WATERSHED ADAPTIVE MANAGEMENT PLAN

Deerfield Wastewater Treatment Facility
Village of Deerfield, Wisconsin

February 2019

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1. INTRODUCTION AND BACKGROUND

1.1 Introduction

In 2010 the State of Wisconsin modified NR 102 and NR 217 to include new water quality based effluent limits for phosphorus. As a result, wastewater treatment facilities (WWTF) have begun to receive water quality based phosphorus limits in their new or re-issued Wisconsin Pollutant Discharge Elimination System (WPDES) permits from the Department of Natural Resources (DNR). As a part of the new rule, WPDES permits include a compliance schedule to evaluate compliance with these new effluent limits. The Deerfield WWTF received a re-issued permit in December of 2013. The current permit includes an interim phosphorus limit of 1.5 mg/L for monthly averages, a compliance schedule of 7-9 years with annual requirements, and target effluent limits of 0.075 mg/L for a 6-month average and 0.225 mg/L for monthly averages.

The Village of Deerfield evaluated compliance options in the November 2016 Phosphorus Compliance Alternatives Plan and selected Adaptive Management, due to the uncertainty of the impact that Total Maximum Daily Load (TMDL) allocations for Koshkonong Creek will have on the Village's discharge limit.

1.2 Existing Facilities

The Deerfield WWTF is located on the northeast side of the Village, on the east side of Highway 73, and discharges to a tributary of Mud Creek in the Upper Koshkonong Creek Watershed.

The WWTF was last upgraded in 2001. Wastewater treatment is achieved through preliminary, biological and effluent aeration processes. Preliminary treatment processes include mechanical screening and grit removal. Biological treatment processes include selector basins, diffused air activated sludge and final settling. Effluent post aeration is achieved through the use of a cascade outfall structure before discharge to the tributary of Mud Creek. A site plan and process flow diagram for the WWTF are provided in Appendix A.

The treatment process achieves biological nutrient removal (BNR) through the specific arrangement of anaerobic, anoxic and aerobic zones to promote uptake of phosphorus by the activated sludge microorganisms. Phosphorus is permanently removed from the liquid process through wasting of settled biomass from the final clarifiers. Waste activated sludge (WAS) is pumped to a gravity belt thickener (GBT) prior to aerobic digestion. The GBT filtrate is recycled back to the influent wetwell. Decant from the aerobic digesters can also be recycled back to the head of the plant should the operators choose to do so. Stabilized sludge is stored on site prior to land application.

Current operation of the BNR process achieves enhanced biological phosphorus removal for the majority of the year. However, there are periods when the addition of ferric chloride is required to reduce phosphorus to acceptable levels, particularly during the summer months. On days when the GBT is operated, ferric chloride is typically added to either the GBT filtrate or the selector basins. This chemical addition has reduced peaks in effluent phosphorus concentrations that used to occur following GBT operation.

Wastewater flowing to the Deerfield WWTF comes from a combination of residential, and commercial sources. The population of the Village is 2,319 people based upon the 2010 census. The Department of Administration (DOA) has a population projection of 2,930 by the year 2035. The WWTF has no significant industrial dischargers.

Current flow and loadings based on data from the past 3 years are summarized in Table 1-1, along with design values for the facility.

Table 1-1
Deerfield WWTF Loadings Summary

Parameter	Current	Design	% Design
Average Flow (MGD)	0.166	0.393	42%
BOD (lbs/day)	471	1,060	44%
TSS (lbs/day)	346	1,120	31%

1.3 Phosphorus Compliance Evaluation

Per the requirements of the 2013 WPDES permit Phosphorus Compliance Schedule, the Village of Deerfield conducted a phosphorus compliance evaluation for the treatment facility, which consisted of a series of annual reports.

The year one report consisted of generating an Optimization Plan for the facility. This Optimization Plan identified the following “Action Plans” to improve (reduce) phosphorus discharges from the WWTF:

1. Collection of Recycle Loading Data
    a. Weekly sampling of GBT filtrate
    b. Tracking of ferric chloride quantities added to GBT filtrate
2. Testing and Evaluation of BNR System
    a. Determine the potential for optimizing overall phosphorus removal
    b. Inter-basin testing across selector zones
3. Review and Optimize Polyphosphate Use at Well #4

The year two report consisted of a phosphorus planning update, which summarized the progress on the plant optimization, as well as identified the possible compliance options for the facility. The compliance options included:

1. Mechanical upgrade to the existing facility
2. New treatment technologies-alternate chemical addition
3. Consolidation with nearby sewerage system
4. Alternative discharge locations
5. Watershed based approaches
    a. Water Quality Trading

   b. Watershed Adaptive Management
6. Water quality variance
7. New multi-discharger phosphorus variance

The year three report consisted of a Phosphorus Compliance Alternatives Plan. In this plan, the alternatives from the year two report were evaluated based on economic and non-economic factors. Economic evaluations considered capital and operational costs through a present worth analysis. Non-economic evaluation considered the feasibility, long term benefit to the Village, and environmental benefits of each alternative.

