silt loam, 0 to 3 percent slopes	2141.2	2.6%
CeD2	Casco loam, 12 to 20 percent slopes, eroded	2134.8	2.5%
SeA	St. Charles silt loam, gravelly subtratum, 0 to 2 percent slopes	1931.1	2.3%
Sm	Sebewa silt loam	1752.1	2.1%

Several key characteristics of soil have implications for water quality. These soil characteristics are included in Appendix D. First, the general erodibility of the soils is a good indication of how susceptible different types of soil are to releasing particulate phosphorus to nearby surface waters. Soil erodibility is described by many factors provided by SSURGO, but most importantly by the whole soil erosion factor K_w and the ground slope. The soil erosion factor quantifies the tendency of soil particles to detach from their surrounding, as well as their ability to be transported by water, while accounting for the amount of rocks in a given soil. This factor is an important empirical coefficient in a number of soil loss estimation models such as the Universal Soil Loss Equation (USLE) and the Revised USLE (RUSLE). It is a function of the soil's texture, structure, organic matter content, and permeability. In general, then, K_w values will improve with anything that enhances infiltration into the soil, impedes the transport of runoff, or improves the natural cohesion of soil particles. Values of K_w range from 0.02 to 0.69, with higher values indicating a greater propensity for the soil to erode. Another factor contributing to soil erosion provided by SSURGO is the ground slope. Greater soil slopes lead to greater risk of soil detachment and transport due to the increased velocity of runoff over the surface.

The watershed contains predominantly high-rated K factor soils. Figure 2 below illustrates this distribution based on the area of land that each type of soil occupies. In addition, Map 3 in Appendix B shows a map of the Oconomowoc River Watershed with the different soil plots shaded based on K value. The darker blue and yellow indicate larger K_w values and a greater risk of soil erosion. Many of the areas with greatest risk of soil erosion are northeast of Oconomowoc near Mason Creek, the Little Oconomowoc River, and Flynn Creek. However, there are some areas of high erosion risk around Battle Creek and the area south of the confluence of the Oconomowoc and Rock rivers, which may provide critical opportunities for runoff mitigation near the point of compliance.

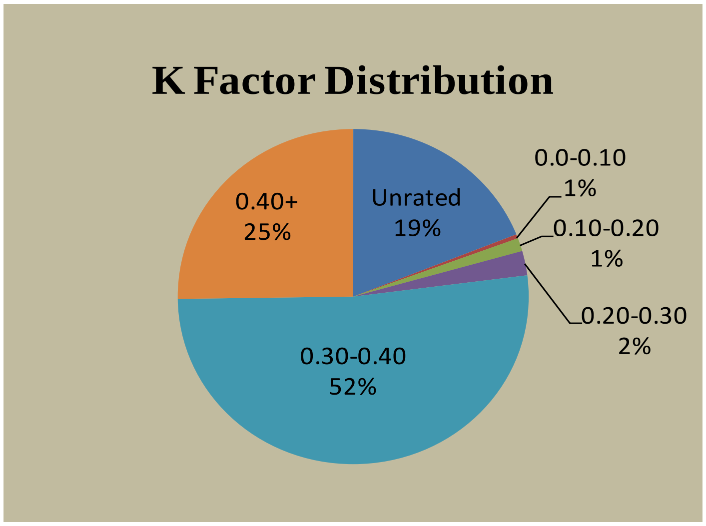


Figure 2. K_w Factor Distribution by Land Area for the Oconomowoc River Watershed

The SSURGO data also includes a soil description giving a class of accelerated erosion which is shown in Figure 3. The classes of accelerated erosion describe the amount of soil that has been removed from the upper horizons of the soil profile. Class A describes sheet erosion where less than 25% of the upper soil has been eroded. Class B describes 25-75% soil removal, and Class C describes soil erosion greater than 75% that usually occurs when deep rill or gullies form on sloped fields. A third rating, “None – deposition”, describes soil which is not prone to transport off site. Unfortunately, the majority of the soils in watershed were unrated, giving a limited picture of the extent of existing soil erosion in the action area. This limitation emphasizes the need for site exploration and windshield surveys which will be described later in this document.

The ability for soil to either drain or retain water is another important factor in understanding the behavior of water in a watershed. The SSURGO data provides a number of soil descriptions along these lines as well, most important of which are the soil hydric rating and the hydrologic soil group. Hydric soil is soil that is saturated with water for all or parts of the year, characteristic of soils found in wetlands or floodplains. This frequent saturation leads to a lack of oxygen in the soil (anaerobic conditions) which promotes the growth of wetland vegetation and species. Hydric soils maintain their physical characteristics even when converted to farmland, keeping these areas prone to water accumulation.

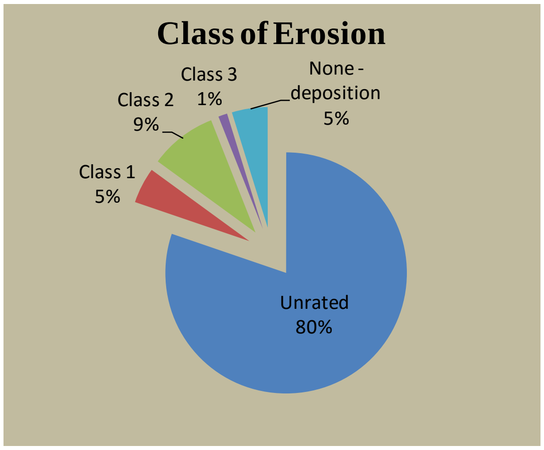


Figure 3. Distribution of Erosion Classes by Land Area for the Oconomowoc River Watershed

The hydrologic soil group system was developed by the NRCS to describe the infiltration rate of water into the ground by dividing soils into four categories: A, B, C, and D. Class A is characterized by high infiltration rates and low runoff potential, while Class D consists of soils with low infiltration and high risk of runoff and soil transport. Class A soils are typically sandy or granular, Class B soils are silts and loams, Class C soils are sandy clay loams, and Class D soils have high contents of clayey soils or a high water table. If two classes are listed, the first letter describes the soil if it is drained by a man-made drainage system while the second letter describes the soil in its natural state.

In the Oconomowoc River Watershed, about 20% of the soil is hydric (17,200 acres) with the rest being non-hydric or unrated. Figure 4 below illustrates the distribution of hydrologic soil groups in the watershed by area. The results show the majority of the soil is Class B, which is intuitive given the large amounts of silt loam in the area. There is also a considerable amount of less drainable soil in Classes C and D, with a potential for more poorly drained soil depending on the drainage condition of the dual classifications. Map 4 of Appendix B shows both hydrologic soil group ratings and the location of hydric soils.

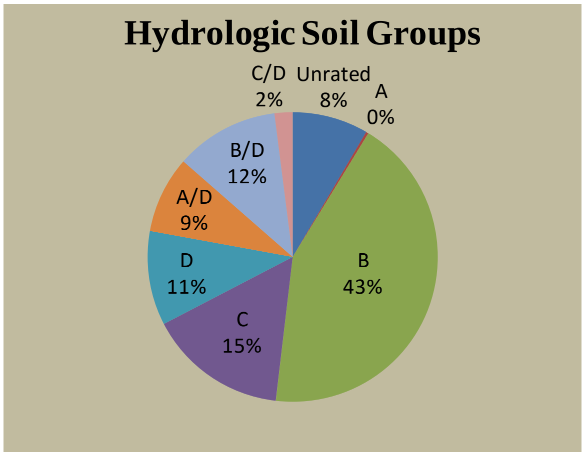


Figure 4. Hydrologic soil group distribution in the Oconomowoc River Watershed

Other SSURGO data that is presented in Appendix D includes the general drainage condition and flooding frequency of the soils listed. Over 80% of the soils were not rated to flood or to rarely flood, with only 3% of the soils rated to flood occasionally or frequently. Table 12 shows the ratings of drainage condition by area. These supporting soil descriptions indicate that the majority of the watershed is not a risk of flooding, while there is a significant portion of soils that present a risk of overland water flow and erosion.

Table 12. Drainage Condition of the Soils in the Oconomowoc River Watershed

Drainage Condition	Area (ac)	% Cover
Very poorly drained	9512.5	11.4%
Poorly drained	5269.2	6.3%
Somewhat poorly drained	5451.6	6.5%
Moderately well drained	1351.4	1.6%
Well drained	44634.6	53.3%
Somewhat excessively drained	10716.8	12.8%
Excessively drained	47.8	0.1%
Unrated	6765.8	8.1%

The National Land Use Database (NLCD) was used to assess land use in the action area. Map 5 in Appendix B shows the land use map for the watershed, and Table 13 summarizes land use information and agricultural statistics in a tabular format (agricultural statistics were provided by county LWC Departments). In addition, Maps 6 and 7 in Appendix B illustrate the locations of wetlands and floodplains in the action area. Over half of the land use in the watershed consists of croplands or grasslands, with the majority of croplands consisting of typical row crop rotations. Due to the prevalence of dairy farming in the area, there is also a significant amount of forage crops in the action area. Approximately half of the existing cropland is not tilled at any point during the year, while about 35% of the cropland is conventionally tilled. About 16% of the land consists of forests, 13% of the land consists of wetland-type vegetation, and 7.5% of the land is open water. 6% of the land area is developed, with the majority of residential and urban area near the City of Oconomowoc. The majority of livestock in the watershed are dairy cows (49%), with a sizeable portion of beef cattle and horses.

Table 13. AM Land Use Overview

Current Land Use				
Land Use	**Approximate Land Cover (ac)**	**Approximate Land Cover (%)**	**Typical Impervious Fraction/Runoff Coefficient[1]**	**Approximate Impervious Area in Watershed**
High Density Urban	1,426	1.7%	0.7	1.2%
Low Intensity Urban	2,990	3.6%	0.3	1.1%
Golf Course	697	0.8%	0.2	0.2%
Primary Row Crops	4,111	4.9%	0.1	0.5%
Corn	12,543	15.0%	0.1	1.5%
Other Row Crops	3,379	4.0%	0.1	0.4%
Forage Crops	14,508	17.3%	0.1	1.7%
Grassland	11,811	14.1%	0.1	1.4%
Mix/Other Coniferous	1,319	1.6%	0.1	0.2%
Oak	1,276	1.5%	0.1	0.2%
Mixed/Other Broad-Leaved Deciduous	10,840	12.9%	0.1	1.3%
Open Water	6,243	7.5%	0.0	0.0%
Emergent/Wet Meadow	3,324	4.0%	0.08	0.3%
Lowland Shrub (Broad-Leaved Deciduous)	2,505	3.0%	0.08	0.2%
Lowland Shrub (Broad-Leaved Evergreen)	150	0.2%	0.08	0.0%
Lowland Shrub (Needle-Leaved)	140	0.2%	0.08	0.0%
Forested Wetland (Broad-Leaved Deciduous)	4,601	5.5%	0.08	0.4%
Forested Wetland (Coniferous)	326	0.4%	0.08	0.0%
Forested Wetland (Mixed Deciduous/Coniferous)	64	0.1%	0.08	0.0%
Barren	1,295	1.5%	0.2	0.3%
Shrubland	202	0.2%	0.2	0.0%
Total	**83,750**	**100.0%**		**11.0%**

Description of Cropping Practices		
Common Rotations	**Approximate Land Cover (ac)**	**Approximately Land Cover (%)**
Corn-Soybean	9,768	45.3%
Hayland	2,556	11.9%
Dairy Rotation	2,171	10.1%
Corn-Oats-Hay (5 Year)	1,776	8.2%
Row-Grain-Hay (7 Year)	1,754	8.1%
Corn-Soybean w/Cover Crop	1,332	6.2%
Row-Grain-Hay (6 Year)	1,116	5.2%
Corn-Soybean-Wheat	957	4.4%
Continuous Corn	82	0.4%
Potato-Grain-Vegetable	36	0.2%
Total	**21,548**	**100.0%**

[1]Runoff coefficients are used in the rational equation, which is one of the simplest methods to determine peak discharge from drainage basin runoff. These values are provided as a general approximation for decision-making purposes and should be modified as appropriate.

Table 13. AM Land Use Overview (continued)

Tillage Practices	
Common Rotations	**Approximate Land Cover (ac)**
No-till (ac)	10,072
Conservation Tillage (30% or more) (ac)	2,643
Conventional Tillage (less than 30%) (ac)	6,999
Unknown (ac)	1,834
Livestock Density	
	Approximate Number of Animas in Watershed
Dairy	1,545
Beef	833
Horses	625
Poultry	20
Pork	10
Other	145
Total	3,178

The zoning maps for Jefferson and Waukesha Counties were reviewed to compare existing land use with potential future land use. Information provided by Jefferson and Waukesha Counties indicated how land use could change near some of the larger cities and areas where Management Measures will be implemented. Based on this exercise, land use in Jefferson County is not expected to change significantly and there will not be significant development. For Waukesha County, the City of Oconomowoc Zoning Map was reviewed. The zoning map indicated several areas designated "urban reserve" along the western edge of the City of Oconomowoc at the Waukesha County line as well as in the southwestern and northeastern parts of the City. This zoning designation denotes land that is in transition between urban and rural areas, and has the potential to be zoned for industrial or residential use in the future. The urban reserve areas on the southwestern part of the City are the most important to monitor in the future as many lots are adjacent to the Oconomowoc River flowing south out of Lac La Belle. The area east and northeast of the City of Oconomowoc consists of the Oconomowoc, Okauchee and North Lakes. These lakes already have significant development at or near the shoreline. Okauchee Lake in particular has significant development that extends thousands of feet from its northern and western borders. It is anticipated that the northern half of Okauchee Lake will be served with a sanitary sewer system in the future.

There are several secondary projects and objectives associated with the OWPP that will be occurring alongside agricultural Management Measures as a part of the AM program. One of these secondary objectives is to reduce known runoff problems in the watershed. There has been severe soil deposition in North Lake in the area where Mason Creek enters the lake. This has been a well-documented problem for many years. The Rock River TMDL identified the area tributary to Mason Creek as extremely high in background non-point baseline TSS and TP loading per acre. There is also evidence of streambank erosion along Mason Creek. Several OWPP partners are participating in the Mason Creek Project. The Town of Merton, Village of Merton, North Lake Management District, Tall Pines Conservancy, and SEWRPC have been organizing to address this problem for the past several years. Also, SEWRPC is in the process of applying for an EPA 319 grant to address the soil erosion tributary to Mason Creek. Through coordination with the OWPP, additional resources may be brought to this area.

The restoration of degraded habitat for fish and wildlife in the watershed is another secondary objective. One way to reduce phosphorus runoff from agricultural lands is to restore wetlands. Waukesha and Washington counties have identified areas where wetland restoration is possible. Increased wetland areas will allow birds, waterfowl, and other wildlife to depend on these lands for their habitat.

Another secondary objective of the OWPP is to save energy through the application of municipal biosolids from wastewater treatment facilities on agricultural land. The Oconomowoc Wastewater Utility can directly help with this objective as a source of fully digested, safe, and stable biosolids that have high levels of nitrogen and TP. Through this program, additional farmers in the watershed will be made aware of this resource. Farmers can save money by using biosolids instead of traditional fertilizers to condition their soils. Per WAC, biosolids applied to farm field must be incorporated in the ground as it is applied. This reduces any possibility that the nutrients from the biosolids could runoff. The OWPP will ensure that biosolids are incorporated into the soil. Using biosolids as a natural fertilizer reduces energy consumption as traditional fertilizer production is energy and water intensive.

Several partners involved in the OWPP see the potential benefits of improved lake health and water quality through this project as a secondary objective. Concerns for the lakes in the action area include the clarity of the water, health of habitat for fish and other aquatic organisms, and excessive aquatic plant growth. With reduced TSS and TP, the water quality in the lakes should be improved. This in turn may reduce the need for extensive aquatic plant harvesting that several of the lakes need to conduct for boating purposes.

The last secondary objective is farmland preservation. The Tall Pines Conservancy is a key partner in the OWPP. This land trust works to provide deed restrictions to prevent farm land from becoming developed into a different land use. Land trusts are an essential tool to preserving the rural character of many of the townships in the watershed. Waukesha County in particular has experienced development pressure and the loss of high quality farm land. Typically the deed restrictions have requirements that sound conservation practices are in place and working to reduce soil and nutrient runoff. In this way, the objectives of the AM program and farmland preservation are common.

IDENTIFY WHERE REDUCTIONS WILL OCCUR

Potential CSAs for agricultural lands were identified in a variety of ways depending on the county staff members involved.

In Jefferson County and western Waukesha County, a preliminary list of sites was compiled by using orthophotography overlaid with topographic maps. Areas with steeper slopes and minimal natural buffer between farmland and the river were identified. The City of Oconomowoc then contracted with Ken Denow, a soil scientist formerly with the WDNR, to conduct a windshield survey of these areas and other areas nearby. Through this windshield survey, a general understanding of the soil types, crop rotations, and drainage patterns was obtained for the identified sites.

In Waukesha County, GIS was first used to identify cropland areas within 750 feet of surface waters. Then the county analyzed these areas using soil maps and orthophotography overlaid with topographic information to further refine areas for phosphorus runoff reduction potential.

Washington County had very specific information on areas for runoff and phosphorus reduction potential. The lands identified in Washington County were further refined using orthophotography overlaid with topographic information. One of the OWPP's core partners runs Erin Meadows Farms, a sizeable operation in Washington County. He was able to identify improvements on his land and his neighbors' land. This partner has also expressed interest in being one of the initial sites where Management Measures will be implemented in the OWPP.

Maps 8 and 9 in Appendix B show the potential CSAs identified in the action area. Map 8 shows the southwest portion of the watershed. Map 9 shows the northeast portion of the watershed. Two maps were needed to show the areas for phosphorus reduction potential at a usable scale. Each CSA has a unique identification number.

Table 14 below further describes the CSAs compiled for the action area. The numbers in the table correspond to the numbers in Maps 8 and 9 of Appendix B.

Table 14. OWPP CSAs and Management Measures

CSA #	County, Township	Lat, Long	General Land Use Category	Controlled Area (Ac)	Management Measure Description	Comments
1	Jefferson, Ixonia	43.113245, -88.619499	Cropland	5	Nutrient management; additional buffer; conservation tillage; cover crop.	Small field near the confluence of the Rock and Oconomowoc Rivers.
2	Jefferson, Ixonia	43.112620, -88.616174	Cropland	20	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop.	Field slopes to Oconomowoc River at two different points.
3	Jefferson, Concord	43.098922, -88.612055	Cropland	40	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop.	Multiple areas of the field are adjacent to the river with minimal buffer.
4	Jefferson, Concord	43.097767, -88.617280	Cropland	65	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop.	Direct runoff conduits to river; additional buffer necessary.
5	Jefferson, Concord	43.094727, -88.608983	Cropland	50	Nutrient management; additional buffer; reroute field drain; conservation tillage; cover crop.	Crops adjacent to river; drainage ditch ties directly into the river.
6	Jefferson, Concord	43.097375, -88.602579	Cropland	90	Nutrient management; additional buffer; conservation tillage; cover crop.	Offshoot of Oconomowoc River near the confluence is surrounded by highly erodible soil. Further site investigation needed to understand drainage pattern.

CSA #	County, Township	Lat, Long	General Land Use Category	Controlled Area (Ac)	Management Measure Description	Comments
7	Jefferson, Concord	43.086521, -88.602593	Cropland	60	Nutrient management; additional buffer; reroute field drain; conservation tillage; cover crop.	Field drains directly to the river; possible dairy pasture next to river.
8	Jefferson, Concord	43.087677, -88.602350	Cropland	45	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop.	Signs of erosion around the source of an ephemeral stream connecting to the Oconomowoc River.
9	Jefferson, Concord	43.072235, -88.607279	Cropland	30	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop.	Signs of erosion around the source of an ephemeral stream connecting to the Oconomowoc River.
10	Jefferson, Concord	43.072616, -88.593707	Cropland	10	Nutrient management; additional buffer; conservation tillage; cover crop.	Minimal buffer to adjacent stream.
11	Jefferson, Concord	43.068217, -88.591901	Cropland	15	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop.	Minimal buffer to adjacent stream; signs of erosion to stream location.
12	Jefferson, Concord	43.062866, -88.607689	Cropland	30	Nutrient management; rotate contours 45 degrees; additional buffer; conservation tillage; cover crop.	Offshoot of Oconomowoc River south of the interstate is surrounded by moderate to highly erodible soil. Field drains directly into stream.
13	Jefferson, Concord	43.067926, -88.569931	Cropland	125	Nutrient management; additional buffer; grassed waterways; reroute field drains; conservation tillage; cover crop.	Minimal buffer to adjacent stream/drainage network; signs of erosion to stream; highly erodible soil in the area.
14	Jefferson, Concord	43.081950, -88.574255	Cropland	10	Nutrient management; additional buffer; rotate contours 90 degrees; conservation tillage; cover crop.	Small areas of field adjacent to Oconomowoc River.
15	Jefferson, Concord	43.078592, -88.558061	Cropland	35	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop.	Relatively steep slope to the confluence of Battle Creek and Oconomowoc River.
16	Jefferson, Concord	43.063890, -88.557820	Cropland	65	Nutrient management; additional buffer; grassed waterways; reroute field drains; conservation tillage; cover crop.	Minimal buffer to adjacent stream/drainage network; signs of erosion to stream.
17	Jefferson, Concord	43.082165, -88.548016	Cropland	25	Nutrient management; additional buffer; grassed waterways; reroute field drains; conservation tillage; cover crop.	Signs of erosion to drainage ditches on west and south sides of the field; ditches drain to both Oconomowoc River and Battle Creek.
18	Jefferson, Concord	43.088621, -88.553319	Cropland	30	Nutrient management; additional buffer; reroute drainage; conservation tillage; cover crop.	Field adjacent to the river; contains highly erodible soil types.