The lowest cost, feasible alternative was found to be Water Quality Trading, followed by Watershed Adaptive Management and advanced treatment using SorbX®. The Water Quality Trading and Watershed Adaptive Management alternatives were similar in cost and the Village has determined that Watershed Adaptive Management is the most feasible alternative for the next permit term. The use of Watershed Adaptive Management for subsequent permit terms will depend on the status of TMDL allocations for Koshkonong Creek and the success of Adaptive Management. The Village may opt to switch to another compliance option following the first permit term. Additionally, there may be other communities in the Koshkonong Creek watershed that choose to do Watershed Adaptive Management, which may affect how the program is implemented for Deerfield and provide potential opportunities for partnership.

1.4 Adaptive Management Eligibility

A permittee is eligible for Watershed Adaptive Management as long as the following three requirements are met:

- The receiving water is exceeding the applicable water quality criterion (WQC) for phosphorus, which is 0.075 mg/L for Mud Creek.
- An upgrade to the existing facility would be required to comply with the new final effluent limit. It is expected that tertiary filtration (or similar means) in conjunction with chemical coagulation and/or polymer additions will be required to reach these levels. Tertiary treatment technologies include deep bed, continuously backwashing filters, cloth media disc filtration, and tertiary membrane filtration.
- Nonpoint sources contribute at least 50% of the total phosphorus entering the receiving water. The PRESTO-Lite Report estimates the Nonpoint Phosphorus Ratio for Adaptive Management to be 2:98.

Currently, the Deerfield WWTF's effluent phosphorus concentration is below all interim limits, with an average concentration of 0.22 mg/L in 2017. The Village will continue to run the treatment plant as it currently is, and will be able to meet the interim limits for all three permit terms.

Only one data point for Mud Creek in-stream phosphorus concentrations is available from the DNR's Surface Water Data Viewer mapping software, at Station

10010963 Mud Creek at Hillcrest Road, which is approximately 4 miles upstream of the WWTF compliance point. The total phosphorus concentration at this point was 0.070 mg/L when sampled in May 2011. The Village collected one set of samples in October 2017, and five additional samples in summer of 2018. This data can be located in Appendix G. The average in-stream phosphorus concentrations were 0.13 mg/L both upstream and downstream of where the WWTF discharge tributary joins Mud Creek. These points demonstrate that he receiving water is exceeding the applicable phosphorus criteria of 0.075 mg/L. The DNR has approved Mud Creek from Adaptive Management.

1.5 Adaptive Management Plan Components

The DNR has created a guideline for a successful Adaptive Management Program, which is outlined below and addressed in the subsequent chapters. The components to develop a successful management plan include:

1. Identify partners
2. Describe the watershed and set load reduction goals
3. Conduct a watershed inventory
4. Identify where reductions will occur
5. Describe management measures
6. Estimate load reductions expected by permit term
7. Measuring success
8. Financial security
9. Implementation schedule with milestones

A schedule of where these components will be addressed is included in Table 1-2.

Table 1-2
DNR Adaptive Management Components

Component	Addressed in
Identify Partners	Section 4.1
Describe the watershed and set load reduction goals	Sections 2 & 3
Conduct a watershed inventory	Section 3
Identify where reductions will occur	Section 4.2
Describe management measures	Section 4.3
Estimate load reductions expected by permit term	Section 3.4
Measuring success	Sections 3.2.2, 5.8 & 5.9
Financial security	Section 6
Implementation schedule with milestones	Section 5.10