CSA #	County, Township	Lat, Long	General Land Use Category	Controlled Area (Ac)	Management Measure Description	Comments
19	Jefferson, Concord	43.088530, -88.541900	Cropland	20	Nutrient management; additional buffer; reroute drainage; conservation tillage; cover crop.	Field adjacent to the river; contains highly erodible soil type; some field drainage appears to tie into the Oconomowoc River.
20	Waukesha, Summit	43.092539, -88.535525	Cropland	20	Wetland restoration; nutrient management; additional buffer; reroute field drains; conservation tillage; cover crop.	Soybean field with hydric soils (high flooding potential) close to the river; field drains directly to river.
21	Waukesha, Summit	43.096515, -88.537801	Cropland	30	Nutrient management; additional buffer; grassed waterways; reroute field drains; conservation tillage; cover crop.	Several signs of erosion to river; significant field slopes into wetland area.
22	Waukesha, Summit	43.100765, -88.535359	Cropland	15	Nutrient management; additional buffer; reroute field drainage; rotate contours 90 degrees; conservation tillage; cover crop.	Small contact area between field and adjacent river; drainage ditch ties into river.
23	Waukesha, Summit	43.101674, -88.531400	Cropland	15	Nutrient management; additional buffer; reroute field drainage; rotate contours 90 degrees; conservation tillage; cover crop.	Small field area slopes into the river; drainage ditch ties into river.
24	Waukesha, Summit	43.036862, -88.513365	Cropland	20	Nutrient management; additional buffer; grassed waterways; rotate contours 90 degrees; conservation tillage; cover crop.	Field adjacent to the river; sizable slopes with minimal buffer.
25	Waukesha, Summit	43.103897, -88.506212	Public Park	15	Optimize fertilizer usage; additional buffer.	Champion Field adjacent to river; City of Oconomowoc can easily put conservation practices into place.
26	Jefferson, Concord	43.076758, -88.548347	Cropland	50	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop.	Field slopes to Battle Creek at several points and contains some highly erodible soils.
27	Waukesha, Summit	43.082238, -88.538162	Cropland	15	Nutrient management; additional buffer; grassed waterway; conservation tillage; cover crop.	Field drains to a northern offshoot of Battle Creek.
28	Jefferson, Concord	43.075436, -88.542372	Cropland	25	Nutrient management; additional buffer; grassed waterway; conservation tillage; cover crop; wetland restoration.	Field on both sides of a northern offshoot of Battle Creek.
29	Waukesha, Summit	43.065258, -88.537197	Cropland	35	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop.	Field on both sides of Battle Creek with significant slopes to the river; signs of existing erosion on both fields.

CSA #	County, Township	Lat, Long	General Land Use Category	Controlled Area (Ac)	Management Measure Description	Comments
30	Waukesha, Summit	43.063930, -88.527743	Cropland	10	Nutrient management; additional buffer; conservation tillage; cover crop.	Minimal buffer to drainage ditch.
31	Waukesha, Summit	43.060129, -88.532177	Cropland	10	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop.	Significant slope to river area.
32	Waukesha, Summit	43.057328, -88.534607	Cropland	20	Nutrient management; additional buffer; reroute field drainage; rotate contours 45 degrees; conservation tillage; cover crop.	Minimal buffer to drainage ditch which flows into Battle Creek; signs of erosion into drainage ditch.
33	Waukesha, Summit	43.056875, -88.528298	Cropland	15	Wetland Restoration	Signs of erosion into drain to Battle Creek; area recommended for wetland restoration by Waukesha County LWC Department.
34	Waukesha, Summit	43.051585, -88.516961	Cropland	7.5	Nutrient management; additional buffer; conservation tillage; cover crop.	Some addition buffer could be needed by river.
35	Waukesha, Summit	43.055066, -88.515920	Cropland	15	Nutrient management; additional buffer; grassed waterways; rotate contours 90 degrees; conservation tillage; cover crop; wetland restoration.	Signs of erosion to river location; grassed waterway recommended.
36	Waukesha, Summit	43.058117, -88.507600	Cropland	20	Nutrient management; additional buffer; reroute drainage; grassed waterways; conservation tillage; cover crop.	Signs of erosion into ditch which eventually drains to Battle Creek.
37	Waukesha, Summit	43.068308, -88.513916	Cropland	105	Wetland Restoration	Large near Battle Creek recommended for wetland restoration by Waukesha County LWC Department.
38	Waukesha, Oconomowo c	43.154395, -88.516423	Cropland	110	Nutrient management; additional buffer; grassed waterway; conservation tillage; cover crop; wetland restoration.	Signs of significant erosion to stream draining to Lac La Belle; grassed waterway recommended.
39	Waukesha, Oconomowoc	43.141518, -88.497118	Cropland	80	Nutrient management; additional buffer; rotate contours 90 degrees; grassed waterway; conservation tillage; cover crop; wetland restoration.	Signs of erosion to field drainage with minimal buffer.
40	Waukesha, Oconomowoc	43.140242, -88.48275	Cropland	50	Nutrient management; additional buffer; grassed waterway; conservation tillage; cover crop; wetland restoration.	Field drains to Rosenow Creek offshoot to the north; signs of erosion to stream location.

CSA #	County, Township	Lat, Long	General Land Use Category	Controlled Area (Ac)	Management Measure Description	Comments
41	Waukesha, Oconomowoc	43.144745, -88.475757	Cropland	55	Nutrient management; additional buffer; grassed waterway; conservation tillage; cover crop; wetland restoration.	Minimal buffer on both sides of stream offshoot; stream crossing apparent from aerial photography.
42	Waukesha, Oconomowoc	43.123576, -88.468090	Cropland	30	Additional buffer; wetland restoration.	Recent develop in this areas; may require additional protection of Rosenow Creek.
43	Waukesha, Merton	43.148417, -88.403573	Cropland	75	Nutrient management; additional buffer; grassed waterways; rotate contours 90 degrees; conservation tillage; cover crop; reevaluate site drainage.	Crops adjacent to river between North Lake and Okauchee Lake.
44	Waukesha, Merton	43.155795, -88.397444	Cropland	30	Nutrient management; additional buffer; grassed waterways; rotate contours 90 degrees; conservation tillage; cover crop; reevaluate site drainage.	Crops adjacent to river between North Lake and Okauchee Lake.
45	Waukesha, Merton	43.171957, -88.379867	Cropland	85	Nutrient management; additional buffer; conservation tillage; cover crop; wetland restoration.	Several fields adjacent to stream draining to North Lake.
46	Waukesha, Merton	43.174542, -88.389537	Cropland	10	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop; wetland restoration.	Field slopes towards Mason Creek; additional buffer possibly needed.
47	Waukesha, Merton	43.183146, -88.392669	Cropland	40	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop; wetland restoration.	Signs of erosion to a drainage ditch between two fields; grassed waterway possibly needed on east field.
48	Waukesha, Merton	43.189628, -88.386979	Cropland	65	Nutrient management; additional buffer; grassed waterway; conservation tillage; cover crop; wetland restoration.	Field drains to a northern offshoot of Mason Creek.
49	Waukesha, Merton	43.188727, -88.407825	Cropland	15	Nutrient management; additional buffer; grassed waterways; rotate contours 90 degrees; conservation tillage; cover crop; wetland restoration.	Minimal buffer to Mason Creek; field contours perpindicular to the creek.
50	Waukesha, Merton	43.193286, -88.403283	Cropland	25	Nutrient management; additional buffer; grassed waterway; conservation tillage; cover crop; wetland restoration.	Field on both sides of a northern offshoot of Mason Creek; stream crossings apparent from aerial photos.
51	Waukesha, Merton	43.191759, -88.411599	Cropland	65	Nutrient management; additional buffer; grassed waterways; reroute drainage; conservation tillage; cover crop.	Field drains directly to the river at multiple locations; some areas with minimal buffer.

CSA #	County, Township	Lat, Long	General Land Use Category	Controlled Area (Ac)	Management Measure Description	Comments
52	Washington, Erin	43.202364, -88.416205	Cropland, Feedlot	50	Pasture/Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop.	Significant slope to river area; Washington County LWCD indicates the presence of a feedlot and pasture management opportunities.
53	Washington, Erin	43.207287, -88.397819	Cropland	7.5	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop.	Two small fields adjacent to the creek; further site investigation necessary.
54	Waukesha, Merton	43.176621, -88.370363	Feedlot	0.35	Manure storage/management; filter strips.	Feed lot next to Little Oconomowoc River west offshoot.
55	Waukesha, Merton	43.176490, -88.359182	Cropland	10	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop; wetland restoration.	Fields on three sides of the Little Oconomowoc River with some areas with minimal buffer and significant slopes.
56	Waukesha, Merton	43.181073, -88.362060	Cropland	15	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop; wetland restoration.	Little Oconomowoc River is adjacent to the field on three sides; some vehicle tracks crossing the river.
57	Waukesha, Merton	43.179198, -88.369245	Cropland	5	Nutrient management; additional buffer; grassed waterway; conservation tillage; cover crop.	Signs of erosion into the adjacent stream.
58	Washington, Erin	43.241444, -88.363907	Cropland, Feedlot	350	Sedimentation pond installation/maintenance; manure storage optimization; nutrient/pasture management; wetland restoration; additional buffer; grassed waterways; conservation tillage; cover crop.	A large sedimentation pond would help the Erin Meadows farm and neighboring farms reduce runoff and be a source of irrigation water. The pond could also serve a nearby dairy and beef cattle farm located on both sides of the river. In addition, an existing sedimentation pond needs to be cleaned out for better performance. There are seven springs on this farm that could be developed with a grass waterway to create a new trout stream. The Washington County LWCD also indicates the need for wetland restoration, pasture management, and manure storage optimization at this site.
59	Washington, Erin	43.249216, -88.352284	Cropland	45	Nutrient management; additional buffer; check field contours; reroute drainage; grassed waterways; conservation tillage; cover crop.	Several fields surrounding a complicated drainage network; further site investigation necessary to determine most effective BMPs.

CSA #	County, Township	Lat, Long	General Land Use Category	Controlled Area (Ac)	Management Measure Description	Comments
60	Waukesha, Merton	43.164281, -88.354853	Cropland	12.5	Nutrient management; additional buffer; conservation tillage; cover crop.	Field adjacent to Funks Millpond.
61	Waukesha, Merton	43.168732, -88.347290	Cropland	17.5	Wetland Restoration	Field draining to Funks Millpond; significant signs of erosion in center of field; opportunity for wetland restoration.
62	Waukesha, Merton	43.165853, -88.346102	Cropland	50	Nutrient management; wetland restoration; rotate contours 90 degrees; additional buffer; grassed waterway; conservation tillage; cover crop.	Field on both sides of tributary to Funks Millpond; signs of erosion to stream; opportunity for wetland restoration.
63	Waukesha, Merton	43.176823, -88.349449	Cropland	3.5	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop.	Signs of significant erosion to the Oconomowoc River in multiple areas.
64	Washington, Erin	43.216611, -88.330096	Cropland	5	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop.	Two small fields adjacent to the creek; further site investigation necessary.
65	Washington, Erin	43.227020, -88.327181	Cropland	25	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop.	Flynn Creek cuts through the field, and there are signs of erosion to the creek.
66	Washington, Erin	43.238459, -88.318669	Cropland	100	Wetland Restoration	Several fields surrounding a complicated drainage network; Washington County LWCD indicates site as priority wetland restoration area.
67	Washington, Erin	43.245314, -88.309547	Cropland	25	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop.	Field with signs of erosion adjacent to Flynn Creek.
68	Washington, Erin	43.249043, -88.305541	Cropland	25	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop.	Minimal buffer to Flynn Creek.
69	Washington, Richfield	43.259668, -88.268711	Cropland	20	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop.	Ephemeral stream drains the field to the Oconomowoc River, and no conservational practices are in place.
70	Washington, Richfield	43.270409, -88.256031	Cropland	15	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop.	Several fields surrounding the Coney River with minimal buffer in place.

CSA #	County, Township	Lat, Long	General Land Use Category	Controlled Area (Ac)	Management Measure Description	Comments
71	Washington, Richfield	43.267116, -88.230414	Cropland	95	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop; reevaluate site drainage.	There is an opportunity to improve severe runoff conditions on the Pleasant Hill sod farm. Sedimentation basins and traps for runoff capture and irrigation would be located downstream of the sod farm at strategic locations. An innovative phosphorus filtration process could be used at the ponds to remove TSS and TP.
72	Washington, Richfield	43.270750, -88.229803	Cropland	40	Nutrient management; additional buffer; grassed waterways; rotate contours 90 degrees; conservation tillage; cover crop; reevaluate site drainage.	Signs of erosion into the nearby headwaters of the Oconomowoc River.
73	Washington, Polk	43.292037, -88.265580	Cropland	60	Nutrient management; additional buffer; conservation tillage; cover crop; contour farming.	Coney Rivers winds around set of fields with a relatively steep slope to the water; some signs of erosion.
74	Washington, Polk	43.298378, -88.272187	Cropland	17.5	Nutrient management; additional buffer; conservation tillage; cover crop; contour farming.	Coney River cuts through set of field; minimal buffer; some signs of erosion.
75	Washington, Polk	43.301311, -88.275605	Cropland	10	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop.	Field with significant slope to the Coney River.
76	Washington, Polk	43.298600, -88.286381	Cropland	65	Nutrient management; barnyard improvements; additional buffer; grassed waterways; conservation tillage; cover crop.	Coney River cuts through two fields with signs of erosion; field to north may need barnyard improvements.
77	Washington, Polk	43.292012, -88.287933	Cropland	70	Drain tile diversion; nutrient management; additional buffer; conservation tillage; cover crop.	Signs of erosion and drain tiles near Coney River fork; minimal buffer to the river.
78	Washington, Polk	43.287557, -88.298137	Cropland	55	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop.	Fields with significant slope to the Coney River.
79	Washington, Polk	43.314594, -88.281648	Cropland	15	Nutrient management; additional buffer; conservation tillage; cover crop.	Coney River cuts through set of fields just south of Mud Lake; additional buffer may be necessary.

DESCRIBE MANAGEMENT MEASURES

The OWPP team coordinated with the three county LWC Departments and other partners to identify various Management Measures to be used. The agricultural Management Measures are briefly described below in the text below, and can be seen associated with CSAs in Table 14. Multiple Management Measures were identified for most areas to provide flexibility. In most of the areas, coordination with the farmers has not happened yet. The exact Management Measures to be implemented will depend on what the farmer is agreeable to and the nature of their operations.

The OWPP will utilize existing nonpoint pollution control programs and related program partners as a resource for the design and implementation of Management Measures. One important program to note is WAC Chapter NR 151. This agricultural nonpoint program establishes statewide agricultural performance standards and prohibitions regarding runoff management. Existing strategies for the implementation, enforcement, and ongoing monitoring of Management Measures in this program will be reviewed and utilized when applicable.

Nutrient Management Plan

Nutrient management plans are required by NR 151. The purpose of the plans is for farmers to have a proactive plan for managing the amount of nutrients in the soil for optimum crop yields. The plans also help prevent an excess of nutrients in the soil. When there is an excess of nutrients, pollutant runoff associated with soil loss is exacerbated. The plans consider the soil type, crop rotation, nutrient uptake of the crops, the amount and type of fertilizer applied, and other general operation details. The goal of the plans is to balance the optimum amount of nutrients required for a particular farming operation taking into account soil type, field slope, crop rotation, and tillage practices.

Cover Crops

Cover crops are vegetation that is planted typically in the fall after the main crop (for example corn or soy beans) is harvested. The cover crop grows quickly and establishes a substantive root structure near the surface of the soil, thus holding the soil in place and helping to prevent soil erosion. The crop dies in the cold weather, but the root structure remains in the soil to stabilize it during the winter months. Winter wheat and winter rye are two examples of cover crops that could be used in the OWPP.

Riparian Buffers

Riparian buffers are meant inhibit solids transport and promote nutrient uptake from runoff originating from agricultural operations before reaching nearby surface water. Riparian buffers are typically effective starting at a minimum width of 75 feet. Washington County has been engaged with the farming community to implement buffers that could be harvested (e.g. hay), a couple times a year. Through the harvesting program, the buffer area still provides some economic value to farmers. Harvesting also removes the phosphorus taken up by the plant.

Improved Tillage

Improved tillage practices can result in healthier soil and reduced soil loss. Improvements could include implementing no-till or conservation tillage practices to reducing the magnitude of tilling (e.g. going from chisel plowing to disc tilling). The OWPP project team is ready to work with the county LWC Departments, the NRCS, and the Farmer Leadership Group to analyze where improved tillage practices could be implemented.

Grassed Waterways

Grassed waterways are drainage channels in a field that are planted with grass to reduced erosion and the transport of TSS to the ditch line. Grassed waterways are typically more effective at TSS reduction compared to TP. However, there is still a benefit for TP reduction.

Retention Ponds

Retention ponds help to capture solids and particulate phosphorus during and after a precipitation event. The ponds collect the storm water and settle out the solids as opposed to having the solids transported to surface water. There are several locations in Washington County where these ponds can be implemented.

Barnyard Improvements

Barnyard improvements consist of practices that could implemented in areas of concentrated livestock feeding. These areas typically lack vegetation or well-established root systems because of the high traffic from livestock. Improvements could include the installation of terraces, re-grading, having multiple feed points, and covering the feed points.

Wetland Restoration

Wetland restoration would consist of taking land in a low area with hydric soils out of production and converting it back into a wetland. Some farmland in the area has been drained with a network of tile drains to convert it into farm land. This land is still marginal for production and is prone to flooding with heavy rains. Waukesha and Washington counties have identified specific areas that would be good candidates for wetland restoration. In addition, there are a couple of agricultural areas in Jefferson County that may be successfully converted to wetland.

ESTIMATE LOAD REDUCTION EXPECTED BY PERMIT TERM

The Spreadsheet Tool for Estimating Pollutant Load (STEPL) model is a landscape model that estimates watershed-scale nutrient transport by accounting for land use, local precipitation data, soils data, agricultural statistics, and other related factors. For the OWPP, STEPL was used to estimate baseline load information for nitrogen, phosphorus, biological oxygen demand, and sediment in each of the HUC-12 areas represented in the action area. Another output of the STEPL model provided broad-scale estimations of pollutant load reductions based on Management Measures. The model worked well to assess general "what if" scenarios, providing pollutant load reduction estimates associated with several combinations of best management practices. An average annual pollutant load reduction (expressed in lb/year) was calculated for each HUC-12 based on the suite of Management Measures incorporated in the model. Also, these loads were converted to reduction factors (expressed in lb/acre-year) which were applied to many of the identified CSAs in Table 14.

While the STEPL model is accessible and user-friendly, it has several limitations. First, the input parameters of the model are approximate and empirical due to the broad scope of the model. Average precipitation data was taken from a built-in weather station approximately 50 miles away from the project location, and a single soil hydrologic group was approximated for each HUC-12 area. In addition, septic system information was taken from dated surveys from the National Small Flows Clearinghouse, and manure application rates were expressed as the approximate number of months in a year that manure is spread. Finally, highly empirical formulas including the curve number method and the original USLE were used in conjunction with approximate existing pollutant concentrations in soil and runoff to predict the baseline loads.

Second, the hydrologic effect of the large number of lakes in the watershed was not incorporated in the model, so their propensity to act as pollutant sinks was not evaluated. Thus, pollutant load reductions generated for upstream HUC-12 areas (Watersheds 2, 3, and 4 in the model) may not affect the nutrient levels seen at the point of compliance. Taken together, these limitations associated with the model yielded very approximate results. However, the results of the STEPL model were useful in understanding how nutrient loads are distributed in the Oconomowoc River Watershed. The results also illustrated relative Management Measure efficiency. The incorporation of Management Measures in the STEPL model is described below.

The STEPL program has a built-in best management practice calculator. This calculator allows users to evaluate the pollutant removal efficiencies of several combinations of Management Measures in series or in parallel, giving a single removal efficiency as an output. In this way, the calculator helps accommodate the STEPL requirement of a single removal efficiency factor for each of the modeled pollutants in each watershed. Due to the fact that the OWPP is still in the planning stages, a specific set of Management Measures was not selected to represent each of the watersheds in the model. Instead, the project team intends to present each agricultural partner with a large selection of Management Measures so that they are able to select options that are appropriate for their operation. Taking these factors into account, Table 1 shown in Appendix E was developed. This table lists the output of the best management practice calculator for several combinations of Management Measures, including the phosphorus reduction factor expressed in lb/acre-year. These reduction efficiencies were averaged over the entire list, and the result was selected as the input for each watershed in the STEPL model. A complete summary of the output of the STEPL model and related discussion can be found in Appendix E.

In addition to the STEPL model, the OWPP considered modeling results included in the Rock River TMDL. The group that developed this report used the Soil and Water Assessment Tool (SWAT) to calculate pollutant loads from agricultural and natural areas, and the Source Loading and Management Model (SLAMM) to calculate loads from urban areas for each TMDL reach in the Rock River Basin. Both of these models have more complex and dynamic input parameters than STEPL, giving more comprehensive outputs. The baseline loading results generated in the

Rock River TDML were used as a check for the STEPL output. A summary of the SWAT and SLAMM models and related discussion is included in Appendix E.

As field-level implementation starts in the OWPP, the SnapPlus modeling tool will be used to further refine phosphorus reduction estimations from the CSAs. SnapPlus requires many field-specific inputs that are not available presently. It is expected that the modeling conducted in the future with SnapPlus will be more appropriate for field-scale applications than the modeling described in Appendix E.

The county LWC Departments will be consulted for realistic pollutant reductions for Management Measures that were not modeled. These include streambank stabilization and wetland restoration.

The expected reductions for each area and Management Measure are shown in Table 15. An average phosphorus reduction factor of 1.45 pounds of phosphorus per acre per year was derived from the STEPL model. Table 15 is sorted according to the expected order of implementation. Table 15 identifies a total of 4,419 pounds of TP reduction per year. It is expected that a number of the opportunities in the table will not be implemented for a variety of reasons. These could include lack of farmer cooperation, not being able to reach an agreement with a farmer, or general lack of interest. In addition, some practices may not be as effective as expected, and the expected water quality reductions may not materialize.

Table 15 also includes a column representing the cost of implementation and ongoing maintenance of Management Measures. There is one value for the cost for each CSA item. The majority of the CSA item costs in the table are approximated on a yearly basis assuming a value of $35 per pound of phosphorus removal (Winsten, 2014). Several of the CSA items involve more substantial capital construction costs (e.g. sedimentation ponds or manure storage). These practices are not shown as annual costs, but are intended to be a capital cost and are noted with an asterisk.

Table 15. OWPP CSAs, Management Measures, Reduction Amounts, and Cost Estimates.

Priority #	CSA #	General Land Use Category	Controlled Area (Ac)	Management Measure Description	Reductions (lbs. P/year)	Annual Cost
1	*58	Cropland, Feedlot	350	Sedimentation pond installation/maintenance; manure storage optimization; nutrient/pasture management; wetland restoration; additional buffer; grassed waterways; conservation tillage; cover crop.	300	$170,000
2	2	Cropland	20	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop.	29	$1,015
3	3	Cropland	40	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop.	58	$2,030
4	4	Cropland	65	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop.	94	$3,299

Priority #	CSA #	General Land Use Category	Controlled Area (Ac)	Management Measure Description	Reductions (lbs. P/year)	Annual Cost
5	5	Cropland	50	Nutrient management; additional buffer; reroute field drain; conservation tillage; cover crop.	73	$2,538
6	6	Cropland	90	Nutrient management; additional buffer; conservation tillage; cover crop.	131	$4,568
7	20	Cropland	20	Wetland restoration; nutrient management; additional buffer; reroute field drains; conservation tillage; cover crop.	29	$1,015
8	7	Cropland	60	Nutrient management; additional buffer; reroute field drain; conservation tillage; cover crop.	87	$3,045
9	1	Cropland	5	Nutrient management; additional buffer; conservation tillage; cover crop.	7	$254
10	8	Cropland	45	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop.	65	$2,284
11	13	Cropland	125	Nutrient management; additional buffer; grassed waterways; reroute field drains; conservation tillage; cover crop.	181	$6,344
12	16	Cropland	65	Nutrient management; additional buffer; grassed waterways; reroute field drains; conservation tillage; cover crop.	94	$3,299
13	21	Cropland	30	Nutrient management; additional buffer; grassed waterways; reroute field drains; conservation tillage; cover crop.	44	$1,523
14	10	Cropland	10	Nutrient management; additional buffer; conservation tillage; cover crop.	15	$508
15	11	Cropland	15	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop.	22	$761
16	9	Cropland	30	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop.	44	$1,523
17	12	Cropland	30	Nutrient management; rotate contours 45 degrees; additional buffer; conservation tillage; cover crop.	44	$1,523
18	14	Cropland	10	Nutrient management; additional buffer; rotate contours 90 degrees; conservation tillage; cover crop.	15	$508
19	*71	Cropland	95	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop; reevaluate site drainage.	138	$100,000
20	72	Cropland	40	Nutrient management; additional buffer; grassed waterways; rotate contours 90 degrees; conservation tillage; cover crop; reevaluate site drainage.	58	$2,030
21	15	Cropland	35	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop.	51	$1,776
22	17	Cropland	25	Nutrient management; additional buffer; grassed waterways; reroute field drains; conservation tillage; cover crop.	36	$1,269

Priority #	CSA #	General Land Use Category	Controlled Area (Ac)	Management Measure Description	Reductions (lbs. P/year)	Annual Cost
23	18	Cropland	30	Nutrient management; additional buffer; reroute drainage; conservation tillage; cover crop.	44	$1,523
24	22	Cropland	15	Nutrient management; additional buffer; reroute field drainage; rotate contours 90 degrees; conservation tillage; cover crop.	22	$761
25	23	Cropland	15	Nutrient management; additional buffer; reroute field drainage; rotate contours 90 degrees; conservation tillage; cover crop.	22	$761
26	26	Cropland	50	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop.	73	$2,538
27	28	Cropland	25	Nutrient management; additional buffer; grassed waterway; conservation tillage; cover crop; wetland restoration.	36	$1,269
28	27	Cropland	15	Nutrient management; additional buffer; grassed waterway; conservation tillage; cover crop.	22	$761
29	19	Cropland	20	Nutrient management; additional buffer; reroute drainage; conservation tillage; cover crop.	29	$1,015
30	29	Cropland	35	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop.	51	$1,776
31	37	Cropland	105	Wetland Restoration	152	$5,329
32	31	Cropland	10	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop.	15	$508
33	32	Cropland	20	Nutrient management; additional buffer; reroute field drainage; rotate contours 45 degrees; conservation tillage; cover crop.	29	$1,015
34	33	Cropland	15	Wetland Restoration	22	$761
35	30	Cropland	10	Nutrient management; additional buffer; conservation tillage; cover crop.	15	$508
36	35	Cropland	15	Nutrient management; additional buffer; grassed waterways; rotate contours 90 degrees; conservation tillage; cover crop; wetland restoration.	22	$761
37	34	Cropland	7.5	Nutrient management; additional buffer; conservation tillage; cover crop.	11	$381
38	24	Cropland	20	Nutrient management; additional buffer; grassed waterways; rotate contours 90 degrees; conservation tillage; cover crop.	29	$1,015
39	36	Cropland	20	Nutrient management; additional buffer; reroute drainage; grassed waterways; conservation tillage; cover crop.	29	$1,015

Priority #	CSA #	General Land Use Category	Controlled Area (Ac)	Management Measure Description	Reductions (lbs. P/year)	Annual Cost
40	43	Cropland	75	Nutrient management; additional buffer; grassed waterways; rotate contours 90 degrees; conservation tillage; cover crop; reevaluate site drainage.	109	$3,806
41	25	Public Park	15	Optimize fertilizer usage; additional buffer.	22	$761
42	66	Cropland	100	Wetland Restoration	145	$5,075
43	65	Cropland	25	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop.	36	$1,269
44	38	Cropland	110	Nutrient management; additional buffer; grassed waterway; conservation tillage; cover crop; wetland restoration.	160	$5,583
45	39	Cropland	80	Nutrient management; additional buffer; rotate contours 90 degrees; grassed waterway; conservation tillage; cover crop; wetland restoration.	116	$4,060
46	64	Cropland	5	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop.	7	$254
47	40	Cropland	50	Nutrient management; additional buffer; grassed waterway; conservation tillage; cover crop; wetland restoration.	73	$2,538
48	41	Cropland	55	Nutrient management; additional buffer; grassed waterway; conservation tillage; cover crop; wetland restoration.	80	$2,791
49	42	Cropland	30	Additional buffer; wetland restoration.	44	$1,523
50	44	Cropland	30	Nutrient management; additional buffer; grassed waterways; rotate contours 90 degrees; conservation tillage; cover crop; reevaluate site drainage.	44	$1,523
51	67	Cropland	25	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop.	36	$1,269
52	68	Cropland	25	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop.	36	$1,269
53	45	Cropland	85	Nutrient management; additional buffer; conservation tillage; cover crop; wetland restoration.	123	$4,314
54	47	Cropland	40	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop; wetland restoration.	58	$2,030

Priority #	CSA #	General Land Use Category	Controlled Area (Ac)	Management Measure Description	Reductions (lbs. P/year)	Annual Cost
55	51	Cropland	65	Nutrient management; additional buffer; grassed waterways; reroute drainage; conservation tillage; cover crop.	94	$3,299
56	*52	Cropland, Feedlot	50	Pasture/Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop.	73	$50,000
57	62	Cropland	50	Nutrient management; wetland restoration; rotate contours 90 degrees; additional buffer; grassed waterway; conservation tillage; cover crop.	73	$2,538
58	46	Cropland	10	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop; wetland restoration.	15	$508
59	50	Cropland	25	Nutrient management; additional buffer; grassed waterway; conservation tillage; cover crop; wetland restoration.	36	$1,269
60	55	Cropland	10	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop; wetland restoration.	15	$508
61	56	Cropland	15	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop; wetland restoration.	22	$761
62	60	Cropland	12.5	Nutrient management; additional buffer; conservation tillage; cover crop.	18	$634
63	61	Cropland	17.5	Wetland Restoration	25	$888
64	49	Cropland	15	Nutrient management; additional buffer; grassed waterways; rotate contours 90 degrees; conservation tillage; cover crop; wetland restoration.	22	$761
65	48	Cropland	65	Nutrient management; additional buffer; grassed waterway; conservation tillage; cover crop; wetland restoration.	94	$3,299
66	53	Cropland	7.5	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop.	11	$381
67	*54	Feedlot	0.35	Manure storage/management; filter strips.	50	$60,000
68	63	Cropland	3.5	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop.	5	$178
69	57	Cropland	5	Nutrient management; additional buffer; grassed waterway; conservation tillage; cover crop.	7	$254
70	59	Cropland	45	Nutrient management; additional buffer; check field contours; reroute drainage; grassed waterways; conservation tillage; cover crop.	65	$2,284

Priority #	CSA #	General Land Use Category	Controlled Area (Ac)	Management Measure Description	Reductions (lbs. P/year)	Annual Cost
71	69	Cropland	20	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop.	29	$1,015
72	70	Cropland	15	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop.	22	$761
75	73	Cropland	60	Nutrient management; additional buffer; conservation tillage; cover crop; contour farming.	87	$3,045
76	74	Cropland	17.5	Nutrient management; additional buffer; conservation tillage; cover crop; contour farming.	25	$888
73	75	Cropland	10	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop.	15	$508
74	76	Cropland	65	Nutrient management; barnyard improvements; additional buffer; grassed waterways; conservation tillage; cover crop.	94	$3,299
78	77	Cropland	70	Drain tile diversion; nutrient management; additional buffer; conservation tillage; cover crop.	102	$3,553
77	78	Cropland	55	Nutrient management; additional buffer; grassed waterways; conservation tillage; cover crop.	80	$2,791
79	79	Cropland	15	Nutrient management; additional buffer; conservation tillage; cover crop.	22	$761
				Total:	**4,419**	**515,046**

In addition to the agricultural Management Measures described above, other means of nonpoint nutrient management will be explored in the OWPP. One such option is phosphorus reduction through lake improvements. There are several lake management districts represented in the watershed that have given their support to the project. Phosphorus reductions in these lake systems can be achieved in a number of ways. The approach for phosphorus mitigation for each management district will be determined by the needs of each lake system and the resources of the communities surrounding the lake. Potential lake management options may include mechanical harvesting of excess aquatic plant growth, dredging, private lake shore maintenance and restoration, wetland restoration, watercraft inspection programs, and proper storm water management strategies. Any Management Measures should be accompanied by methodical water quality monitoring which may help project partners better understand existing TP levels in the lakes and its transport downstream. It was assumed that lake improvements would cost the City $15/lb phosphorus reduced and that 1,000 lbs of phosphorus reduction could be achieved. Lake Management Measures were assumed to be a relatively affordable option as there is existing capital available for implementation. The OWPP would supplement this capital when necessary and offer technical assistance in order to help implement these measures.

Another source of phosphorus reductions in the Oconomowoc River Watershed will be streambank stabilization. Existing research has shown that this option can be a cost effective means of reducing phosphorus loads to surface waters (Center for Watershed Protection et al., 2005; Dove et al., 2009; Bair, 2011). Streambank stabilization uses natural or engineered materials to prevent bank erosion and the transport of sediment into surface waters. These sediments have been shown to transport large amounts of TP. Dove et al. 2009 estimate that streambank erosion contributes approximately 93 lbs of TP per 1,000 feet of channel per year. Therefore, the OWPP estimated that approximately 75 lbs of TP could be mitigated per 1,000 feet of channel per year with proper streambank stabilization techniques. An average cost of stream restoration of $129,135 per river mile was estimated (Bair, 2011), and it was estimated that 1,000 lbs of phosphorus reduction could be achieved with this practice.

An additional 2,000 lbs of phosphorus reductions were estimated by implementing additional urban Management Measures in the Oconomowoc MS4. For the purposes of the AM plan, it was assumed that the MS4 area and reductions from this area included both regulated and non-regulated areas in the City. Non-regulated City areas would include areas that do not drain to the storm sewer system. This estimate was generated from a report written in 2008 by MSA Professional Services, Inc., where baseline TSS loading without any controls was established at 1,030 tons of TSS per year. The sediment reduction program that the City of Oconomowoc has in place was estimated to remove 212 tons of the baseline TSS load. Assuming 3% phosphorus content in TSS and not including the portion of the City in TMDL Reach 26, approximately 34,000 pounds of phosphorus is being discharged to the Oconomowoc River from Reach 25. Considering the current loading, an additional reduction of 2,000 lbs of phosphorus per year was determined to be reasonable. Additional reductions may come through implementation of grass swales, detention ponds, settling basins, infiltration devices, or other urban storm water pollutant reduction practices. It was estimated that 50% of the estimated reductions would be achieved with permanent structures with a single cost evaluated at $100 per lb TP removed. The remaining 50% of estimated reductions were evaluated as ongoing yearly costs at $35 per lb TP reduced, which is similar to the estimate used for agricultural Management Measures.

Finally, the OWPP estimated approximately 2,500 lbs of phosphorus reduction by reducing the effluent TP levels at the Oconomowoc WWTF. In order to reach interim limits of 0.6 mg/L and 0.5 mg/L TP in the second and third permit terms, respectively, additional chemical will be added. Previous dosing studies have indicated that these levels can be reached without excessive fouling of the existing filters at the treatment facility. An approximate level of 0.4 mg/L will be maintained to provide a safety buffer with respect to the interim limits. It was assumed that 40 gallons per day of additional chemical will be needed to maintain this level. The Oconomowoc WWTF staff will seek to achieve this goal relatively early in the project to observe its effect on the level at the point of compliance.

Table 16 shown below includes the breakdown of estimated reduction per permit term in pounds per year.

Table 16. Estimated TP Reduction by Permit Term.

	Permit Term 1	Permit Term 2	Permit Term 3	**Total**
WWTF Effluent Reductions	2,504			2,504
CSA Management Measures	2,175	1,071		3,246
Lake Improvements	200	600	200	1,000
Streambank Stabilization	200	600	200	1,000
City of Oconomowoc MS4		500	1,500	2,000
Total	5,079	2,771	1,900	9,750

Based on an earlier section of the AM plan, the current point source load and current total load in the receiving water at the confluence are 5,365 pounds TP per year and 22,499 pounds TP per year, respectively. The Oconomowoc WWTF's share of the total loading at the receiving water is:

(5,365/22,499) x 100 = 23.8 percent.

The WDNR Adaptive Management Technical Handbook states that the AM applicant must, at a minimum, demonstrate that its contributing load to the watershed will be offset in the first permit term. Using this requirement and the overall target reduction of 9,750 pounds per year, the amount of reduction that will be required in the first permit term is:

9,750 pounds TP per year x 0.238 = 2,320 pounds TP per year.

The OWPP will "front-load" the reductions. According to Table 16, the OWPP plans to reduce 5,079 pounds TP per year by the end of the first permit term. Note that the reductions in the third permit term is currently less than the 2,320 pound level. However, these reductions will be reevaluated at the time of permit issuance for each permit term. At this time, the phosphorus load contribution from the Oconomowoc WWTF will be reduced as a priority, and the ongoing minimum reductions will similarly be reduced.

The ongoing TP reductions will be documented through modeling and other methods.

MEASURING SUCCESS

The City has a standard monitoring program for TP in the watershed. The monitoring used in the OWPP will be based on the standard monitoring already in place. For the past two years, the wastewater utility has conducted once a month monitoring of various points in the watershed. These locations are shown in Map 1 of Appendix B. Official data used for compliance determination and assessment of OWPP progress will be sampling data 30 days apart for the months of May through October. The parameters tested at the points are TP and, at some locations, TSS as well. Most of the monitoring locations will be monitored once per month. The sampling will occur on or close to the same day every month (the fifteenth day of the month). By sampling the same day, there will be a reduction in any bias in the pollutant concentrations from very wet or very dry weather. This sampling method is in accordance with Wisconsin DNR guidance. Some of the critical monitoring points (e.g. just upstream and just downstream of the WWTF outfall and the confluence) will be monitored twice per month. For these locations, samples will be collected on the first and fifteenth days of each month.

In the case of wet weather and very dry weather, the City will conduct "unofficial" event-specific sampling to determine how increased river flow rates affect TP and TSS levels. The City plans to conduct this event-specific sampling after 1.5 inch of rainfall in a time period of 24 hours or less.

Unofficial monitoring will also take place at additional locations in the watershed as practices are implemented. The monitoring will help determine if the implemented Management Measures are effective. Edge-of-field monitoring may take place to better assess reductions in phosphorus loading to surface waters.

When sampling, City staff take a grab sample from the portion of the river with the greatest flow at a depth below the water surface of three to six inches. The sample bottles are rinsed three times before the sample is taken. Staff are careful not to disturb the river bottom while taking the sampling. In addition, staff collect the sample facing upstream.

The monitoring guidance in Section 5.01 of the Guidance for Implementing Wisconsin's Phosphorus Water Quality Standards for Point Source Discharges will be followed. The sample containers are preserved using 1 ml (or slightly more if necessary) of 50% sulfuric acid solution. This ensures the samples have a pH of 2 or lower. Containers are put on ice in a cooler shortly after they are collected. The analytical portion of the testing is conducted at the Oconomowoc WWTF which is a certified laboratory.

The City is beginning to collaborate with Jefferson County on a citizen-based monitoring program for the Rock River basin. This program could potentially be used to reduce the monitoring work on wastewater utility staff. Any monitoring personnel used through this program would be fully trained in the proper collection and preservation procedures.

The OWPP is beginning to coordinate with the Sand County Foundation to provide flow monitoring at key points in the watershed.

Information on the monitoring locations is summarized in the table below.

Table 17. AM Monitoring Overview

Monitoring Location					
Sample Point	**Sample Point Description**	**Latitude**	**Longitude**	**Parameters to be Collected**	**Sampling Frequency**
CR 1	Coney River 1	43.281386	-88.288309	TP	Monthly
CR 2	Coney River 2	43.295812	-88.290017	TP	Monthly
CR 3	Coney River 3	43.298550	-88.280657	TP	Monthly
CR 4	Coney River 4	43.295693	-88.272886	TP	Monthly
CR 5	Coney River 5	43.290792	-88.260946	TP	Monthly
CR 6	Coney River 6	43.295476	-88.247104	TP	Monthly
CR 7	Coney River 7	43.281111	-88.249924	TP	Monthly
CR 8	Coney River 8	43.261235	-88.256830	TP	Monthly
DB 1	Daniel Boone Conservation League	43.252630	-88.272496	TP	Monthly
02	Oconomowoc River Hillside Rd.	43.264010	-88.241699	TP	Monthly
01	Oconomowoc River Hwy. 167	43.251229	-88.272887	TP	Monthly
0	Oconomowoc River Hubertus Rd.	43.221488	-88.289700	TP	Monthly
1	Flyn Creek Emerald Rd.	43.209365	-88.336630	TP	Monthly
2	Hwy. Q Monches	43.193608	-88.338054	TP	Monthly
3	Mason Creek CW	43.181144	-88.405995	TP	Monthly
4	Mason Creek No. Woods Dr.	43.160064	-88.380645	TP	Monthly
5	Oconomowoc River Hwy. 83	43.159970	-88.370098	TP	Monthly
6	Oconomowoc River Hwy. K	43.139345	-88.406940	TP	Monthly
7	Okauchee Dam (in) Oconomowoc Lake	43.108264	-88.454194	TP	Monthly
8	Oconomowoc Lake (out)	43.104390	-88.469026	TP	Monthly
9	Oconomowoc River Cemetery	43.112414	-88.488332	TP	Monthly
10	Fowler Lake Dam	43.117746	-88.499270	TP	Monthly
11	Rosenow Creek (Blackhawk)	43.128992	-88.504776	TP	Monthly
12	LaBelle Dam	43.118540	-88.517419	TP	Monthly
13	Oconomowoc River (up)	43.105539	-88.511613	TP	Monthly
14a	Oconomowoc River (down)	43.095803	-88.521340	TP	Monthly
14b	Oconomowoc River Morgan Rd.	43.093033	-88.539923	TP	Monthly
15	Battle Creek Hwy. B	43.074758	-88.545601	TP	Monthly
16	Oconomowoc River Hwy. F	43.082673	-88.586287	TP	Monthly
17	Rock River Hwy. F	43.114159	-88.589009	TP	Monthly
18	Oconomowoc River Point of Compliance	43.113318	-88.617344	TP	Monthly
19	Rock River Hwy. P/E (down)	43.142781	-88.645001	TP	Monthly

Sampling Methodology		
Who will collect samples?	City of Oconomowoc Wastewater Utility	
Lab Information	Name:	Wastewater Treatment Facility
	Lab ID:	268004550
	Address:	900 South Worthington Street Oconomowoc, WI 53066
Phosphorus Analysis	Methodology Used:	4500 PE STO Methods 19th Ed.
	LOD:	0.02 mg/l
	LOQ:	0.07 mg/l

Other Lab Analysis for AM			
Pollutant 1 Name:	Methodology Used:	LOD	LOQ
Chloride*	4500 Chl. - B Std. Meth. 19th	N/A	N/A
Pollutant 2 Name:	Methodology Used:	LOD	LOQ
TSS*	2540-D Std. Meth. 19th	2.0 mg/l	2.0 mg/l
Pollutant 3 Name:	Methodology Used:	LOD	LOQ
Temp.	N/A Traceable Inst.	N/A	N/A

*Frequency of analysis varies based on river conditions, weather events, and ambient temperature.

FINANCIAL SECURITY

There are many costs involved in the OWPP. Costs include (1) implementing agricultural Management Measures such as cover crops, riparian buffers, nutrient management plans, sedimentation basins and grassed waterways; (2) implementing other practices such as wetland restoration or streambank restoration; (3) optimizing the WWTF to meet interim limits; (4) conducting outreach and education; (5) modeling; (6) river monitoring; (7) the cost advantage of the RCPP grant; and (8) administration.