2. WATERSHED DESCRIPTION

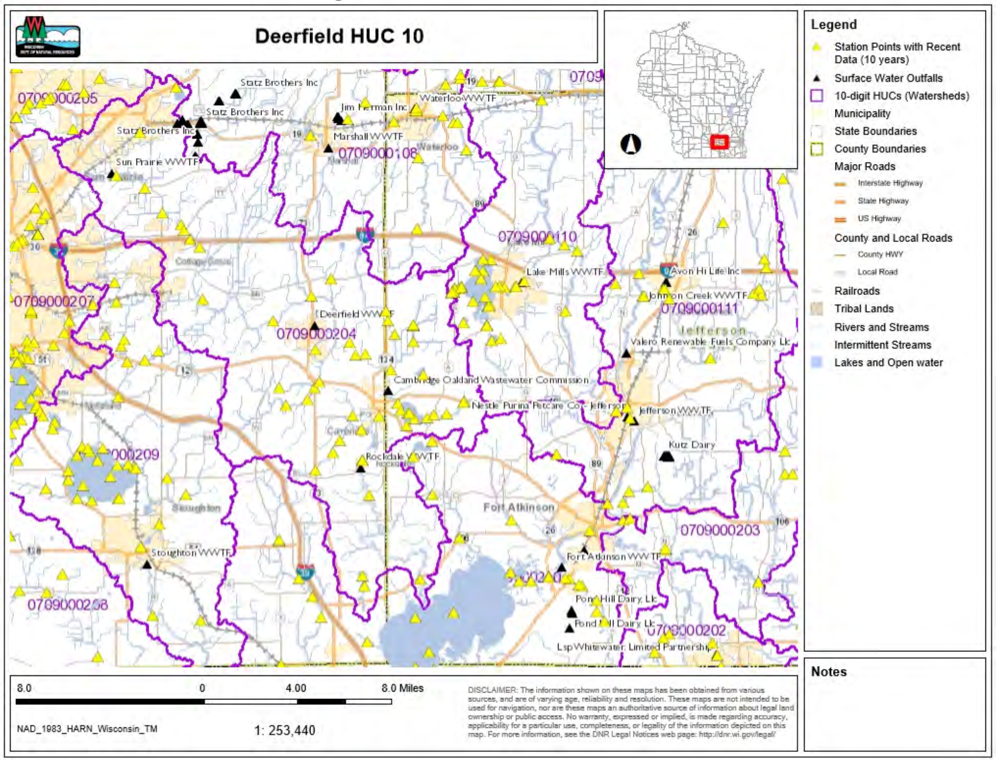
The Deerfield WWTF is located in the Upper Koshkonong Creek Watershed of the Lower Rock River Basin. The WWTF discharges to a tributary of Mud Creek, which then discharges to Koshkonong Creek approximately 1,000 feet downstream of the confluence with the WWTF's discharge tributary. The DNR has agreed that the point of compliance for watershed-based programs like Adaptive Management would be where the WWTF outfall tributary discharges to Mud Creek. Throughout this report, the term "Mud Creek watershed" will be used to refer to the watershed upstream of this compliance point, and will be considered the action area for this adaptive management plan. This action area comprises nearly the entire HUC 12 watershed listed below, and will be the target for initial management measures. If needed in future permits, the Village of Deerfield will expand the action area beyond the HUC 12 for additional phosphorus reductions.

This section presents general information about the Mud Creek watershed characteristics, which are important when evaluating phosphorus loading conditions and modeling future phosphorus reduction strategies. Data were collected from on-line tools and geographic information systems (GIS), such as the DNR Surface Water Data Viewer, and the Nations Resources Conservation Service (NRCS) Web Soil Survey. The data included watershed boundaries, soil data, land use, land cover, and temperature and precipitation statistics.

2.1 HUC and Watershed Information

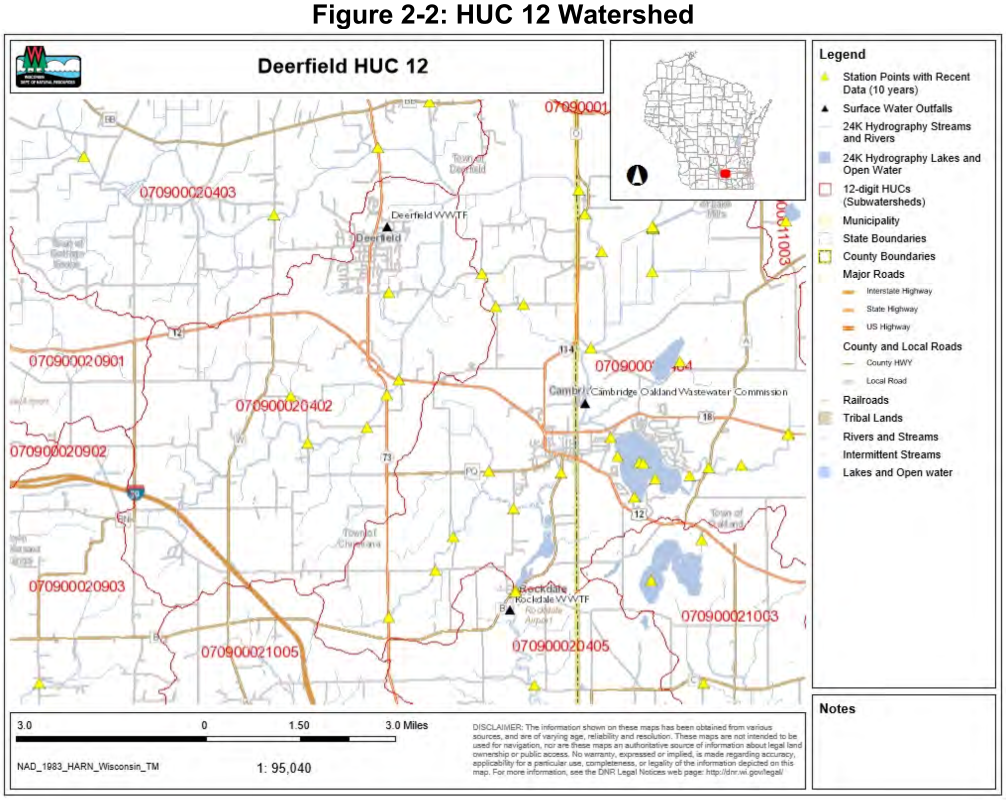
Maps of the HUC 10 (# 0709000204) and HUC 12 (# 070900020402) watersheds for the Deerfield WWTF are shown below in Figures 2-1 and Figures 2-2 and are included in Appendix B.