Optimization to meet interim limits of TP at the WWTF consists of the additional chemical usage needed to meet the lower interim permit term TP concentrations of 0.6 mg/L and 0.5 mg/L. This cost was assumed using additional ferrous chloride. The WWTF can meet an effluent TP level of 0.5 mg/L with ferrous chloride. The City is presently piloting a new rare-earth coagulant product that has shown promise at other WWTFs in Southeastern Wisconsin. This product may provide additional TP removal efficiency compared to ferrous chloride. In addition, there are benefits to the settleability and compaction of biosolids with the product. If this product is used at the Oconomowoc WWTF going forward, there could be a cost advantage compared to the historical use of ferrous chloride at the WWTF.

Administration consists of compiling monitoring data, tracking watershed activities with a GIS interface, planning for, holding, and debriefing many meeting with various stakeholders, stakeholder communication and coordination, updates to the document management site, and writing the annual report and conducting compliance checks.

These anticipated costs and others are summarized in Table 18 for a ten year period. Costs for City staff are assumed to be over and above their normal job duties. The table details various assumptions used. For example, communication with the Farmer Leadership Group is assumed to consist of monthly meetings taking approximately 3 hours (including preparation) for the next 10 years. The meetings will include one City of Oconomowoc staff member and a consultant acting on behalf of the City. The assumptions in the table serve as basis for determining a cost. Actual costs will be different based on many factors.

Table 18. OWPP Overall Costs – Ten Year Period

Type of Activity/Practice	Component	Cost	Comments
Agricultural Management Measures	Selected Management Measures	$1,182,579	Assume $35/lb TP removed, and 73.5% of Management Measures identified in the watershed will be implemented.
	Subtotal	**$1,182,579**	
	Meetings with Farmer Leadership Group - Staff	$31,320	Meetings once a month. Assume $87 per hour and 3 hours per meeting including preparation.
	Meetings with Farmer Leadership Group - Consultant/Partner	$60,480	Meetings once a month. Assume $168 per hour and 3 hours per meeting including preparation.
	Travel Costs	$6,720	Meetings once a month. Use $0.70 per mile. Assume 40 miles per meeting. Includes one trip each meeting for staff and consultant/partner.
	Soil Testing	$30,000	Testing associated with OWPP Farmer Agreements. Assume 5,000 acres associated with agreements, one soil test every five acres and two rounds of testing (every 4 years) in 10 year period.
	Subtotal	**$128,520**	
Other Practices	Wetland Restoration	$88,537	Assume $35/lb TP removed, and 73.5% of wetland restoration identified in the watershed will be implemented.
	Lake Improvements	$150,000	Assume $15/lb TP removed.
	Streambank Stabilization	$326,098	Assume $129,135/river mile. Total cost was estimated assuming 75 lbs. of TP would be mitigated per 1000 ft. of streambank, and a goal of 1000 lbs. reduction of TP was to be achieved.

Type of Activity/Practice	Component	Cost	Comments
	MS4 Reductions	$450,000	Assume $100/lb TP removed for 50% of reductions achieved with permanent structures. Assume $35/lb TP removed yearly for 50% of reductions achieved with Urban Management Measures.
	Subtotal	**$1,014,635**	
	Meetings - Staff	$20,880	Meetings once every two months. Assume $87 per hour and 4 hours per meeting including preparation.
	Meetings - Consultant/Partner	$40,320	Meetings once every two months. Assume $168 per hour and 4 hours per meeting.
	Travel Costs	$3,360	Meetings once every two months. Use $0.70 per mile. Assume 40 miles per meeting. Includes one trip each meeting for staff and consultant/partner.
	Subtotal	**$64,560**	
WWTF Optimization to Meet Interim Limits	Additional Chemical	$51,000	Assume 40 extra gallons per day at $0.35 per gallon.
	Consultant Cost for Industrial Program	$35,000	Work with industries to reduce phosphorus discharge to plant.
	Staff Costs for Industrial Program	$50,000	Work with industries to reduce phosphorus discharge to plant.
	Subtotal	**$136,000**	
Outreach and Education	Staff Time for Meetings	$17,400	Meetings once a quarter for overall group. Assume $87 per hour and 5.0 hours per meeting including preparation.
	Consultant/Partner Time for Meetings	$33,600	Meetings once a quarter for overall group. Assume $168 per hour and 5.0 hours per meeting including preparation.
	Materials	$5,000	Assume $500 per year.
	Meeting Room Rental	$8,000	Meetings once a quarter for overall group. Assume $200 per quarter.
	Travel For Meetings	$2,240	Meetings once a quarter for overall group. Includes one trip each meeting for staff and consultant/partner.
	Website	$18,000	$8,000 initial cost and $1,000 per year for maintenance.
	Collaboration Software	$80,000	8,000 per year, 50 users on Office 365 Platform
	Consultant Cost For Updating Document Information	$80,640	Assume 48 hours per year of consultant/partner cost to update and maintain website.
	Partner	$30,000	Assume $3,000 per year for outreach and education.
	Partner	$30,000	Assume $3,000 per year for outreach and education.
	Subtotal	**$304,880**	
Modeling	Technology Needs to Run Models	$10,000	Assume $1,000 per year for technology needs to run models.
	Consultant/Partner	$120,000	Assume $12,000 per year.

Type of Activity/Practice	Component	Cost	Comments
	Financial Needs of County Land and Water Conservation Departments	$50,000	Assume $5,000 per year for county resources.
	Subtotal	**$180,000**	
River Monitoring	Staff Time to Gather Sample	$41,760	Assume an extra 4 hours per month with a rate of $87 per hour.
	Staff Time to Run Test	$41,760	Assume an extra 4 hours per month with a rate of $87 per hour.
	Supplies (Reagents, Bottles)	$15,000	Assume an extra $1,500 per year.
	Testing Cost (Outside Services)	$30,000	Assume an extra $3,000 per year.
	Travel costs	$3,780	Assume 18 trips per year at 30 miles per trip and 0.70 per mile.
	Subtotal	**$132,300**	
RCPP Grant	Grant amount	-$500,000	
	Administration (reports) Associated with Grant - Staff Time	$32,400	Assume 80 hours per year for staff time for 5 years at $81 per hour.
	Administration (Reports) Associated with Grant - Consultant/Partner Time	$39,000	Assume 50 hours per year for consultant/partner time for 5 years at $156 per hour.
Corporate Sponsorship	Clean Water Association	-$285,000	$15,000 in year 2016, $30,000 for the next 9 years
	Subtotal	**-$713,600**	
Technical Support	Consultant/Partner	$200,000	Assume $20,000 per year.
	Financial Needs of County Land and Water Conservation Departments	$150,000	Assume 15,000 per year.
	Partner	$100,000	Assume 10,000 per year.
	Partner	$100,000	Assume 10,000 per year.
	Subtotal	**$550,000**	
Compliance Checking	Consultant/Partner Time to Track Activities with GIS	$134,400	Assume 80 hours per year at a rate of $168 per hour.
	Communication, Administration and Coordination with DNR - Staff	$34,800	Assume 40 hours per year at a rate of $87 per hour.
	Misc. Administration and Coordination with DNR - Consultant/Partner	$67,200	Assume 40 hours per year at a rate of $168 per hour.

Type of Activity/Practice	Component	Cost	Comments
	Annual DNR Report - Staff	$34,800	Assume 40 hours per year at a rate of $87 per hour.
	Annual DNR Report - Consultant/Partner	$67,200	Assume 40 hours per year at a rate of $168 per hour.
	Field Visits - Staff	$20,880	Assume 24 hours per year at a rate of $87 per hour.
	Field Visits - Consultant/Partner	$40,320	Assume 24 hours per year at a rate of $168 per hour.
	Travel	$3,360	Includes 12 visits per year with 40 miles per visit. Use $0.70 per mile. Includes one trip for each meeting for staff and consultant.
	Subtotal	**$402,960**	
	Grand Total	**$3,382,835**	

The City of Oconomowoc understands that the OWPP is a long term program that will last 10 years or more and is fully committed to supporting this program.

Name: Sarah Kitsembel

Title: Director of Finance/Administrative Services

Date: 12-7-15

IMPLEMENTATION SCHEDULE WITH MILESTONES

A detailed implementation schedule is shown in Table 19. The table shows the implementation in units of incremental pounds of phosphorus reduction every two years for years 2015 through 2027. The table shows that a disproportionate amount of the reductions are to be completed in the early years of the OWPP. For the OWPP, there is an incentive to implement Management Measures sooner rather than later as the RCPP grant money is only available through year 2020.

The OWPP will review the monitoring data in detail throughout the watershed once per year. The concentration at the confluence will be analyzed specifically with regard to the median value 30 days apart for the months of May through October. The monitoring data will be used to directly evaluate the progress of the OWPP.

Several benchmarks will be used to monitor indirect progress of the program. These are described below:

Contracts

The City of Oconomowoc will use several types of agricultural contracts to implement Management Measures in CSAs. Oconomowoc will work with the NRCS and offer additional incentives through covered programs in the RCPP. The covered programs are the Environmental Quality Incentives Program (EQIP), Agricultural Conservation Easement Program (ACEP), and the Conservation Stewardship Program (CSP). A template contract will be created for each program. In addition, a template contract will be in place for the

OWPP working outside of the RCPP program. The template contracts are important because they will outline specifically what the OWPP is offering farmers in exchange for implementing Management Measures. The template contracts will be used as a starting point for a contract with a farmer. The template contracts will be in place by year end 2015.

Modeling

Modeling will be an important part of the program. SnapPlus in particular will be needed to model the expected reductions and ongoing effectiveness of Management Measures implemented in CSAs. The OWPP will contract with County LWC staff for modeling services or a consultant will be used. The final arrangements for detailed modeling will be in place by year end 2016.

Streambank Stabilization Reductions

A portion of the required target reductions come from streambank stabilization. The SEWRPC has worked in the Mason Creek area in recent years to identify sources of runoff to North Lake. There are several streambank projects along Mason Creek that have been identified by SEWRPC. The OWPP will work SEWRPC on these projects. To support the reductions from streambank stabilization 2,000 pounds per year of potential reductions from the watershed will be identified by year end 2017.

Lake Reductions

The Oconomowoc River watershed contains many lakes. These lakes provide the benefits of recreation, wildlife habitat and clean water. The Clean Water Association (CWA) is a partner that promotes clean water specifically in and around lake communities. The CWA plans to raise corporate money to support activities that reduce runoff in around the many lake communities in the watershed. The activities could be erosion control, bank stabilization, harvesting of excessive aquatic plant growth, wetland restoration and commercial fertilizer control. The CWA has a successful track record of corporate fundraising in the Yahara WINS watershed project in the Madison, WI area. The CWA fundraising will directly support the portion of the target reduction in the OWPP from the lakes. As a benchmark for the OWPP, the annual corporate donation to the program totaling $30,000 will be in place by year end 2016.

Flow Monitoring

The OWPP has extensive monitoring in place for TP concentrations in the watershed. However, the flow rates of surface waters throughout the watershed are unknown. Knowing flow and phosphorus concentration will yield a mass loading value which should allow a better understanding of where to allocate resources and address CSAs. The OWPP plans to partner with Sand County Foundation to start a flow monitoring program at key places in the watershed. The flow monitoring program will be in place by year end 2016.

MS4 Reductions

A portion of the required TP reduction comes from the City of Oconomowoc MS4. Based on storm water modeling conducted by the City, approximately 34,000 pounds of phosphorus per year is presently discharged to both regulated and non-regulated portions of TMDL Reach 25. The reductions in the MS4 area could come from improvements at parks, golf courses, the incorporation of TSS collection structures, additional detention ponds, or changes in street sweeping. To support the required reduction from the City's MS4, 3,000 pounds of potential reductions will be identified by year end 2016.

The water quality milestone is achieving a statistically significant TP concentration at the confluence of the Oconomowoc River and the Rock River of less than or equal to 0.075 mg/L. The statistically significant methodology will be in accordance with the Wisconsin Consolidated Assessment and Listing Methodology. The goal of the OWPP is to meet the water quality milestone in less than ten years.

Various practices will be used in combination for the annual compliance check for load reductions by permit term. The most important practice will be the river monitoring program. The standard program will be used as the indicator. Non-official sampling at different times (e.g. a very wet period) or different places (e.g. a small stream feeding into the Oconomowoc River with a location not in Appendix C) will not be used for the load reduction assessment. Rather, this information will be used to ascertain how different weather patterns affect phosphorus transport through the watershed and the effectiveness of specific Management Measures.

With the RCPP program, the City will have a contract with the United States Department of Agriculture. NRCS staff has indicated to the City that the RCPP program will likely be open to audits by other federal agencies. As a condition to receiving RCPP funds, the City of Oconomowoc is required to maintain detailed project documentation and to submit routine reporting on specific activity. The NRCS will also work closely with the county LWC staff for the RCPP. The NRCS and county LWC staff will conduct intermittent farm visits and windshield checks as a part of the RCPP program.

Another important part of the annual compliance check will involve regular (perhaps bi-monthly) status checks with partners in the agricultural community. Through the Farmer Leadership Group, the OWPP plans to establish a farmer peer-led audit system. The OWPP plans leverage the respect, knowledge, trust, and support in place already in the agricultural community. This type of compliance mechanism will promote trust rather than a top down system. The NRCS and county LWC staff check will supplement the primary system of the farmer self-audit system. The farmer-led system will also help reduce the compliance checking effort of the City of Oconomowoc.

Geographical Information Systems will be used to track the Management Measures throughout the action area. GIS is an ideal tool for obtaining information on areas of land in a rural setting. The GIS system will provide detailed mapping for areas where practices have been implemented. Color coding and line work can be used to quickly convey information about the type, effectiveness, and compliance status of Management Measures.

Table 19. Project Milestones.

Reduction Sources	Incremental Pounds per Year Reduction Year End 2015	Incremental Pounds per Year Reduction Year End 2017	Incremental Pounds per Year Reduction Year End 2019	Incremental Pounds per Year Reduction Year End 2021	Incremental Pounds per Year Reduction Year End 2023	Incremental Pounds per Year Reduction Year End 2025	Incremental Pounds per Year Reduction Year End 2027	Total
WWTF Effluent to 0.4 mg/L		1,073	1,431					2,504
Implementation of CSAs identified (out of a total of 4,414 pounds per year identified)	200	700	1,275	1,071				3,246
Lake Improvements			200	300	300	200		1,000
Streambank Stabilization			200	300	300	200		1,000
City of Oconomowoc MS4 Reach 25				250	250	500	1,000	2,000
Total	200	1,773	2,906	1,921	850	900	1,000	9,750

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Appendix A

AM Request Form

State of Wisconsin
Department of Natural Resources
Bureau of Watershed Management
PO Box 7921, Madison WI 53707-7921
dnr.wi.gov

Watershed Adaptive Management Request

Form 3200-139 (1/12)

Notice: Pursuant to s. NR 217.18, Wis. Adm. Code, this form must be completed and submitted to the Department at the time of the reissuance of an existing WPDES (Wisconsin pollutant discharge elimination system) permit to request adaptive management for phosphorus water quality based effluent limits (WQBEL).Failure to provide all requested information may result in denial of your request. Personal information collected will be used for administrative purposes and may be provided to requestors to the extent required by Wisconsin Open Records law [ss. 19.31-19.39, Wis. Stats.].

Type of Request:

☒ This is the formal adaptive management request as required in s. NR 217.18(2)
☐ This is a preliminary adaptive management request (to be submitted as part of facility planning.)

Facility and Permit Information

Facility Name	WPDES Permit No.
City of Oconomowoc	WI - 0021181-08-0

Facility Address	City	State	ZIP Code
900 South Worthington St.	Oconomowoc	WI	53066

Receiving Water: Oconomowoc River

Owner Contact Information

Last Name	First Name	MI	Phone No. (incl. area code)
Steinbach	Thomas	R.	(262) 569-2192

Street Address	FAX Number
900 South Worthington St.	(262) 569-3273

City	State	ZIP Code	Email address
Oconomowoc	WI	53066	tsteinbach@oconomowoc-wi.gov

Facility Information

Provide listed information for each lagoon or pond basin

Required for AM Request	Wis. Administrative Code Reference	Conclusion	Evidence/Source of information (attach as needed)
1. NPS contribute at least 50% of total P contribution	s. NR 217.18(2)(b)	☒ NPS contributes at least 50% ☐ NPS DOES NOT contribute at least 50%	PRESTO GIS Tool
2. WQBEL Requires Filtration	s. NR 217.18(2)(c)	☒ Filtration required ☐ Filtration NOT required	
3. AM Plan	s. NR 217.18(2)(d)	☐ Plan is Included – Page 3 ☒ Plan is NOT Included *For a preliminary adaptive management request, AM plan not required*	

Facility Operation and Performance

1. **Current P removal capability** – If the facility is currently required by a WPDES permit to monitor effluent phosphorus (P) provide a summary of the influent and effluent annual average P concentrations for each of the past three (3) years. If permit required P data is not available, the applicant should provide any other P data that may be applicable and available. If no data is available, the Department may estimate the P effluent concentration by based on data from other similar facilities.

   See Attachment A.

2. **Facility Operation** – Provide a summary description of overall facility operation. If not a continuously discharging facility, describe storage procedures and the time periods when effluent discharge occurs.

The Oconomowoc Wastewater Treatment Facility (WWTF) uses an activated sludge process. The treatment processes at the WWTF include screening, influent pumping, grit removal, primary clarification, aeration, final clarification, tertiary filtration, UV disinfection and dissolved oxygen uptake. Solids are thickened with an air flotation thickener, anaerobically digested, thickened with a gravity belt thickener and land-applied as a soil conditioner. Discharge from the WWTF is on a continuous basis to the Oconomowoc River.

3. **Previous Studies** – Reference or attach any facility planning or evaluation study that evaluated facility performance capabilities (Note – Only include studies that are recent, within 5 years, or otherwise applicable for the evaluation of the existing facility and current conditions).

The City has experimented with varying doses of ferrous chloride in 2011. The dose - response information is shown on Attachment B. The lower limit that can be achieved is 0.2 mg/L. At this level, ferrous chloride severely fouls the membrane filter used for polishing effluent total respended solids.
The City has also hosted a pilot test to determine the cold weather flux using ultrafiltration with equipment provided by Ovivo.

Adaptive Management Plan (s. NR 217.18(d))

This section should summarize the Adaptive Management Plan for internal and external review. A complete Adaptive Management Plan should be attached. Note: If this is a preliminary adaptive management request, this section is not required.

Watershed	Percent Contribution of Applicant Discharge
Oconomowoc River	30

Action Area (include map)

Oconomowoc River Watershed

Watershed Characteristics and Timeline Justification

Watershed includes many lakes that the Oconomowoc River wastewater flows through. There are several impaired or pending impaired water bodies in the watershed. Approximately 43 percent of the watershed is agricultural. A large urban area of the watershed is in Waukesha County in the City of Oconomowoc. A timeline of 10 or more years is justified since it will take a long time to implement runoff reduction from agricultural land.

Key Proposed Actions

Actions include implementing management measures, treatment facility optimization, conducting outreach and education, modeling compliance checking and user monitoring, and provide technical support.

Key Goals and Measures for Determining Effectiveness

Key Goals are the following:
1. Implement management measures to get as many controlled acres in place as soon as possible.
2. Implement the Resource Conservation Partnership Program Grant.
3. Work closely with County Land and Water Conservation staff.
4. Leverage full capability of all program partners.

The method for determining effectiveness will be reaching a statistically significant total phosphorus concentration of 0.075 mg/l or lower at the confluence of the Rock and Oconomowoc Rivers.

Partner(s)

City of Oconomowoc Wastewater Utility, NRCS, Tall Pines Conservancy, Farmer Leadership Group, Ruekert & Mielke, Inc., Washington County, Jefferson County, Waukesha County, Clean Wisconsin, WDNR, Southeastern Wisconsin Regional Planning Commission (SEWRPC), North Lake Management District, SEH Consulting Engineers, Greener Oconomowoc, Mid Kettle Partners, Carmelites of Holy Hill, Camp Whitcomb/Mason, Okauchee Lake Management District, Lac La Belle Lake Management District, Friess Lake Advancement Association, Silver Lake Management Group, Village of Oconomowoc Lake, Rock River Coalition, Erin Meadows Farms, Town & Country Resource Conservation & Development, Inc., University of Wisconsin (UW) Extension, Wisconsin Department of Agriculture, Trade and Consumer Protection (WDATCP), Clear Water Association, Pabst Farms and American Farmland Trust

Funding Sources

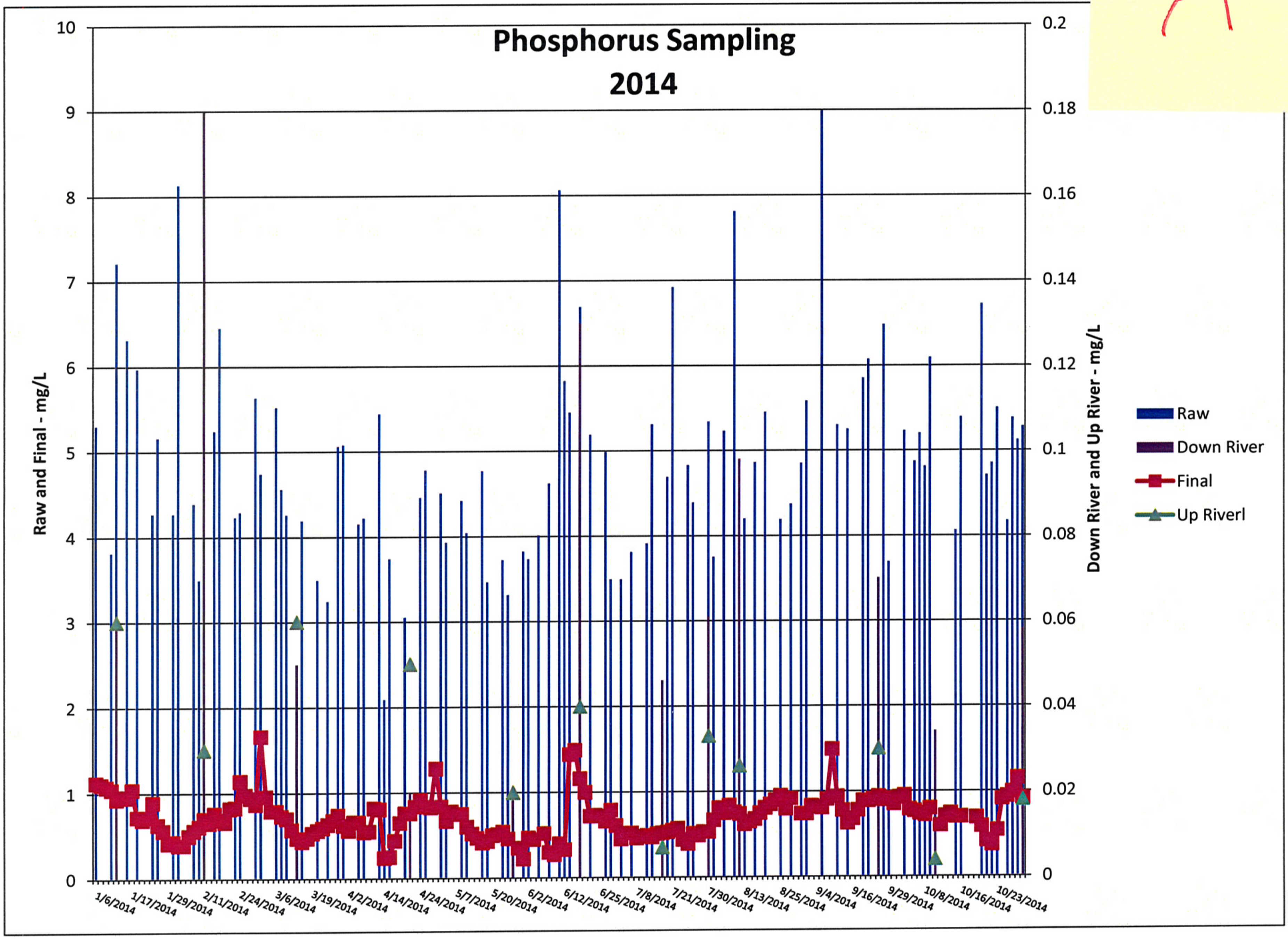
Adaptive Management Request and Certification

Based on the information provided, I am requesting the Watershed Adaptive Management option to achieve compliance with phosphorus water quality standards in accordance with s. NR 217.19, Wis. Adm. Code.
I certify that the information provided with this request is true, accurate and complete to the best of my knowledge.

Print or type name of person submitting request*	Title
Thomas R. Steinbach	Wastewater Operations Manager
Signature of Official: Thomas R Steinbach	Date Signed: August 6, 2015

*Must be an Authorized Representative for the treatment facility

A


Phosphorus Sampling
2014
Raw and Final - mg/L
Down River and Up River - mg/L
0
1
2
3
4
5
6
7
8
9
10
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
1/6/2014
1/17/2014
1/29/2014
2/11/2014
2/24/2014
3/6/2014
3/19/2014
4/2/2014
4/14/2014
4/24/2014
5/7/2014
5/20/2014
6/2/2014
6/12/2014
6/25/2014
7/8/2014
7/21/2014
7/30/2014
8/13/2014
8/25/2014
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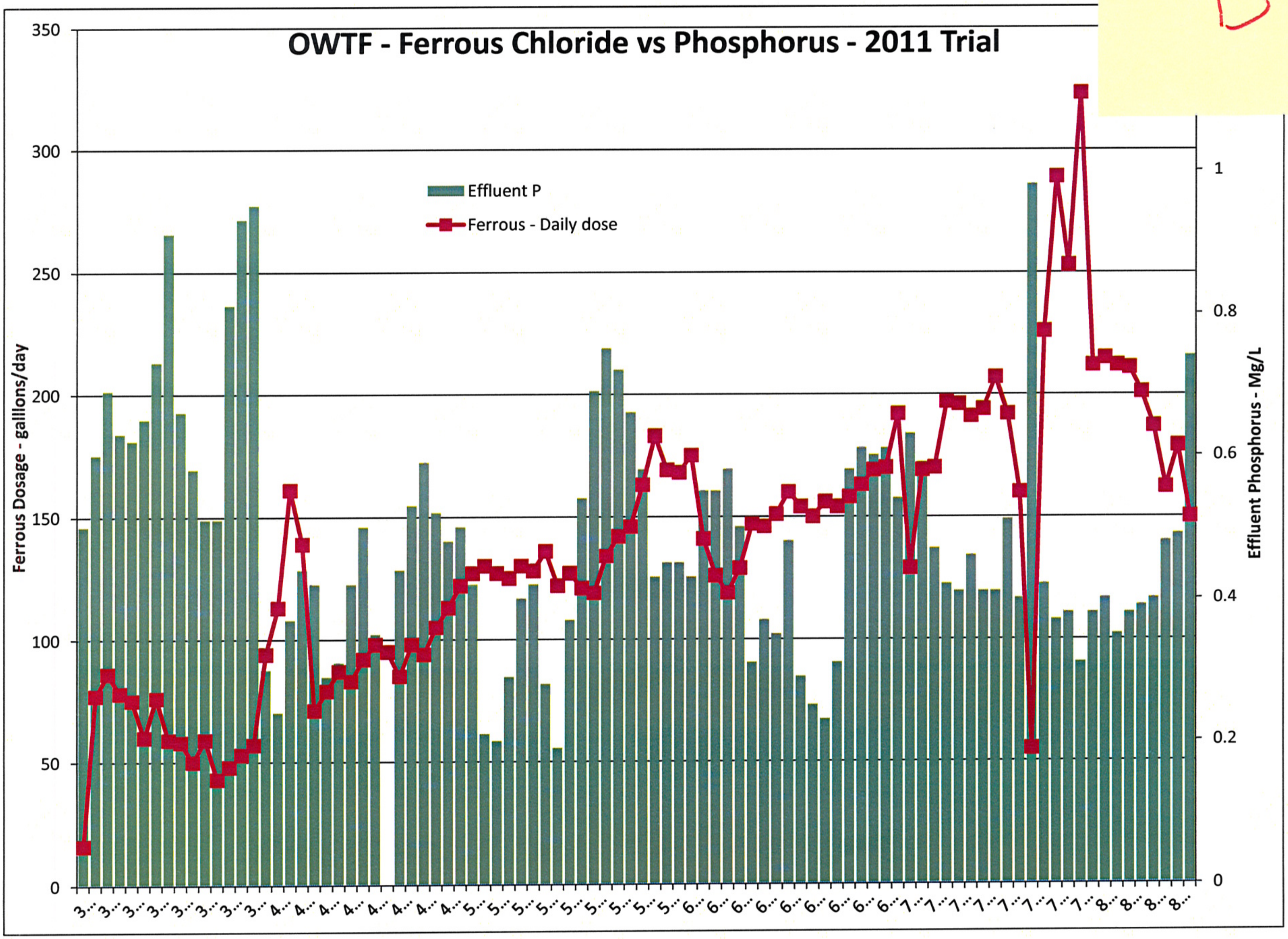
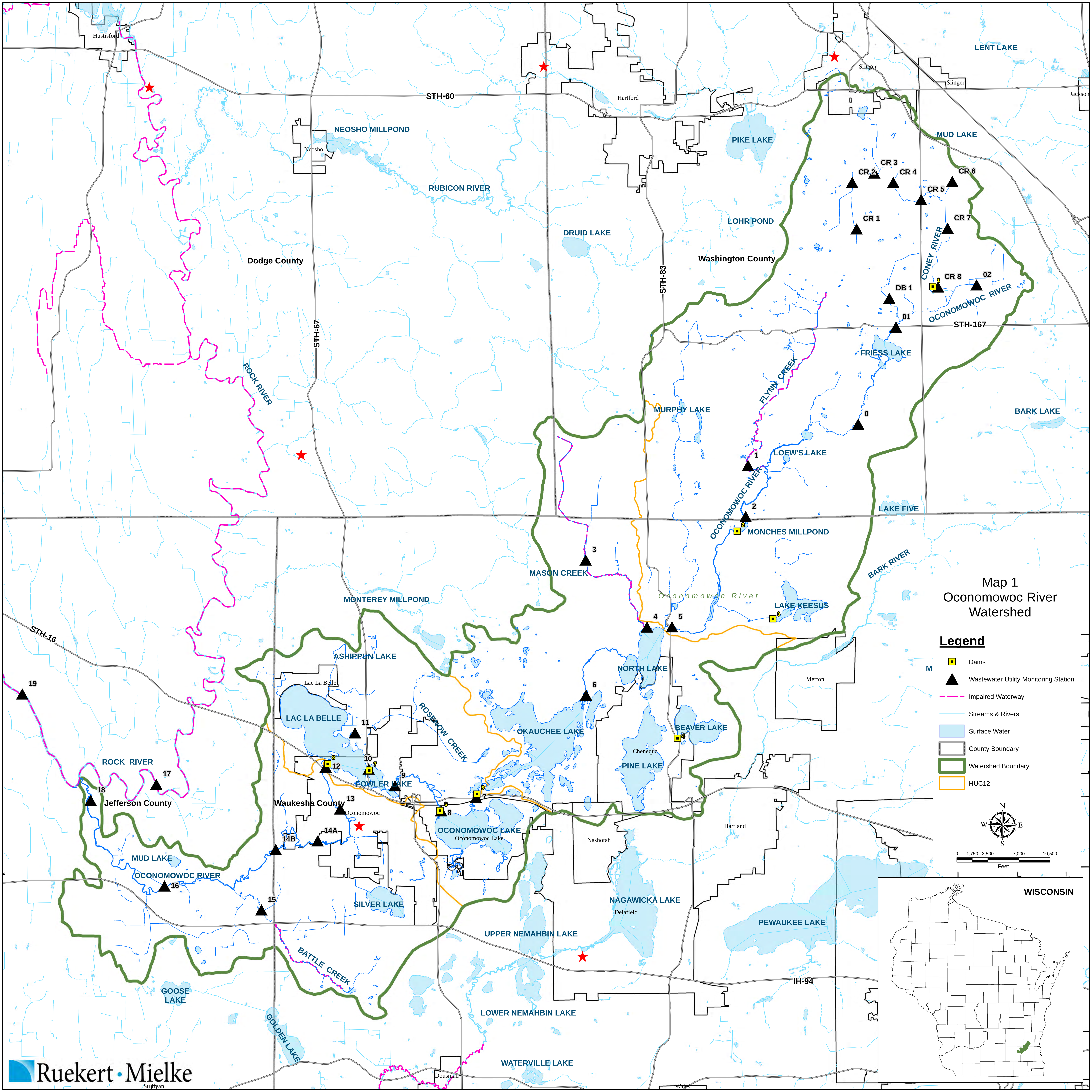
10/23/2014
Raw
Down River
Final
Up Riverl

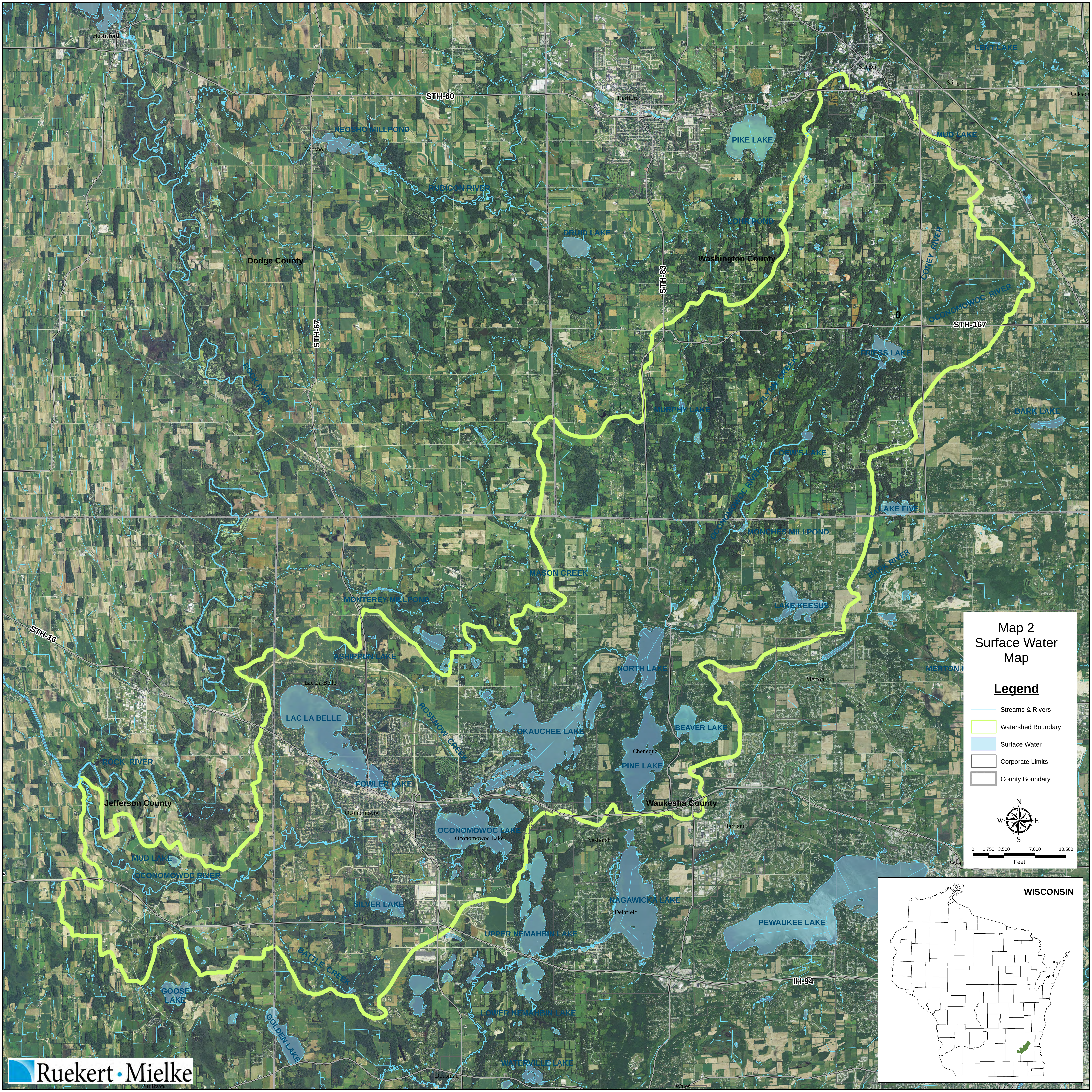

OWTF - Ferrous Chloride vs Phosphorus - 2011 Trial
Effluent P
Ferrous - Daily dose
Ferrous Dosage - gallons/day
Effluent Phosphorus - Mg/L
350
300
250
200
150
100
50
0
1
0.8
0.6
0.4
0.2
0

Appendix B

Map 1 - Oconomowoc River Watershed
Map 2 - Watershed Orthophotography
Map 3 - K Factor
Map 4 - Hydric Soils Information
Map 5 - Land Use
Map 6 - Wetlands
Map 7 - Floodplain
Map 8 - Critical Source Areas - Southwest
Map 9 - Critical Source Areas - Northeast



Source: WiDNR, WisconsinView



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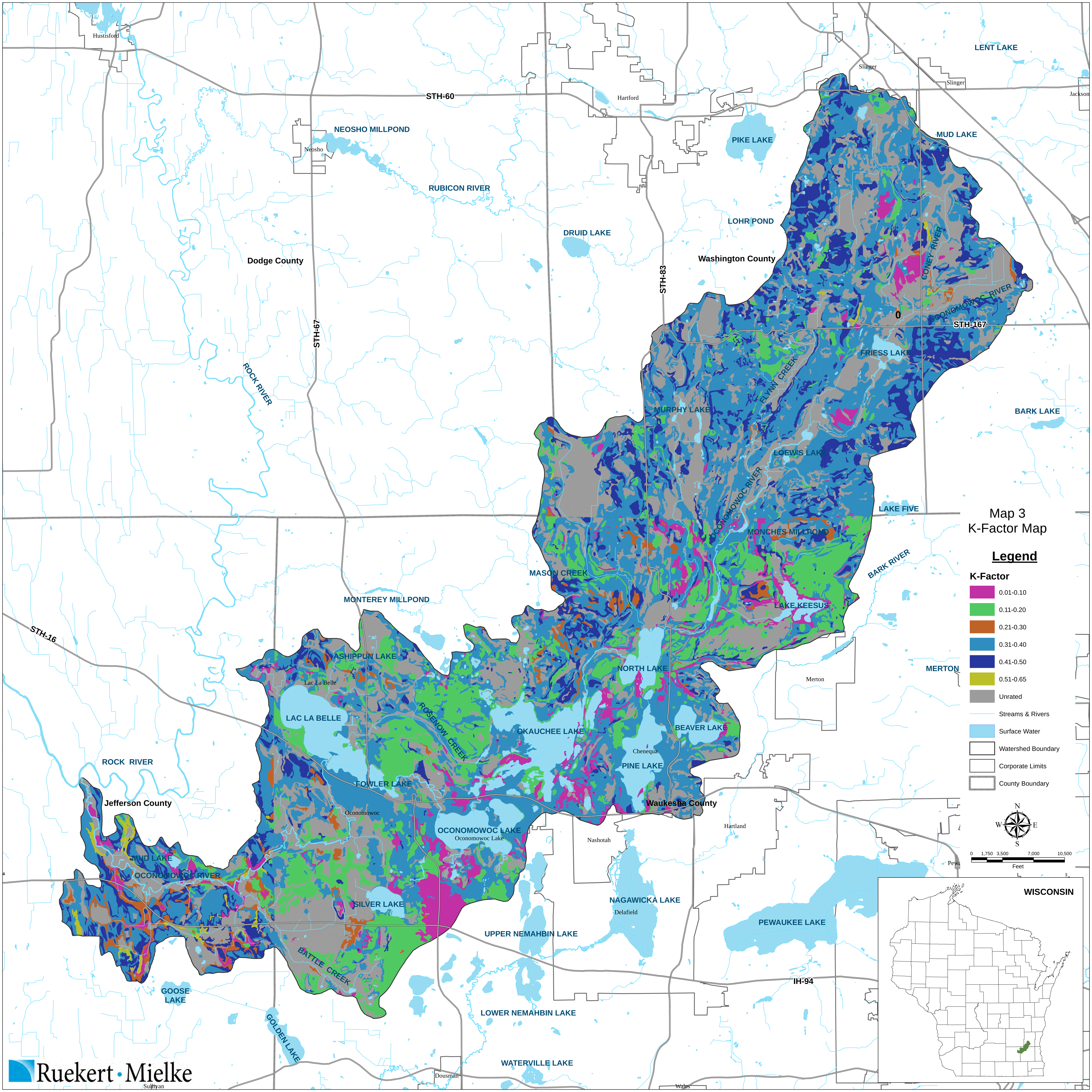
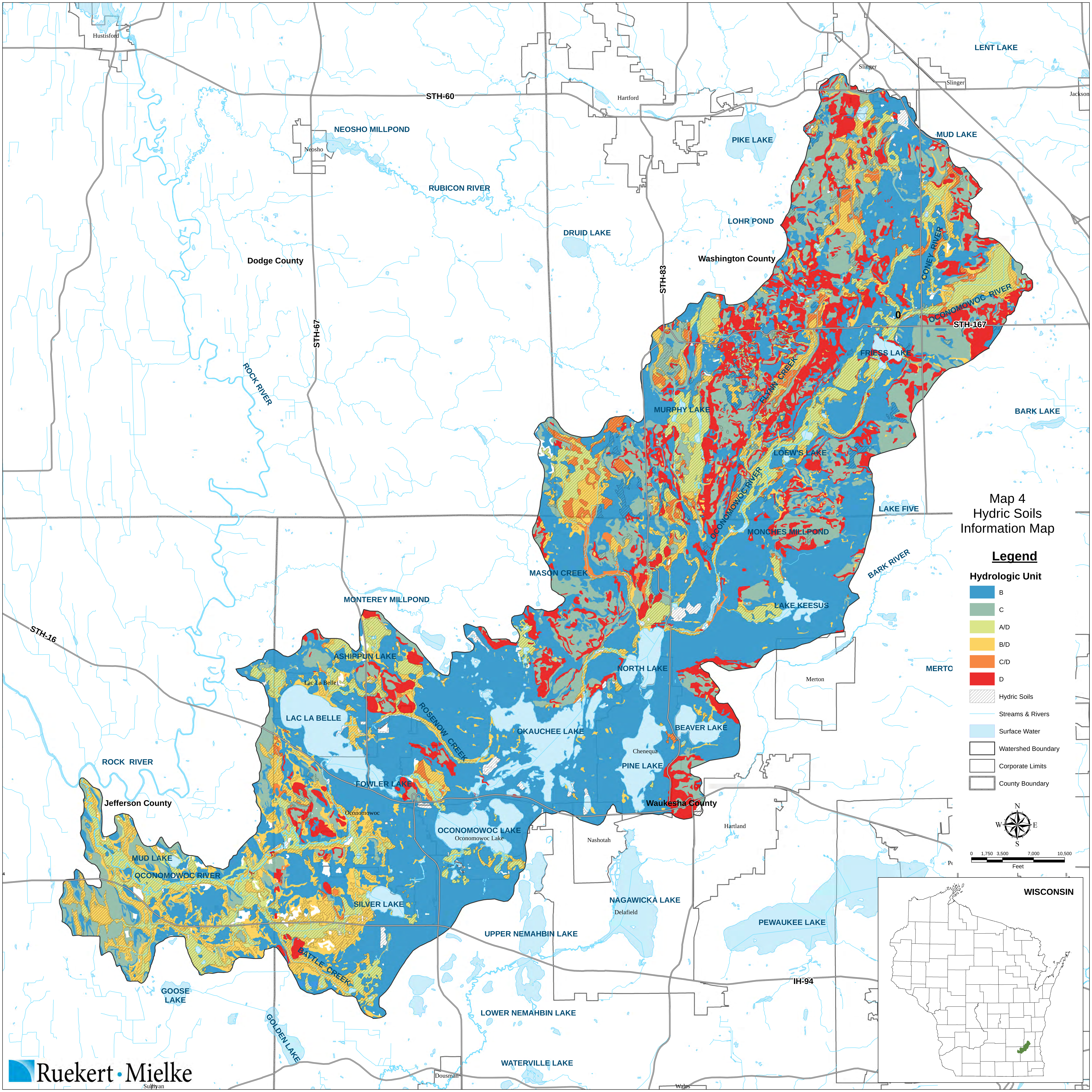
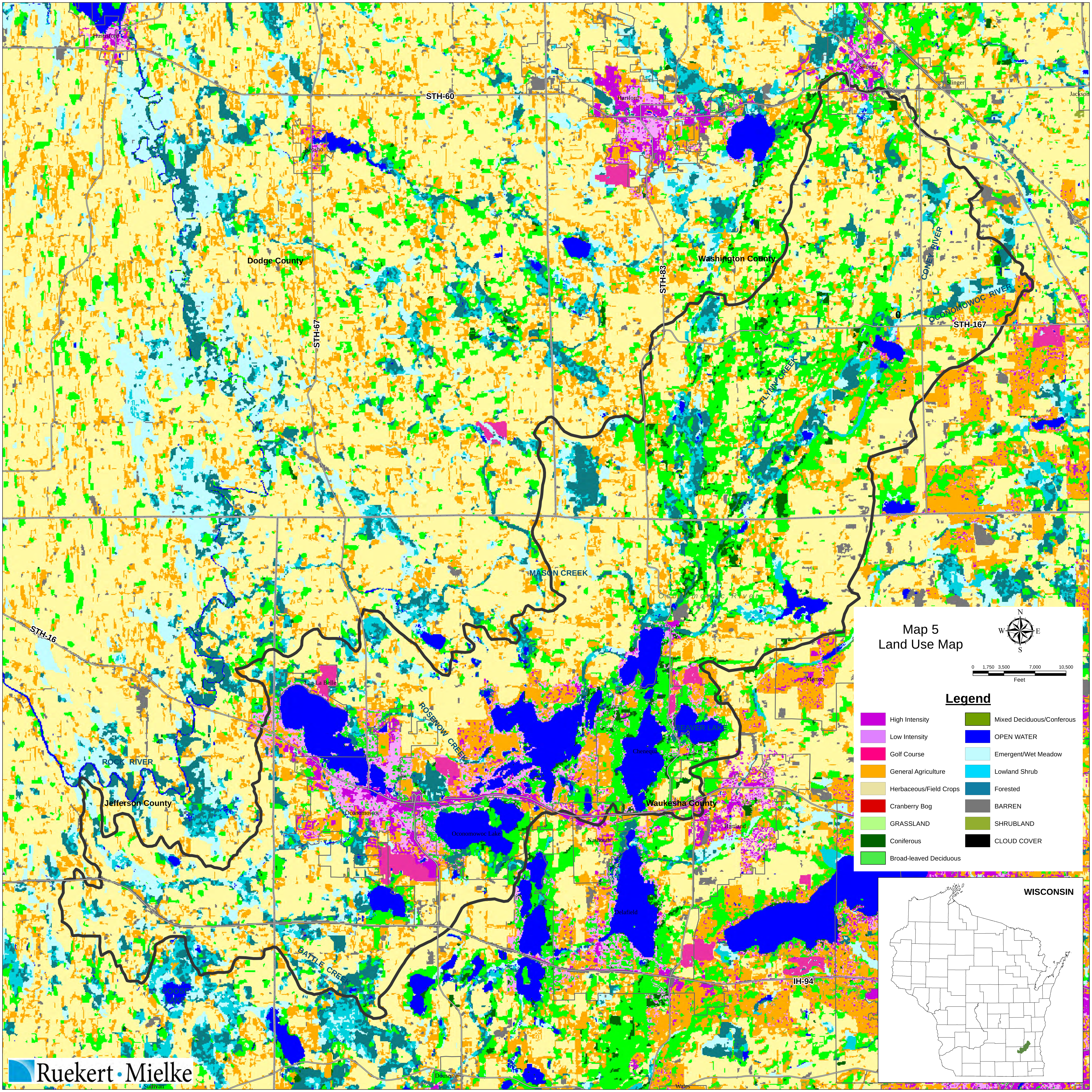