Figure 2-1: HUC 10 Watershed



This figure was provided by the DNR's Surface Water Data Viewer Application.

Figure 2-2: HUC 12 Watershed



This figure was provided by the DNR's Surface Water Data Viewer Application.

Figure 2-3 shows the Mud Creek watershed area, which is approximately 23.6 square miles.

Figure 2-3: Mud Creek Watershed

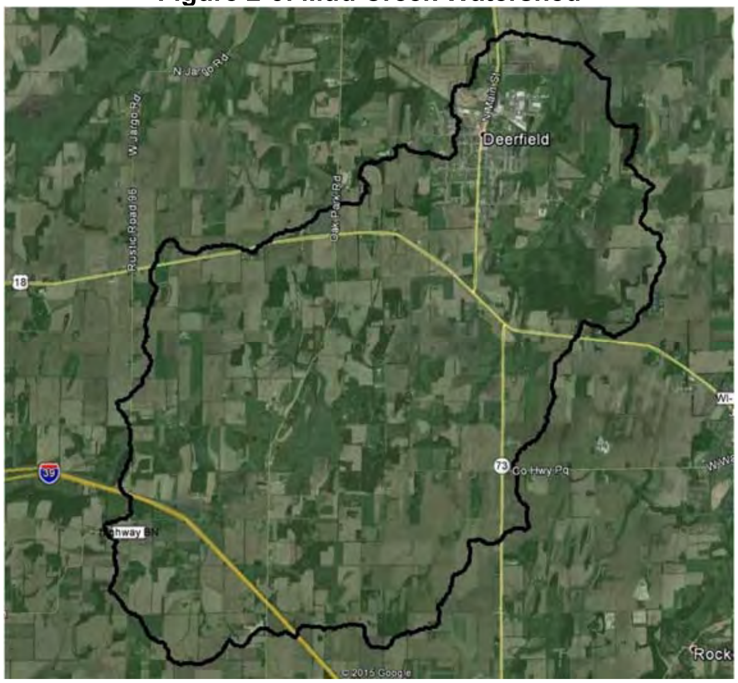


Figure from Purdue University Long Term Hydrologic Impact Analysis (L-THIA) on-line tool.

2.2 Receiving Water Description

As mentioned previously, the Deerfield WWTF discharges to a tributary of Mud Creek. At the point of discharge, the tributary is classified as a LAL (Limited Aquatic Life) system, while Mud Creek itself is classified as an LFF (Limited Forage Fish) community. A complete map of the impaired waters in the Mud Creek watershed is included in Appendix C. Per NR 102.06 Section (3) Paragraph (a), Mud Creek is not listed as having a total phosphorus criterion of 0.1 mg/L, so it shall meet a total phosphorus WQC of 0.075 mg/L.

2.3 Climate and Precipitation

Climatological information can play an important role when modeling phosphorus loads in runoff and calculating phosphorus reductions. Climate and precipitation data for the Mud Creek watershed from 2000 to 2016 were obtained from the National Oceanic and Atmospheric Administration (NOAA). Data from the Deerfield weather station were selected to represent the watershed. Average monthly temperatures range from a high of 72°F in July to a low of 20°F in January. Average monthly precipitation (both rainfall and snowfall) ranged from a high of 5.03 inches in June to a low of 1.24 inches in January. The average annual precipitation over the 17 years reported was 35.70 inches. Table 2-1 presents average monthly data for the reporting period.

Table 2-1
NOAA Climate Data

Month	Temperature			Precipitation		
	Min (°F)	Max (°F)	Average (°F)	Min (inches)	Max (inches)	Average (inches)
Jan	-19	55	20.3	0.21	2.87	1.24
Feb	-17	68	22.3	0.18	3.3	1.45
Mar	-8	83	34.9	0.55	6.19	2.28
Apr	10	87	47.8	1.68	6.43	3.89
May	27	94	58.3	1.4	10.84*	4.19
June	36	97	68.3	0.31	10.93*	5.03
July	43	104	72.2	1.08	7.98	4.04
Aug	40	93	70.4	0.88	15.18*	4.15
Sept	30	94	62.8	0.55	8.46	3.27
Oct	23	87	51.0	0.65	4.96	2.59
Nov	2	73	38.4	0.39	7.49	2.24
Dec	-20	65	24.7	0.61	3.63	1.96

(*) The three largest precipitation amounts occurred in August of 2007, June of 2008, and May of 2004.

It is important to recognize the impact of extreme weather events on erosion and subsequent transport of sediment, including phosphorus, into surface water. Extreme precipitation can result in excessive loads of phosphorus entering surface water, carried by runoff.

2.4 Soil Types

Data on soil types was available through the NRCS's Web Soil Survey (WSS) and Soil Survey Geographic Database (SSURGO). The predominant soil types in the watershed were silt loam and sandy loam. Soil data was used in conjunction with additional data, such as land cover, in several modeling applications. Soil data can be used in calculating the Phosphorus Index (PI) of the land, selecting locations for phosphorus reducing projects, and modeling future phosphorus reductions. A complete map and table of soil types for the Mud Creek watershed is attached in Appendix D.