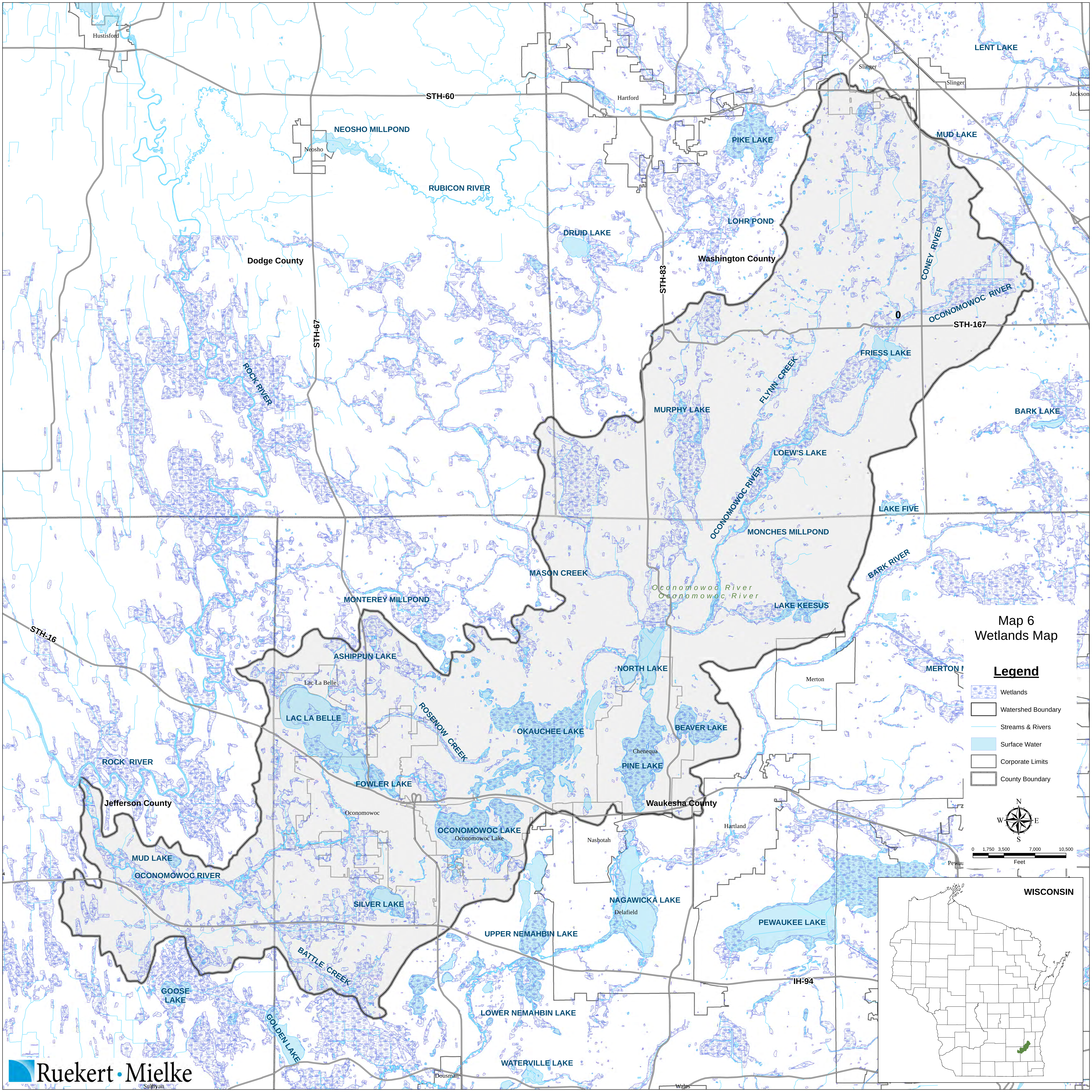
Map 3
K-Factor Map
Legend
K-Factor
0.01-0.10
0.11-0.20
0.21-0.30
0.31-0.40
0.41-0.50
0.51-0.65
Unrated
Streams & Rivers
Surface Water
Watershed Boundary
Corporate Limits
County Boundary
N
E
S
W
0 1,750 3,500 7,000 10,500
Feet
WISCONSIN
Hustisford
STH-60
Hartford
Slinger
Jackson
LENT LAKE
NEOSHO MILLPOND
Neosho
PIKE LAKE
MUD LAKE
RUBICON RIVER
LOHR POND
DRUID LAKE
Dodge County
Washington County
STH-83
CONEY RIVER
OCONOMOWOC RIVER
STH-167
STH-67
FRIESS LAKE
ROCK RIVER
FLYNN CREEK
MURPHY LAKE
BARK LAKE
LOEWS LAKE
LAKE FIVE
MONCHES MILLPOND
BARK RIVER
MASON CREEK
MONTEREY MILLPOND
LAKE KEESUS
STH-16
ASHIPPUN LAKE
NORTH LAKE
MERTON
Merton
Lac La Belle
LAC LA BELLE
ROSENOW CREEK
OKAUCHEE LAKE
BEAVER LAKE
Chenequa
PINE LAKE
ROCK RIVER
FOWLER LAKE
Jefferson County
Waukesha County
Oconomowoc
OCONOMOWOC LAKE
Oconomowoc Lake
Hartland
Nashotah
MUD LAKE
OCONOMOWOC RIVER
SILVER LAKE
NAGAWICKA LAKE
Delafield
PEWAUKEE LAKE
UPPER NEMAHBIN LAKE
BATTLE CREEK
IH-94
GOOSE LAKE
GOLDEN LAKE
LOWER NEMAHBIN LAKE
WATERVILLE LAKE
Dousman
Sullivan
Wales
Ruekert·Mielke
Source: Tiger, NRCS



Source: Tiger, NRCS



Source: Tiger, WiDNR



I:\Projects\47\10024\Map6Wetlands.mxd

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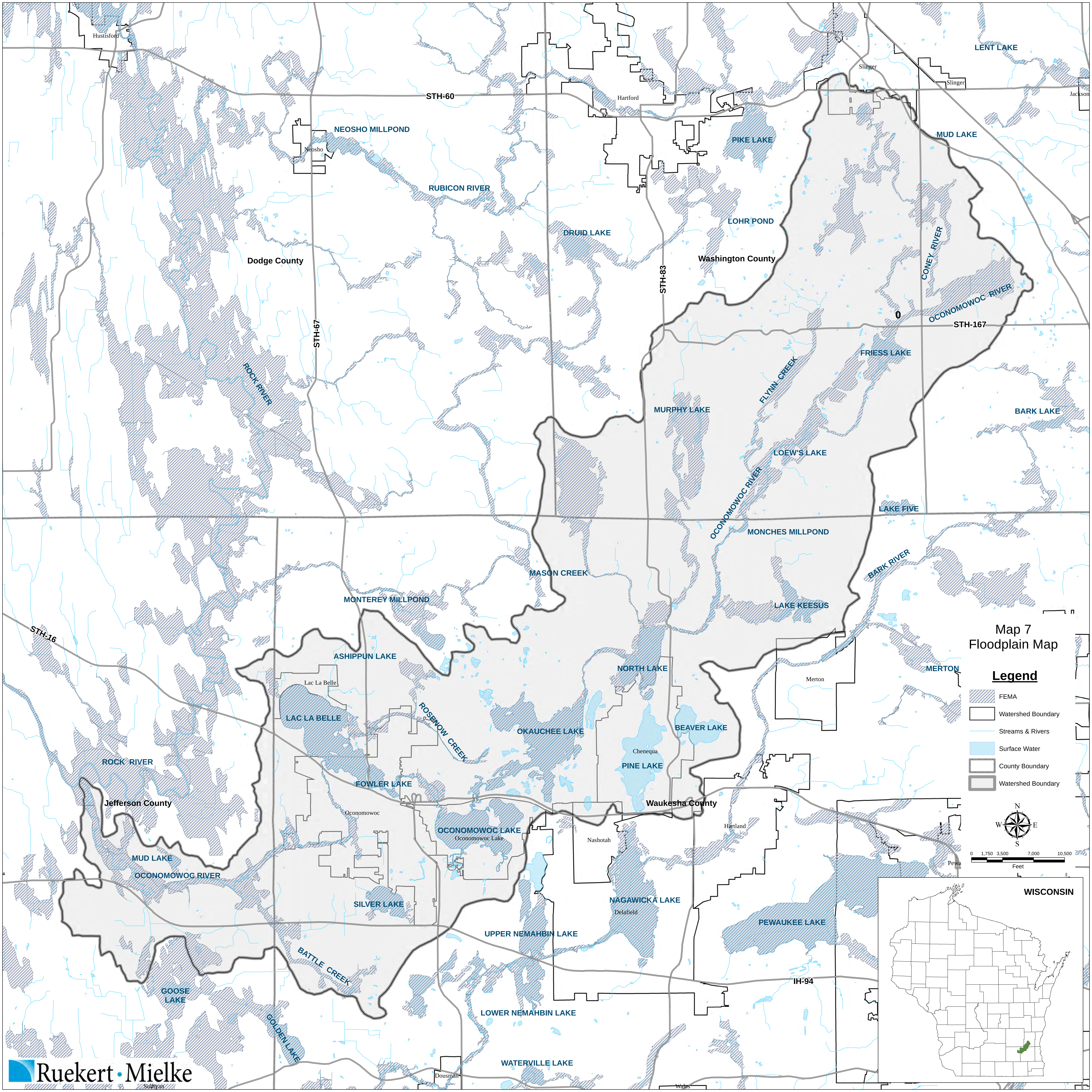
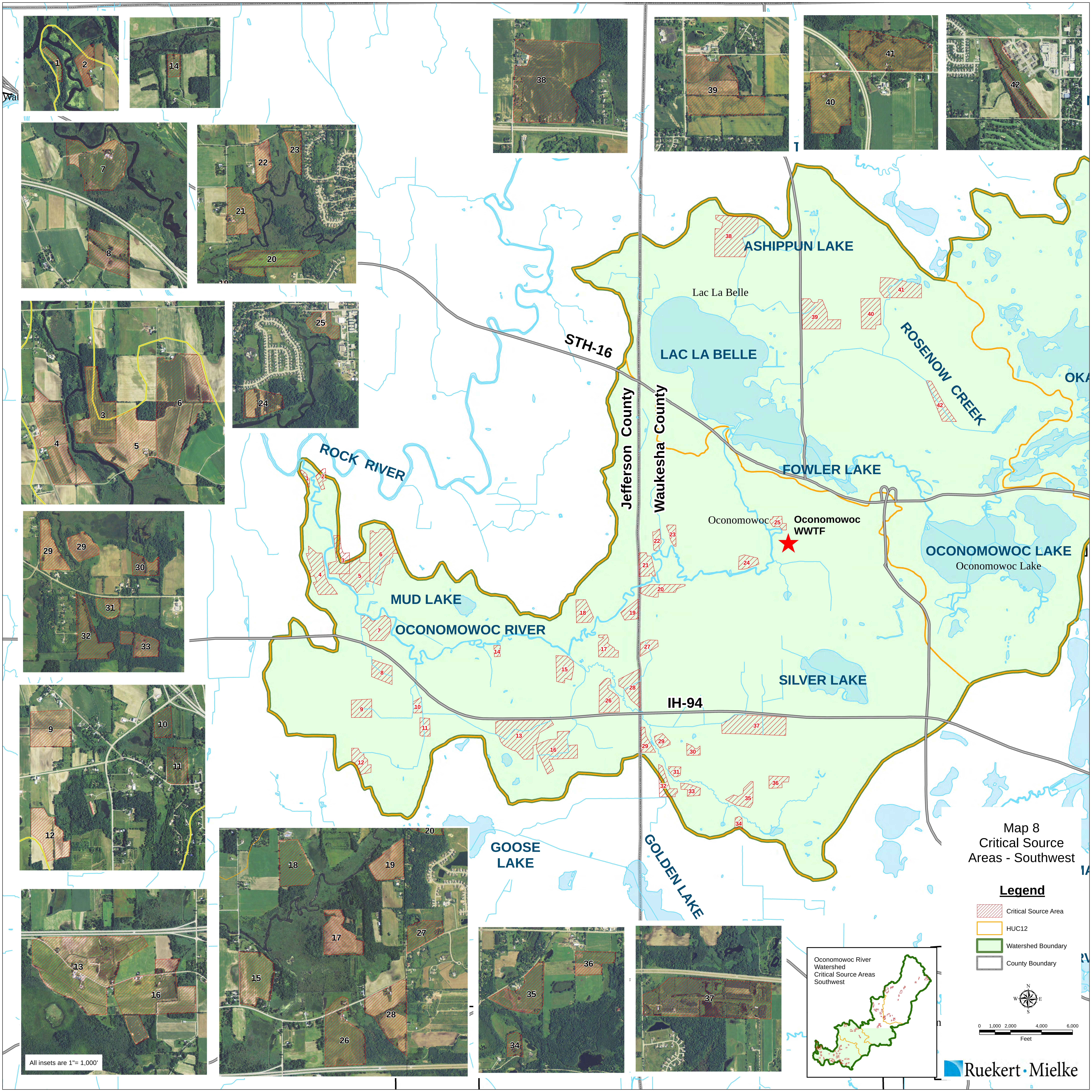
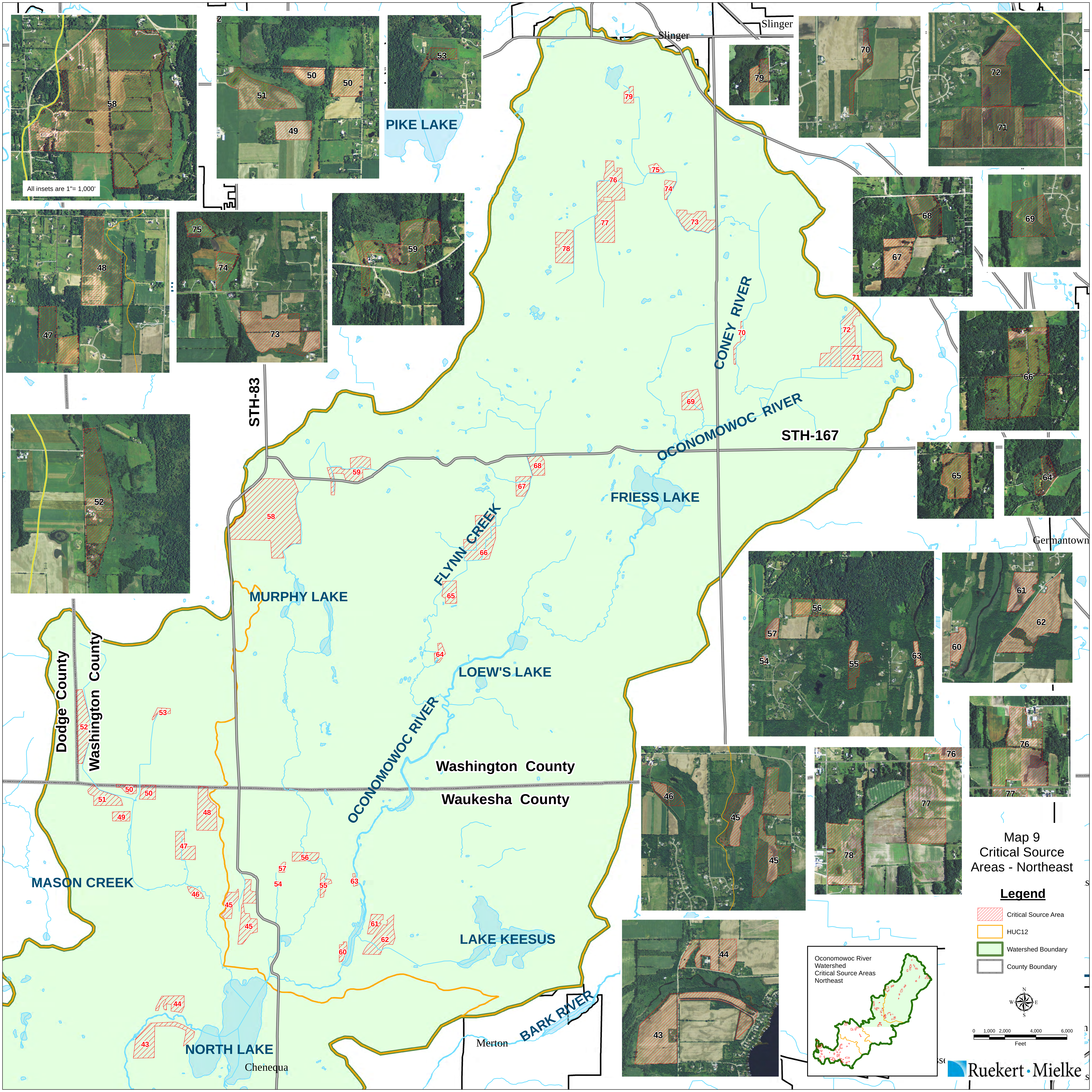