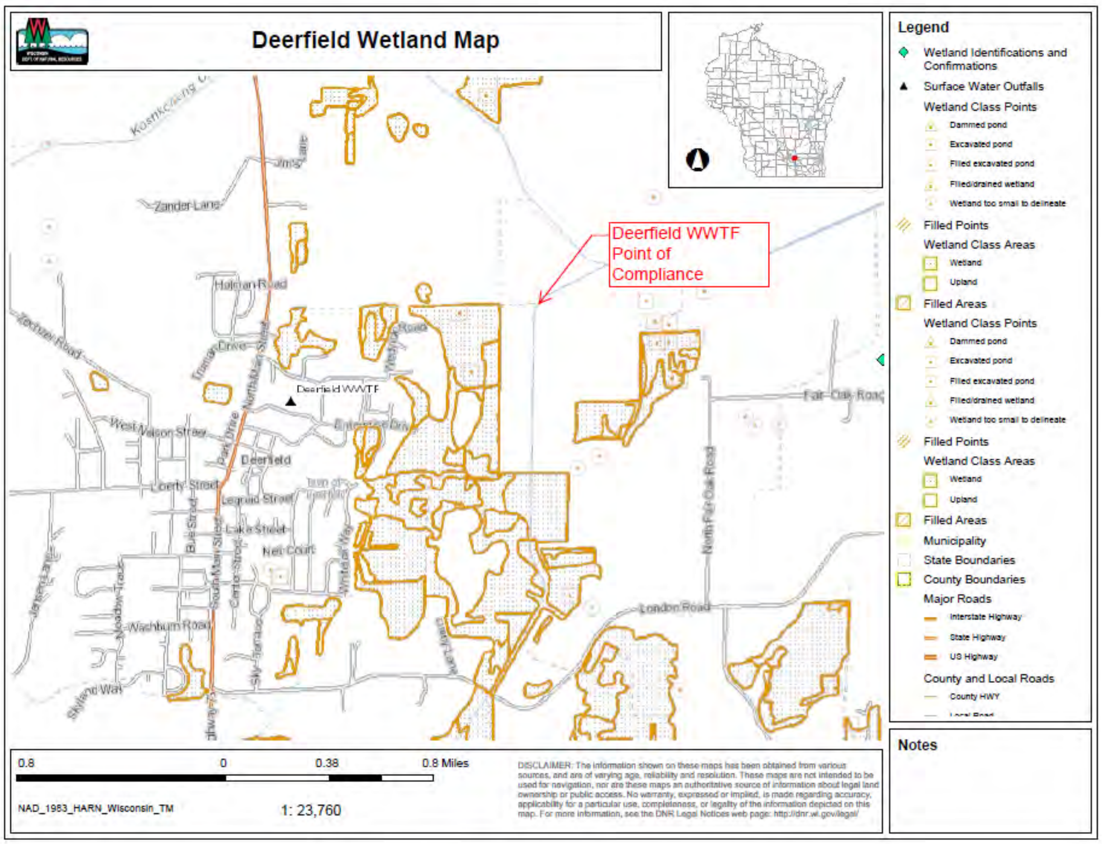
2.5 Land Use

Land use data was obtained through Purdue University's long Term Hydrologic Impact Analysis (L-THIA) model. As with soil type, land use was used in the modeling of phosphorus loads and reduction, as well as to help determine where management measures should take place. The Mud Creek watershed is primarily made up of agricultural land, pasture/hay land, and deciduous forest. These major land use types make up 61%, 11%, and 10% of the watershed, respectively. A complete breakdown of land use for the Mud Creek watershed, as well as the HUC 12 watershed, is included in Appendix E.

2.6 Wetlands

The HUC 12 is spotted with several emergent and small woody wetlands. Respectively, these wetlands make up 5.5% and 1.8% of the watershed by area. A complete map of the wetland results from the Surface Water Data Viewer is attached in Appendix F. A localized wetland map for the point of compliance is show below in Figure 2-4. It is important to remember that wetland can be both a source of phosphorus or can aid in phosphorus reduction. For these reasons, wetland areas should be evaluated before starting any wetland restoration projects.

Figure 2-4: Deerfield Point of Compliance Wetland Map



3. WATERSHED INVENTORY

This watershed inventory for the Mud Creek watershed expands on the watershed characteristics from the previous section to provide insight into where phosphorus management measures could be implemented.

3.1 Point Sources-Current Phosphorus Loads

The EPA defines point sources as “any single identifiable source of pollution from which pollutants are discharged, such as a pipe, ditch, ship or factory smokestack.” With respect to water pollution, common point sources are municipal WWTFs and industries/factories. In the Mud Creek watershed, there are no other point sources besides the Deerfield WWTF.

3.1.1 Municipal WWTFs

Current effluent phosphorus data for the Deerfield WWTF are provided in Appendix G and summarized in Table 3-1. Values for the daily and annual loads were calculated by using annual averages for flow and phosphorus concentration.

Table 3-1
Effluent Phosphorus Summary

Year	Annual Average Flow	Annual Average Phosphorus Concentration	Daily Phosphorus. Loading	Annual Phosphorus. Loading
	MGD	mg/L	lbs/ day	lbs/ year
2012	0.176	0.46	0.67	245
2013	0.210	0.48	0.85	310
2014	0.205	0.50	0.88	321
2015	0.210	0.34	0.65	237
2016	0.219	0.27	0.51	186
2017*	0.226	0.22	0.48	175

*Excludes December 2017, data not available yet

3.2 Nonpoint Sources of Phosphorus

According to the EPA, “Nonpoint source pollution generally results from land runoff, precipitation, atmospheric deposition, drainage, seepage or hydrologic modification. Nonpoint source (NPS) pollution, unlike pollution from industrial and sewage treatment plants, comes from many diffuse sources. NPS pollution is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters and ground waters.”

In the Mud Creek watershed, typical NPS pollution originates from erosion of farmland and streambanks, as well as runoff from barnyards.

3.2.1 Areas of High Erosion

One way to prioritize areas within a watershed that may be vulnerable to water erosion is with the DNR Erosion Vulnerability Assessment for Agricultural Lands (EVAAL) tool, which was used in correlation with soil, land cover and watershed data. This tool allows for the identification of areas that may be most vulnerable to erosion. The EVAAL tool results in a graphic and tabular data set that depicts areas of high vulnerability and can be used to prioritize and focus efforts by identifying fields with high nutrient and sediment transportation.

In order to use the EVAAL tool, the following datasets had to be obtained: LiDAR-based Digital Elevation Model, Area of Interest Boundary, USDA-NRCS Soil Survey Geographic, and Culvert Lines. Using these datasets and the DNR's EVAAL tool, an EVAAL map for the watershed was created and is provided in Appendix H.

The results of the EVAAL tool revealed the highest vulnerability areas to be various farm fields throughout the watershed where gully erosion is evident. Although areas that may be vulnerable to erosion should be targeted for management measures, the accessibility of the land ultimately determines which areas can be targeted. Additionally, areas vulnerable to erosion that are located close to surface water will have a higher priority than more distant areas.

3.2.2 CAFOs

CAFOs (Concentrated Animal Feeding Operations) may generate a substantial amount of manure, which naturally contains phosphorus. This manure is typically disposed of by land applying it as fertilizer. This fertilizer can subsequently be washed off after a large storm event and enter surface water. The fact that the fertilizer is land applied played a large part in the U.S. Court of Appeals case that led to the EPA creating its 2008 CAFO rule. This rule states that agricultural stormwater is exempted from being considered a point source, but the EPA may treat the land application of excessive manure as a point source. This result of the rule is that while CAFOs are not considered a point source, they may have to apply for a NPDES permit, or in Wisconsin, a WPDES permit.

Currently in the Mud Creek watershed, there are no outfalls defined as CAFOs with a WPDES permit.

3.2.3 Barnyards

Outdoor dairy and beef cattle lots can be a significant source of phosphorus entering into surface water. Since Wisconsin has a large beef and dairy industry, it is important that barnyards be examined as a possible target area to reduce phosphorus concentrations.

Barnyards are present in the Mud Creek watershed, but a barnyard inventory has not yet been performed. An initial inventory using aerial photography was conducted and identified 5 possible barnyards located within 1000 feet of Mud Creek, and can be viewed in Appendix M. These barnyards are considered to be possible Critical Source Areas.

3.2.4 Streambanks

Streambank erosion can be a source of sediment and nutrients entering into surface water, as well as having a damaging effect on the habitat. Sedimentation can fill pore spaces, reduce oxygen content, and increase turbidity. Excessive phosphorus loading to streams can lead to eutrophication.

Mud Creek and its tributaries were inspected using aerial photography to attempt to identify areas that are in need of streambank repair, such as oxbows and steep banks. Several potential CSAs were identified within the watershed and can be viewed in Appendix N. Additional inspections of the potential CSAs will need to be conducted to determine their state of erosion.

3.2.5 Phosphorus Nonpoint Source Summary

According to the DNR PRESTO-Lite model results, non-point sources are estimated to contribute approximately 96% of the phosphorus load within the Mud Creek watershed. The PRESTO-Lite watershed delineation report for the Mud Creek watershed is provided in Appendix I. While the quantities of phosphorus contributed from each of the nonpoint sources listed above are not known, it is recognized that erosion of land and streambanks, and runoff from barnyards and feedlots are all potential targets for phosphorus management measures.

3.3 Stream Monitoring Program

3.3.1 Historic Phosphorus Data

Only one data point for Mud Creek in-stream phosphorus concentration is available from the DNR’s Surface Water Data Viewer mapping software, at Station 10010963 Mud Creek at Hillcrest Road, which is approximately 4 miles upstream of the WWTF compliance point. The total phosphorus concentration at this point was 0.070 mg/l when sampled in May 2011. The Village collected one set of samples in October 2017 and the in-stream phosphorus concentration was 0.13 mg/L both upstream and downstream of where the WWTF discharge tributary joins Mud Creek.

In May 2018, sample collection began, and to date, five additional upstream and downstream samples have been tested (Table 3-2.) With this additional sampling, it is believed that Mud Creek exceeds the WQC at the compliance point. Also, Koshkonong Creek does not meet the WQC and has been listed as an impaired water by the DNR.

Table 3-2
In-Stream Phosphorus Analysis

Sample Date	Upstream Phosphorus Conc. (mg/L)	Downstream Phosphorus Conc. (mg/L)
October 20, 2017	0.13	0.13
May 15, 2018	0.14	0.14
May 24, 2018	0.12	0.11
June 1, 2018	0.12	0.13
June 14, 2018	0.11	0.12
June25, 2018	0.16	0.12

3.3.2 In-Stream Sampling Program

For Adaptive Management, the only required monitoring parameters are in-stream phosphorus and flow, and the only required sampling area is at the point of compliance.

Two sampling points are proposed for monitoring in-stream phosphorus concentrations, both upstream and downstream of where the unnamed tributary with the WWTF outfall discharges to Mud Creek, which has been defined as the Watershed Adaptive Management point of compliance for the Village of Deerfield. The downstream sampling point is located at 43°03’42.37”N and 89°03’08.00”W. The up-stream sampling point is located just up-stream of the WWTF outfall, at 43°03’40.04”N and 89°03’012.32”W. No SWIMS IDs are currently associated with either of these points. Both of these points are located on an access road, and are approximately 1 mile east of North Main Street (County Highway 73) and 1.6 miles south of Cottage Grove Rd. Appendix J includes maps of the point of compliance and the proposed sampling locations. As described above, one set of samples was collected at these points in October 2017 and additional sampling will be performed during the 2018 growing season to establish a baseline prior to beginning Adaptive Management. The results of the October 2017 sampling are included in Appendix J. The Village met with the DNR for approval of the proposed sampling points prior to sampling in May 2018.