Source: Tiger, WiDNR, FEMA



Source: WiDNR, WisconsinView



Source: WiDNR, WisconsinView

Appendix C

Phosphorus Monitoring Results

Oconomowoc River Sites	Site #	5/13/2014	6/11/2014	7/16/2014	8/12/2014	9/16/2014	10/16/2014	11/13/2014	12/15/2014	1/15/2015	3/16/2015	4/16/2015	5/15/2015	6/15/2015	7/15/2015	Median (May-Oct)
Ocon Rvr Point of Compliance	18		0.077	0.09	0.137	0.054	0.105	0.064	0.089		0.03	0.061	0.042	0.126	0.103	0.0965
Ocon Rvr Hwy F	16					0.037	0.031	0.057	0.077		0.119	0.07	0.03	0.081	0.073	0.037
Ocon Rvr Downstream Plant	14				0.098	0.139	0.034	0.058	0.045	0.072	0.02	0.038	0.038	0.048	0.077	0.0625
Ocon Rvr Upstream Plant	13				0.026	0.02	0.004	0.018	0.027	0.037	0.02	0.02	0.03	0.029	0.03	0.0275
Lac LaBelle Dam	12				0.032	0.022	0.008	0.026	0.019	0.056	0.036	0.02	0.03	0.022	0.03	0.026
Fowler Lake Dam	10				0.06	0.019	0.006	0.011	0.017	0.023	0.02	0.02	0.03	0.026	0.03	0.028
Ocon Rvr Cemetary	9				0.029	0.037	0.003	0.011	0.015		0.02	0.02	0.03	0.047	0.03	0.03
Ocon Lake Dam	8		0.02	0.03	0.018	0.016	0.026	0.02	0.025		0.02	0.02	0.03	0.01	0.03	0.023
Okauchee Dam Hwy 16	7		0.04	0.02	0.026	0.02	0.004	0.042	0.024	0.025	0.02	0.02	0.03	0.015	0.03	0.023
Ocon Rvr Hwy K	6		0.02	0.05	0.015	0.019	0.003	0.03	0.053	0.067	0.049	0.064	0.03	0.022	0.039	0.021
Ocon Rvr Hwy 83	5	0.17			0.032	0.033	0.007	0.022	0.037		0.039	0.057	0.03	0.063	0.055	0.033
Hwy Q Monches Pond	2				0.028	0.052	0.08	0.023	0.037		0.026	0.052	0.03	0.045	0.034	0.0395
Hubertus Rd	0						0.001	0.061	0.093		0.116	0.12	0.03	0.044	0.036	0.033
Hwy 167	01						0.05	0.063	0.084	0.089	0.186	0.11	0.058	0.176	0.105	0.0815
Hillside Rd	02														0.148	0.148

Offshoot and Rock River Sites	Site #	5/13/2014	6/11/2014	7/16/2014	8/12/2014	9/16/2014	10/16/2014	11/13/2014	12/15/2014	1/15/2015	3/16/2015	4/16/2015	5/15/2015	6/15/2015	7/15/2015	Median (May-Oct)
Rock River Hwy P/E	19			0.27	0.371	0.301	0.172	0.178	0.092		0.15	0.159	0.189	0.241	0.347	0.27
Rock River Hwy F	17			0.3	0.381	0.305	0.213	0.205	0.1		0.073	0.156	0.254	0.289	0.399	0.3
Battle Cr Hwy B	15				0.051	0.065	0.034	0.03	0.125		0.02	0.041	0.03	0.071	0.045	0.048
Rosenow Cr Blackhawk	11		0.06	0.08	0.063	0.071	0.03	0.061	0.053		0.02	0.024	0.03	0.095	0.049	0.0615
Mason Cr N. Woods Dr.	4				0.072	0.054	0.038	0.037	0.056		0.154	0.038	0.03	0.113	0.086	0.063
Mason Cr CW	3	0.13			0.039	0.143	0.042	0.033	0.041		0.018	0.021	0.03	0.07	0.052	0.052
Flynn Creek Emerald Rd	1				0.07	0.041	0.023	0.018	0.039	0.065	0.065	0.023	0.03	0.112	0.086	0.0555
Daniel Boone Cons. League	DB 1															
Coney River 8	CR 8													0.199	0.057	0.128
Coney River 7	CR 7															
Coney River 6	CR 6															
Coney River 5	CR 5															
Coney River 4	CR 4															
Coney River 3	CR 3															
Coney River 2	CR 2															
Coney River 1	CR 1															

* All values reported are for Total Phosphorus expressed in mg/L

Appendix D

Soil Information

Soil Symbol	Soil Name	Area (ac)	% Cover	K factor (K.w)	Class of Accelerated Erosion (SSM)	Hydric Rating	Hydrologic soil group	Drainage Condition	Frequency of flooding
Ac	Adrian muck	173.59	0.21%	-	-	Yes	A/D	Very poorly drained	None
AcA	Ackmore silt loam, 0 to 3 percent slopes	17.77	0.02%	0.32	-	Yes	C	Somewhat poorly drained	Occasional
Ad	Adrian muck	317.76	0.38%	-	-	Yes	A/D	Very poorly drained	Frequent
Ak	Adrian mucky peat	45.25	0.05%	-	-	Yes	A/D	Poorly drained	None
Am	Alluvial land	6.67	0.01%	0.28	-	Yes	-	Moderately well drained	Frequent
AzA	Aztalan fine sandy loam, 0 to 3 percent slopes	28.61	0.03%	0.24	-	No	C	Somewhat poorly drained	Rare
BaA	Barry silt loam, 0 to 3 percent slopes	27.21	0.03%	0.32	-	Yes	B/D	Poorly drained	Rare
BmB	Boyer loamy sand, 2 to 6 percent slopes	12.21	0.01%	0.15	-	No	A/D	Well drained	None
BmC2	Boyer loamy sand, 6 to 12 percent slopes, eroded	9.64	0.01%	0.15	-	No	A/D	Well drained	None
BnB	Boyer sandy loam, 1 to 6 percent slopes	101.74	0.12%	0.15	-	No	A/D	Well drained	None
BoC	Boyer loamy sand, 6 to 12 percent slopes	21.55	0.03%	0.17	-	No	A/D	Well drained	None
BpB	Boyer sandy loam, 1 to 6 percent slopes	47.61	0.06%	0.17	-	No	A/D	Well drained	None
BrE2	Boyer complex, 12 to 30 percent slopes, eroded	4.86	0.01%	0.15	-	No	A/D	Well drained	None
BsA	Brookston silt loam, 0 to 3 percent slopes	909.79	1.09%	0.32	-	Yes	B/D	Poorly drained	None
CaB2	Casco loam, 2 to 6 percent slopes, eroded	121.84	0.15%	0.32	Class 3	No	B	Somewhat excessively drained	None
CaC2	Casco loam, 6 to 12 percent slopes, eroded	104.28	0.12%	0.32	-	No	B	Somewhat excessively drained	None
CcB	Casco loam, 2 to 6 percent slopes	67.39	0.08%	0.28	Class 1	No	B	Somewhat excessively drained	None
CcC2	Casco loam, 6 to 12 percent slopes, eroded	68.50	0.08%	0.32	Class 2	No	B	Somewhat excessively drained	None
CcD2	Casco loam, 12 to 20 percent slopes, eroded	52.61	0.06%	0.24	Class 2	No	B	Somewhat excessively drained	None
CeB	Casco loam, 2 to 6 percent slopes	897.03	1.07%	0.32	Class 1	No	B	Somewhat excessively drained	None
CeB2	Casco loam, 2 to 6 percent slopes, eroded	471.46	0.56%	0.32	Class 3	No	B	Somewhat excessively drained	None

Soil Symbol	Soil Name	Area (ac)	% Cover	K factor (K.w)	Class of Accelerated Erosion (SSM)	Hydric Rating	Hydrologic soil group	Drainage Condition	Frequency of flooding
CeC2	Casco loam, 6 to 12 percent slopes, eroded	2487.55	2.97%	0.32	Class 2	No	B	Somewhat excessively drained	None
CeD2	Casco loam, 12 to 20 percent slopes, eroded	2134.83	2.55%	0.32	Class 2	No	B	Somewhat excessively drained	None
CfC3	Casco soils, 6 to 12 percent slopes, severely eroded	34.20	0.04%	0.28	-	No	B	Well drained	None
CkC2	Casco-Fox loams, 6 to 12 percent slopes, eroded	282.25	0.34%	0.32	-	No	B	Well drained	None
CrC2	Casco-Rodman complex, 6 to 12 percent slopes, eroded	62.83	0.08%	0.32	Class 2	No	B	Somewhat excessively drained	None
CrD	Casco-Rodman complex, 12 to 20 percent slopes	512.52	0.61%	0.32	-	No	B	Well drained	None
CrD2	Casco-Rodman complex, 12 to 20 percent slopes, eroded	474.06	0.57%	0.32	Class 2	No	B	Somewhat excessively drained	None
CrE	Casco-Rodman complex, 20 to 30 percent slopes	2961.01	3.54%	0.32	Class 1	No	B	Somewhat excessively drained	None
CrF	Casco-Rodman complex, 30 to 45 percent slopes	813.43	0.97%	0.32	Class 1	No	B	Somewhat excessively drained	None
CtB	Chelsea loamy fine sand, 1 to 6 percent slopes	1.19	0.00%	0.1	-	No	A	Excessively drained	None
Cv	Clayey land	0.79	0.00%	-	-	No	D	Moderately well drained	None
Cw	Colwood silt loam, 0 to 2 percent slopes	145.21	0.17%	0.32	None - deposition	Yes	C/D	Poorly drained	None
DdA	Dodge silt loam, 0 to 2 percent slopes	281.98	0.34%	0.43	-	No	B	Well drained	None
DdB	Dodge silt loam, 2 to 6 percent slopes	999.29	1.19%	0.43	-	No	B	Well drained	None
DsA	Dresden silt loam, 1 to 3 percent slopes	133.97	0.16%	0.32	-	No	B	Well drained	None
Dt	Drummer silt loam, gravelly substratum	327.28	0.39%	0.32	-	Yes	B/D	Poorly drained	None
EbA	Elburn silt loam, 0 to 3 percent slopes	0.01	0.00%	0.32	-	No	C	Somewhat poorly drained	None
Ev	Elvers silt loam	6.43	0.01%	0.55	-	Yes	B/D	Very poorly drained	Frequent
FaA	Fabius loam, 1 to 3 percent slopes	57.88	0.07%	0.32	-	Yes	B	Somewhat poorly drained	None

Soil Symbol	Soil Name	Area (ac)	% Cover	K factor (K.w)	Class of Accelerated Erosion (SSM)	Hydric Rating	Hydrologic soil group	Drainage Condition	Frequency of flooding
FmA	Fox sandy loam, 0 to 2 percent slopes	113.77	0.14%	0.24	-	No	B	Well drained	None
FmB	Fox sandy loam, 2 to 6 percent slopes	108.68	0.13%	0.24	-	No	B	Well drained	None
FmC2	Fox sandy loam, 6 to 12 percent slopes, eroded	45.46	0.05%	0.24	-	No	B	Well drained	None
Fn	Fluvaquents	5.73	0.01%	-	-	Yes	D	Poorly drained	Frequent
FoA	Fox loam, 0 to 2 percent slopes	646.60	0.77%	0.37	-	No	B	Well drained	None
FoB	Fox loam, 2 to 6 percent slopes	848.46	1.01%	0.37	-	No	B	Well drained	None
FoC2	Fox loam, 6 to 12 percent slopes, eroded	256.88	0.31%	0.37	-	No	B	Well drained	None
FsA	Fox silt loam, 0 to 2 percent slopes	6055.01	7.23%	0.43	-	No	B	Well drained	None
FsB	Fox silt loam, 2 to 6 percent slopes	8688.88	10.37%	0.32	Class 1	No	B	Well drained	None
FsC2	Fox silt loam, 6 to 12 percent slopes, eroded	412.63	0.49%	0.43	-	No	B	Well drained	None
FsD2	Fox silt loam, 12 to 18 percent slopes, eroded	8.46	0.01%	0.43	-	No	B	Well drained	None
FtB	Fox silt loam, loamy substratum, 2 to 6 percent slopes	6.64	0.01%	0.43	-	No	B	Well drained	None
Gd	Gilford sandy loam	93.14	0.11%	0.1	-	Yes	A/D	Very poorly drained	Frequent
GP	Gravel pit	312.22	0.37%	0.02	-	Yes	-	-	None
GrA	Grays silt loam, 0 to 2 percent slopes	50.24	0.06%	0.37	-	No	B/D	Moderately well drained	None
GrB	Grays silt loam, 2 to 6 percent slopes	31.12	0.04%	0.37	-	No	C	Moderately well drained	None
HeB	Hebron loam, 1 to 6 percent slopes	20.15	0.02%	0.37	-	No	C	Well drained	None
HmB	Hochheim loam, 2 to 6 percent slopes	433.16	0.52%	0.32	-	No	D	Well drained	None
HmB2	Hochheim loam, 2 to 6 percent slopes, eroded	1270.66	1.52%	0.32	-	No	D	Well drained	None
HmC2	Hochheim loam, 6 to 12 percent slopes, eroded	4121.40	4.92%	0.32	Class 2	No	D	Well drained	None
HmD2	Hochheim loam, 12 to 20 percent slopes, eroded	2294.84	2.74%	0.37	Class 2	No	D	Well drained	None
HmE	Hochheim loam, 20 to 30 percent slopes	253.79	0.30%	0.37	Class 2	No	D	Well drained	None

Soil Symbol	Soil Name	Area (ac)	% Cover	K factor (K.w)	Class of Accelerated Erosion (SSM)	Hydric Rating	Hydrologic soil group	Drainage Condition	Frequency of flooding
HmE2	Hochheim loam, 20 to 30 percent slopes, eroded	280.22	0.33%	0.37	Class 2	No	D	Well drained	None
HnB	Hochheim silt loam, 2 to 6 percent slopes	0.61	0.00%	0.43	Class 2	No	C	Well drained	None
HnC2	Hochheim silt loam, 6 to 12 percent slopes, eroded	0.55	0.00%	0.49	Class 2	No	C	Well drained	None
HnD2	Hochheim silt loam, 12 to 20 percent slopes, eroded	2.32	0.00%	0.49	Class 2	No	D	Well drained	None
HoC3	Hochheim soils, 6 to 12 percent slopes, severely eroded	105.02	0.13%	0.17	-	No	B	Well drained	None
HoD3	Hochheim soils, 12 to 20 percent slopes, severely eroded	210.76	0.25%	0.17	-	No	B	Well drained	None
HoE3	Hochheim soils, 20 to 30 percent slopes, severely eroded	10.50	0.01%	0.17	-	No	B	Well drained	None
HrD	Hochheim-Hennepin complex, 12 to 20 percent slopes	152.05	0.18%	0.32	-	No	B	Well drained	None
HrE	Hochheim-Hennepin complex, 20 to 30 percent slopes	120.41	0.14%	0.32	-	No	B	Well drained	None
HrF	Hochheim-Hennepin complex, 30 to 45 percent slopes	145.43	0.17%	0.32	-	No	B	Well drained	None
Ht	Houghton muck	999.74	1.19%	-	-	Yes	A/D	Very poorly drained	Frequent
HtA	Houghton muck, 0 to 2 percent slopes	2167.48	2.59%	-	-	Yes	A/D	Very poorly drained	None
HtB	Houghton muck, 2 to 6 percent slopes	2.96	0.00%	-	-	Yes	A/D	Very poorly drained	None
Hu	Houghton muck	2990.43	3.57%	-	-	Yes	A/D	Very poorly drained	Frequent
Hv	Houghton peat, acid variant	6.98	0.01%	-	-	Yes	A/D	Very poorly drained	Rare
IoA	Ionia silt loam, 0 to 3 percent slopes	51.62	0.06%	0.43	-	No	C	Moderately well drained	None
JuA	Juneau silt loam, 1 to 3 percent slopes	466.56	0.56%	0.49	-	No	B/D	Well drained	Occasional
JuB	Juneau silt loam, 1 to 6 percent slopes	21.55	0.03%	0.49	-	No	B	Well drained	Occasional
Kb	Keowns silt loam	270.42	0.32%	0.28	-	Yes	B/D	Poorly drained	Frequent
KdA	Kibbie fine sandy loam, 0 to 3 percent slopes	62.54	0.07%	0.2	-	No	B/D	Somewhat poorly drained	Rare
KfB	Kidder loam, 2 to 6 percent slopes	82.65	0.10%	0.32	-	No	B	Well drained	None

Soil Symbol	Soil Name	Area (ac)	% Cover	K factor (K.w)	Class of Accelerated Erosion (SSM)	Hydric Rating	Hydrologic soil group	Drainage Condition	Frequency of flooding
KfC2	Kidder loam, 6 to 12 percent slopes, eroded	58.49	0.07%	0.32	-	No	B	Well drained	None
KgB	Kidder loam, moderately well-drained, 2 to 6 percent slopes	0.83	0.00%	0.32	-	No	B	Moderately well drained	None
KlA	Kendall silt loam, 1 to 3 percent slopes	438.64	0.52%	0.43	-	Yes	B/D	Somewhat poorly drained	None
Km	Keowns silt loam	4.90	0.01%	0.32	-	Yes	B/D	Poorly drained	None
LaB	Lamartine silt loam, 2 to 6 percent slopes	510.97	0.61%	0.32	None - deposition	No	C	Somewhat poorly drained	None
LDF	Landfill	1.96	0.00%	-	-	-	-	-	-
LmA	Lamartine silt loam, 0 to 2 percent slopes	573.60	0.68%	0.32	-	Yes	C	Somewhat poorly drained	None
LmB	Lamartine silt loam, 2 to 6 percent slopes	174.72	0.21%	0.32	None - deposition	Yes	C	Somewhat poorly drained	None
Lu	Loamy land	108.33	0.13%	-	-	No	B	Moderately well drained	None
LyB2	Lorenzo loam, 2 to 6 percent slopes, eroded	10.32	0.01%	0.24	-	No	B	Well drained	None
Mf	Marsh	175.97	0.21%	-	-	Yes	-	Very poorly drained	None
MgA	Martinton silt loam, 1 to 3 percent slopes	56.42	0.07%	0.28	-	Yes	C/D	Somewhat poorly drained	None
MhA	Matherton sandy loam, 1 to 3 percent slopes	214.26	0.26%	0.15	-	No	B/D	Somewhat poorly drained	None
MmA	Matherton silt loam, 0 to 3 percent slopes	2141.18	2.56%	0.32	-	No	B/D	Somewhat poorly drained	Rare
MoA	Mayville silt loam, 0 to 2 percent slopes	100.61	0.12%	0.43	-	No	C	Moderately well drained	None
MoB	Mayville silt loam, 2 to 6 percent slopes	821.11	0.98%	0.43	-	No	C	Moderately well drained	None
MtA	Mequon silt loam, 1 to 3 percent slopes	3.44	0.00%	0.43	-	No	C/D	Somewhat poorly drained	None
MxD2	Miami loam, sandy loam substratum, 12 to 20 percent slopes, eroded	23.34	0.03%	0.37	-	No	B	Well drained	None
MxE	Miami loam, sandy loam substratum, 20 to 30 percent slopes	1.99	0.00%	0.37	-	No	B	Well drained	None

Soil Symbol	Soil Name	Area (ac)	% Cover	K factor (K.w)	Class of Accelerated Erosion (SSM)	Hydric Rating	Hydrologic soil group	Drainage Condition	Frequency of flooding
Mzb	Montgomery silty clay loam	18.42	0.02%	0.24	-	Yes	C/D	Poorly drained	Frequent
MzfA	Mundelein silt loam, 1 to 3 percent slopes	55.62	0.07%	0.32	-	No	B/D	Somewhat poorly drained	None
Mzk	Mussey loam	114.48	0.14%	0.24	-	Yes	B/D	Poorly drained	None
MzkA	Mussey loam, 0 to 3 percent slopes	88.65	0.11%	0.28	-	Yes	B/D	Poorly drained	None
Na	Navan silt loam	17.69	0.02%	0.37	-	Yes	C/D	Poorly drained	Rare
NnA	Nenno silt loam, 1 to 3 percent slopes	22.78	0.03%	0.2	-	No	B/D	Somewhat poorly drained	None
Oc	Ogden muck	83.63	0.10%	-	-	Yes	C/D	Very poorly drained	None
OnB	Oshtemo sandy loam, 1 to 6 percent slopes	99.02	0.12%	0.28	-	No	A	Well drained	None
Ot	Otter silt loam	40.36	0.05%	0.28	-	Yes	B/D	Poorly drained	Frequent
OuB	Ozaukee silt loam, 2 to 6 percent slopes	8.06	0.01%	0.43	-	No	C	Well drained	None
OuB2	Ozaukee silt loam, 2 to 6 percent slopes, eroded	13.38	0.02%	0.43	-	No	C	Well drained	None
OuC2	Ozaukee silt loam, 6 to 12 percent slopes, eroded	18.97	0.02%	0.43	-	No	C	Well drained	None
OuD2	Ozaukee silt loam, 12 to 20 percent slopes, eroded	4.72	0.01%	0.43	-	No	C	Well drained	None
Pa	Palms muck, 0 to 2 percent slopes	878.20	1.05%	-	None - deposition	Yes	B/D	Very poorly drained	None
Pc	Palms mucky peat, 0 to 2 percent slopes	1224.28	1.46%	-	-	Yes	B/D	Very poorly drained	None
Pg	Pits, gravel	15.69	0.02%	0.02	-	Yes	-	-	None
Ph	Pella silty clay loam, cool, 0 to 2 percent slopes	1355.02	1.62%	0.32	None - deposition	Yes	C/D	Poorly drained	None
PrA	Pistakee silt loam, 1 to 3 percent slopes	299.67	0.36%	0.49	-	No	C	Somewhat poorly drained	Occasional
RaA	Radford silt loam, 0 to 3 percent slopes	392.79	0.47%	0.43	-	No	C	Somewhat poorly drained	Frequent
RtB	Rotamer loam, 2 to 6 percent slopes	129.26	0.15%	0.37	-	No	B	Well drained	None
RtC2	Rotamer loam, 6 to 12 percent slopes, eroded	287.93	0.34%	0.37	-	No	B	Well drained	None

Soil Symbol	Soil Name	Area (ac)	% Cover	K factor (K.w)	Class of Accelerated Erosion (SSM)	Hydric Rating	Hydrologic soil group	Drainage Condition	Frequency of flooding
RtD2	Rotamer loam, 12 to 20 percent slopes, eroded	122.46	0.15%	0.37	-	No	B	Well drained	None
RtE2	Rotamer loam, 20 to 30 percent slopes, eroded	5.30	0.01%	0.37	-	No	B	Well drained	None
Ru	Rollin muck, deep	18.74	0.02%	-	-	Yes	B/D	Very poorly drained	None
RxD2	Rodman-Casco complex, 12 to 30 percent slopes, eroded	46.61	0.06%	0.17	-	No	A	Excessively drained	None
ScA	St. Charles silt loam, 0 to 2 percent slopes	384.96	0.46%	0.37	None - deposition	Yes	B	Well drained	None
ScB	St. Charles silt loam, 2 to 6 percent slopes	373.42	0.45%	0.43	None - deposition	Yes	B	Well drained	None
SdA	St. Charles silt loam, moderately well drained, 0 to 2 percent slopes	2.14	0.00%	0.37	Class 1	No	B	Well drained	None
SeA	St. Charles silt loam, gravelly subtratum, 0 to 2 percent slopes	1931.15	2.31%	0.37	-	No	B	Well drained	None
SeB	St. Charles silt loam, gravelly subtratum, 2 to 6 percent slopes	379.24	0.45%	0.43	Class 1	No	B	Well drained	None
Sf	Sandy and gravelly land	159.14	0.19%	-	-	No	D	Moderately well drained	None
SfB	St. Charles silt loam, moderately well-drained, gravelly substratum, 2 to 6 percent slopes	12.40	0.01%	0.32	-	No	C	Moderately well drained	None
Sg	Sawmill silt loam, calcareous variant	0.85	0.00%	0.37	-	Yes	C/D	Poorly drained	Frequent
Sm	Sebewa silt loam	1752.10	2.09%	0.37	-	Yes	B/D	Poorly drained	Frequent
Sn	Sebewa silt loam, clayey substratum	17.70	0.02%	0.32	-	Yes	B/D	Poorly drained	Frequent
SoB	Sisson fine sandy loam, 1 to 6 percent slopes	15.77	0.02%	0.24	-	No	B	Well drained	None
SoC2	Sisson fine sandy loam, 6 to 12 percent slopes, eroded	11.57	0.01%	0.24	-	No	B	Well drained	None
SuD2	Sisson fine sandy loam, 12 to 25 percent slopes, eroded	0.39	0.00%	0.24	-	No	B	Well drained	None
SvB2	Sisson-Casco-Hochheim complex, 2 to 6 percent slopes, eroded	20.02	0.02%	0.43	-	No	B	Well drained	None

Soil Symbol	Soil Name	Area (ac)	% Cover	K factor (K.w)	Class of Accelerated Erosion (SSM)	Hydric Rating	Hydrologic soil group	Drainage Condition	Frequency of flooding
SvC2	Sisson-Casco-Hochheim complex, 6 to 12 percent slopes, eroded	68.01	0.08%	0.32	-	No	B	Well drained	None
SvD2	Sisson-Casco-Hochheim complex, 12 to 20 percent slopes, eroded	225.48	0.27%	0.32	-	No	B	Well drained	None
SvE	Sisson-Casco-Hochheim complex, 20 to 30 percent slopes	284.87	0.34%	0.32	-	No	B	Well drained	None
ThA	Theresa silt loam, 0 to 2 percent slopes	517.19	0.62%	0.49	Class 1	No	C	Well drained	None
ThB	Theresa silt loam, 2 to 6 percent slopes	4997.07	5.97%	0.49	None - deposition	No	C	Well drained	None
ThB2	Theresa silt loam, 2 to 6 percent slopes, eroded	2995.43	3.58%	0.49	Class 2	No	C	Well drained	None
ThC2	Theresa silt loam, 6 to 12 percent slopes, eroded	1318.55	1.57%	0.49	Class 2	No	C	Well drained	None
TuA	Tuscola silt loam, 0 to 2 percent slopes	4.34	0.01%	0.37	-	No	C	Moderately well drained	None
TuB	Tuscola silt loam, 2 to 6 percent slopes	4.17	0.00%	0.37	-	No	C	Moderately well drained	None
Ud	Udorthents	76.73	0.09%	-	-	No	A	Well drained	None
VrB	Virgil silt loam, 2 to 6 percent slopes	10.67	0.01%	0.43	-	Yes	C	Somewhat poorly drained	None
VsA	Virgil silt loam, gravelly substratum, 0 to 3 percent slopes	156.38	0.19%	0.37	-	No	B/D	Somewhat poorly drained	Occasional
VwA	Virgil silt loam, gravelly substratum, 0 to 3 percent slopes	33.49	0.04%	0.43	-	No	C	Somewhat poorly drained	Frequent
W	Water	6435.96	7.68%	-	-	-	-	-	-
Wa	Wacousta silty clay loam, 0 to 2 percent slopes	373.17	0.45%	0.32	-	Yes	B/D	Very poorly drained	None
WeB	Warsaw loam, 2 to 6 percent slopes	37.72	0.05%	0.24	-	No	B	Well drained	None
WhA	Warsaw silt loam, 0 to 2 percent slopes	528.38	0.63%	0.28	-	No	B	Well drained	None
WmA	Wasepi sandy loam, 0 to 3 percent slopes	188.93	0.23%	0.15	-	No	A/D	Somewhat poorly drained	Rare
WtA	Watseka variant loamy sand, 0 to 3 percent slopes	6.52	0.01%	0.05	-	Yes	A	Somewhat poorly drained	None

Soil Symbol	Soil Name	Area (ac)	% Cover	K factor (K.w)	Class of Accelerated Erosion (SSM)	Hydric Rating	Hydrologic soil group	Drainage Condition	Frequency of flooding
WvA	Wauconda silt loam, 0 to 2 percent slopes	2.57	0.00%	0.37	-	No	C	Somewhat poorly drained	None
WvB	Wauconda silt loam, 2 to 6 percent slopes	2.14	0.00%	0.37	-	Yes	C	Somewhat poorly drained	None
Ww	Wet alluvial land	128.17	0.15%	0.28	-	Yes	-	Poorly drained	Frequent
WxC2	Whalan loam, 6 to 12 percent slopes, eroded	1.05	0.00%	0.32	-	No	C	Well drained	None
ZuA	Zurich silt loam, 0 to 2 percent slopes	51.57	0.06%	0.43	-	No	B	Well drained	None
ZuB	Zurich silt loam, 2 to 6 percent slopes	0.46	0.00%	0.43	-	No	B	Well drained	None
ZuC2	Zurich silt loam, 6 to 12 percent slopes, eroded	4.27	0.01%	0.43	-	No	B	Well drained	None

Appendix E

Modeling Information

This section of the report will discuss the development and outputs of modeling software used to characterize the Oconomowoc River Watershed. Two main models were considered – the STEPL model and the SWAT model. The STEPL model was downloaded and utilized by the project team. Information about SWAT modeling done in the action area was obtained from the Rock River TMDL (The Cadmus Group, Inc., 2011). In this report, the WDNR used the SWAT model (for nonpoint sources) in conjunction with the SLAMM model (for point and urban sources) to generate baseline loading information and load allocations for the TMDL reaches in the Oconomowoc River Watershed. Our group utilized this information as a check for the results generated from the STEPL model.

Input data for the STEPL model was gathered from two main sources. First, all input fields were populated with sample data from the STEPL Model Input Data Server. Due to the organization of this data, the watershed was divided into each of the four HUC-12 areas represented in the Oconomowoc River Watershed for analysis (Watersheds W1, W2, W3, and W4 starting from the confluence with the Rock River). From this point, the input data was refined using the more accurate data received from partners of the project, particularly the county LWC Departments, and the most current GIS data. These revisions resulted in a significantly greater cropland to urban land use ratio and a greater amount of beef and dairy cattle incorporated in the model compared to the STEPL Model Input Data Server.

The sample data from the STEPL Input Data Server was used to populate the septic system information for the watershed as well as most of the default parameters for the USLE and Curve Number Method inputs. These default parameters included the soil and runoff concentrations of nitrogen, phosphorus, and biological oxygen demand. Some areas where the defaults were customized included the land use, agricultural statistics, and manure application rate. In particular, the user-defined land use column was used to reflect the large amount of wetlands in the action area. The model parameters for this custom wetland land use category were selected to reflect a meadow-type land area with relatively conservative soil and runoff nutrient concentrations. It was also assumed that manure was applied to cropland four months out of the year. While some amount of manure is applied to land throughout the year in this watershed, we assumed that the principal months of manure application occurred in the fall after harvest and in the spring before planting.

As mentioned in the body of the report, Table 1 was developed for the purpose of generating a single reduction efficiency for each pollutant and watershed in the model. This table can be seen below, and is organized based on increasing phosphorus reduction efficiency per land area. The approach used in developing this table involved considering several combinations of management measures that may be implemented on a field scale, and modeling them in the STEPL BMP (Best Management Practice) calculator. The various outputs of the BMP Calculator were then averaged, yielding the removal efficiencies used in the STEPL model. This approach was suggested by WDNR representatives during a nonpoint modeling training session. They referenced a similar approach taken by the Outagamie County Land Conservation

Department (2014), which was seen as an effective means of approximating removal efficiencies in the planning stages of a watershed restoration plan.

In addition to combinations of the default management measures in the STEPL program, two custom nutrient management reduction factors were considered in the development of Table 1. These nutrient management options were also adopted from the Outagamie County Land Conservation Department Report, with original authors being Evans and Corradini (2001). The first nutrient management option is a balanced plan, with reductions in nitrogen and phosphorus averaging 19% and 28%, respectively. The second option is a phosphorus-based plan with phosphorus reduction of about 75%. Several more combinations were considered in developing the average removal efficiencies used in the STEPL model than in the approach taken by the Outagamie County Land Conservation Department, reflecting the flexibility to be given to farmers when working with them. However, the overall results were very similar to the Outagamie County Land Conservation Department Report, which used values of 71% and 84% for phosphorus and sediment reduction, respectively.

Table 1. Average Nitrogen, Sediment, and Phosphorus Reductions for Various Management Measure Combinations

Management Measure	N Reduction	Sediment Reduction	P Reduction	P Reduction (lb/acre-year)
Nutrient Management (Balanced)	19.0%	0.0%	28.0%	0.44
Cover Crop	30.0%	35.0%	25.0%	0.58
Diversion	10.0%	35.0%	30.0%	0.65
Nutrient Management (Balanced), Cover Crop	43.3%	35.0%	46.0%	0.90
Diversion, Cover Crop	37.0%	57.7%	47.5%	1.05
Reduced Tillage	55.0%	75.0%	45.0%	1.10
Contour Farming	48.5%	40.5%	55.0%	1.07
Cover Crop, Reduced Tillage	68.5%	83.7%	58.7%	1.36
Nutrient Management (Balanced), Reduced Tillage	63.6%	75.0%	60.4%	1.34
Nutrient Management (P-Based)	0.0%	0.0%	75.0%	1.17
Diversion, Reduced Tillage	59.5%	83.7%	61.5%	1.40
Contour Farming, Cover Crop	64.0%	61.3%	66.3%	1.36
Filter Strip	70.0%	65.0%	75.0%	1.51
Nutrient Management (Balanced), Cover Crop, Contour Farming	70.8%	61.3%	75.7%	1.51
Nutrient Management (P-Based), Cover Crop	30.0%	35.0%	81.3%	1.45
Contour Farming, Reduced Tillage	76.8%	85.1%	75.2%	1.62
Nutrient Management (Balanced), Filter Strip	75.7%	65.0%	82.0%	1.62
Filter Strip, Cover Crop	79.0%	77.2%	81.3%	1.68

Management Measure	N Reduction	Sediment Reduction	P Reduction	P Reduction (lb/acre-year)
Diversion, Filter Strip	73.0%	77.2%	82.5%	1.70
Nutrient Management (P-Based), Reduced Tillage	55.0%	75.0%	86.3%	1.74
Filter Strip, Diversion, Cover Crop	81.1%	85.2%	86.9%	1.81
Filter Strip, Reduced Tillage	86.5%	91.3%	86.3%	1.83
Contour Farming, Filter Strip	84.5%	79.2%	88.7%	1.80
Nutrient Management (P-Based), Filter Strip	70.0%	65.0%	93.8%	1.81
Nutrient Management (Balanced), Reduced Tillage, Filter Strip	89.1%	91.3%	90.1%	1.89
Filter Strip, Reduced Tillage, Cover Crop	90.5%	94.3%	89.7%	1.90
Filter Strip, Diversion, Reduced Till	87.8%	94.3%	90.4%	1.91
Filter Strip, Diversion, Contour Farming	86.1%	86.5%	92.1%	1.89
Nutrient Management (P-Based), Reduced Tillage, Filter Strip	86.5%	91.3%	96.6%	1.99
Average:	**61.8%**	**65.6%**	**70.8%**	**1.45**

The average removal efficiencies developed in Table 1 were applied to the cropland and pastureland management measure areas for each of the four HUC-12s modeled in the action area. It was assumed that an average of 44% of the cropland and pastureland CSAs identified in Table 14 of the main body of the report would participate in the OWPP. With this assumption, the outputs shown below were generated from the STEPL model.

Table 2. Pollutant Loading and Reduction Before and After BMP Implementation.

Watershed	N Load (no BMP)	P Load (no BMP)	BOD Load (no BMP)	Sediment Load (no BMP)	N Load (with BMP)	P Load (with BMP)	BOD (with BMP)	Sediment Load (with BMP)
	lb/year	lb/year	lb/year	t/year	lb/year	lb/year	lb/year	t/year
W1	90287.4	19988.7	192846.5	3787.1	85440.6	18664.5	191197.9	3529.5
W2	50903.2	10269.0	127596.8	1884.9	50213.6	10080.6	127362.2	1848.2
W3	83608.2	17543.0	189510.4	3320.8	82894.5	17348.0	189267.6	3282.9
W4	182178.5	41087.3	360970.5	7867.1	180597.2	40667.2	360448.4	7785.6
Total	406977.3	88888.0	870924.2	16859.9	399145.9	86760.2	868276.0	16446.1

Watershed	N Reduction	P Reduction	BOD Reduction	Sediment Reduction	%N Reduction	%P Reduction	%BOD Reduction	%Sed Reduction
	lb/year	lb/year	lb/year	t/year	%	%	%	%
W1	4846.8	1324.2	1648.7	257.6	5.4	6.6	0.9	6.8
W2	689.6	188.4	234.6	36.7	1.4	1.8	0.2	1.9
W3	713.7	195.0	242.8	37.9	0.9	1.1	0.1	1.1
W4	1581.3	420.1	522.1	81.6	0.9	1.0	0.1	1.0
Total	7831.4	2127.7	2648.2	413.8	1.9	2.4	0.3	2.5

Table 3. Pollutant Loading Distribution By Land Use After Modeled Bmp Implementation.

Sources	N Load (lb/yr)	P Load (lb/yr)	BOD Load (lb/yr)	Sediment Load (t/yr)
Urban	30393.64	4679.68	117464.66	697.29
Cropland	287087.37	70245.03	514370.24	14497.79
Pastureland	62857.87	5778.33	200209.62	1073.30
Forest	2724.09	1328.30	6663.51	91.70
Feedlots	8440.16	1688.03	11253.55	0.00
User Defined	6188.82	2471.40	12377.64	86.07
Septic	1453.92	569.45	5936.82	0.00
Gully	0.00	0.00	0.00	0.00
Streambank	0.00	0.00	0.00	0.00
Groundwater	0.00	0.00	0.00	0.00
Total	399145.87	86760.22	868276.04	16446.15

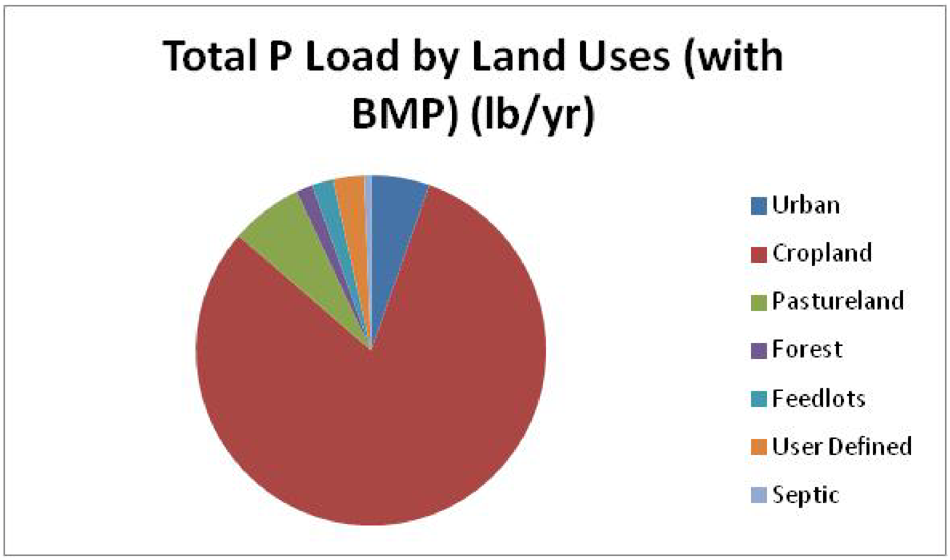


Figure 1. Total Phosphorus Load By Land Use After Modeled BMP Implementation

In the context of the existing monitoring data and the SWAT modeling results discussed later in this section of the report, the total baseline phosphorus load shown in Table 2 is high. Existing monitoring data shows an average phosphorus concentration of 0.08 mg/L at the point of compliance, which translates to an average load of about 18,750 lb P/year compared to the baseline STEPL output of 88,888 lb P/year. However, it is interesting to note that the baseline phosphorus load shown for Watershed 1 (the most downstream HUC-12 area) is about 20,000 lb/year, which is much closer to the monitoring results. This may illustrate the hydrological effect of the chain of lakes existing just upstream of Watershed 1, which are not accounted for in the STEPL model. These lake systems likely serve as nutrient sinks, which effectively reduce the loading seen downstream. With this in mind, the output of the STEPL model may be more meaningful when considered for each of the modeled watersheds instead of a single system.

The SWAT and SLAMM modeling results taken from the Rock River TMDL Report are summarized below in Tables 4 and 5 for phosphorus and TSS. Please note that the data is organized based on TMDL reach, with reach designations remaining the same as in the original report. Reach 27 is the most downstream reach in the watershed, and reach locations move upstream as the designation number decreases.

Table 4. Baseline Phosphorus Loading and Allocation Based on the Rock River TMDL.

TMDL Reach	Reach Description	Baseline P Load (lb/year)	Allocated P Load (lb/year)	Total Reduction (lb/year)	Total % Reduction
22	Flynn Creek	3083	446	2637	86%
23	Oconomowoc River (Mason Creek to Flynn Creek)	8986	3430	5556	62%
24	Mason Creek	6011	476	5535	92%
25	Oconomowoc River (Battle Creek to Mason Creek)	20447	4317	16130	79%
26	Battle Creek	2004	746	1258	63%
27	Oconomowoc River (Rock River to Battle Creek)	582	841	0	0%
	Total:	41113	10255	31117	75%

Table 5. Baseline TSS Loading and Allocation Based on the Rock River TMDL.

TMDL Reach	Reach Description	Baseline TSS Load (tn/year)	Allocated TSS Load (tn/year)	Total Reduction (tn/year)	Total % Reduction
22	Flynn Creek	506	67	439	87%
23	Oconomowoc River (Mason Creek to Flynn Creek)	1079	446	633	59%
24	Mason Creek	963	70	893	93%
25	Oconomowoc River (Battle Creek to Mason Creek)	946	545	401	42%
26	Battle Creek	212	121	92	43%
27	Oconomowoc River (Rock River to Battle Creek)	25	121	0	0%
	Total:	3732	1371	2457	63%

The total baseline load generated by SWAT and SLAMM models for the Oconomowoc River Watershed is about 41,100 lb/year, which falls between the total STEPL estimate and the loading seen at the point of confluence. This result is intuitive, as the SWAT model is more comprehensive, and better reflects the presence of bodies of water in the watershed. This disparity between model results may also be a result of the relatively flat terrain of the watershed, which would be taken into account in the SWAT model and not the STEPL model. Interestingly, the distribution of loads across land uses in each model is effectively reversed.

The STEPL model had the greatest phosphorus contributions in the agricultural areas of the watershed, namely the areas south and north of the City of Oconomowoc and the surrounding lakes. On the other hand, the SWAT model reduced the relative impact of nonpoint source contributions, instead emphasizing large loads from urban storm water and the WWTF in the City of Oconomowoc. In general, the STEPL model better reflects the load distribution based on the results of the official monitoring data shown in Figure 1 of the main body of the report.

The distribution of phosphorus loads from the Rock Rive TDML is reflected in the load allocation breakdown included in that report and shown in Table 6. The bolded categories are the sum of the sources below it, quantifying both the load (non-point sources) and waste load (point and urban sources) allocations. Table 6 also includes the average monthly reductions necessary to achieve the load allocations.

Table 6. Phosphorus Load Allocations Broken Down Into Load Allocation and Waste Load Allocation.

Source	**Reach 22 (lb/year)**	**Average Monthly P Reduction (%)**	**Reach 23 (lb/year)**	**Average Monthly P Reduction (%)**	**Reach 24 (lb/year)**	**Average Monthly P Reduction (%)**
Load Allocation	446	-	2085	-	318	-
Background	6	-	189	-	9	-
Agricultural/Non-Permitted Urban	439	30%	1896	29%	309	39%
Wasteload Allocation	0	-	1345	-	158	-
General Permit Sources	0	-	13	-	0	-
MS4	0	0%	1332	12%	158	11%
WWTF	0	0%	0	0%	0	0%

Source	**Reach 25 (lb/year)**	**Average Monthly P Reduction (%)**	**Reach 26 (lb/year)**	**Average Monthly P Reduction (%)**	**Reach 27 (lb/year)**	**Average Monthly P Reduction (%)**
Load Allocation	469	-	266	-	741	-
Background	43	-	68	-	22	-
Agricultural/Non-Permitted Urban	426	52%	197	32%	719	10%
Wasteload Allocation	3848	-	480	-	100	-
General Permit Sources	61	-	6	-	3	-
MS4	987	64%	474	35%	97	0%
WWTF	2800	77%	0	0%	0	0%