Samples will be taken at both points two times a month, on every other Thursday, from May to October. Samples will be collected from the center of the stream (or the portion of the stream with the strongest flow) at a depth of 3 to 6 inches below the surface, and then placed into preserved sample bottles for future analysis by (method SM4500-PE 20 ed.). Phosphorus samples will meet the preservation requirements in ch. NR 219, Wis. Adm.

Code, Table F, by having acidified sample bottles and a cooler with ice present for sample collection. Care will be taken while sampling to avoid disturbing the sampling site. The samples will be sent to the CT Laboratory (#157066030) with a total phosphorus limit of detection/limit of quantification (LOD/LOQ) 0.00500.016 mg/L in 2018.

In addition to in-stream phosphorus sampling, the Deerfield WWTF staff will continue to collect composite effluent phosphorus samples at the outfall three times a week, in accordance with the WPDES permit. Samples will also be sent to CT Laboratory in Baraboo, where the stream samples will be analyzed for phosphorus using EPA method 365.4, and the effluent samples will be analyzed using EPA method 365.1.

In-stream flow measurements will be taken at access bridge (located at 43°03'41.15"N and 89°03'11.14"W) where the in-stream samples are taken, if possible. The next downstream bridge crossing is 2.25 miles west at Bridge Street, located at 43°03'41.49"N and 89°00'32.95"W. A map of these points in included in Appendix J. Town and Country has contacted the USGS in order to establish a stage-flow relationship for these points in the stream. Once established, the Village will measure the stage of the stream during sampling events to determine the flow.

3.4 Required Phosphorus Load Reduction

Following the guidance for Adaptive Management, phosphorus reductions were calculated for the first permit term. Although the calculation will be for the minimum reduction per permit term, it may be advantageous to offset more than the minimum reduction required to improve the chances of success for Adaptive Management.

Variables for calculations:

- Average flow (2015-2017) of the Deerfield treatment plant= **0.217 MGD**
- Permit Term 1 interim limit monthly average effluent phosphorus concentration =**0.60 mg/L**
- Annual mean flow of Mud Creek (from DNR) at the Point of Compliance= **5.92 MGD**
- Mean phosphorus concentration of Mud Creek (as calculated from the Presto Lite Report's Average Annual Nonpoint Phosphorus Load) = $(7{,}491\,\frac{lbs}{year})/((5.92\ MGD - 0.217\ MD) * 8.34 * 365)$ **=0.43 mg/L**
- 8.34= unit conversion
- Water Quality Criterion for phosphorus= **0.075 mg/L**

Term1:
Step 1: Calculate the current discharge as an annual load.

$$0.217\ MGDx\ 0.60\ \frac{mg}{L} x\ 8.34\ x\ 365 \frac{days}{year} = \mathbf{396}\ \frac{\mathbf{pounds}}{\mathbf{year}}$$

Step 2: Calculate the current load in the receiving water just downstream from the discharge

$$396\frac{pounds}{year} + 7{,}491\frac{pounds}{year} = \mathbf{7,887}\frac{\mathbf{pounds}}{\mathbf{year}}$$

Step 3: Calculate the applicant's percent contribution of load.

$$\frac{396\frac{pounds}{year}}{7{,}887\frac{pounds}{year}} * 100 = \mathbf{5.0}\%$$

Step 4: Calculate the allowable load in the receiving water.

$$(0.217MGD + 5.703MGD) * 0.075\frac{mg}{L} * 8.34 * 365\frac{days}{year} = \mathbf{1,352}\frac{\mathbf{pounds}}{\mathbf{year}}$$

Step 5: Calculate the needed reduction in the receiving water

$$7{,}887\frac{pounds}{year} - 1{,}352\frac{pounds}{year} = \mathbf{6,535}\frac{\mathbf{pounds}}{\mathbf{year}}$$

Step 6: Calculate the applicant's proportional share of the needed reduction.

$$6{,}535\frac{pounds}{year} * 5.0\% = \mathbf{327}\frac{\mathbf{pounds}}{\mathbf{year}}$$

For the first permit term of 5 years, the Deerfield WWTF needs to reduce at least 327 pounds of phosphorus a year throughout the Adaptive Management program. However, in order to meet water quality goals in Mud Creek, a higher level of reduction should be targeted during the first permit term. Ideally, 30-50% of the overall needed reduction (6,535 lbs) will be targeted within the first 5 years. These reductions will be accomplished by a combination of management measures as described in Section 4.3. In order to calculate the expected phosphorus load reductions, modeling tools (such as SnapPlus and BARNY) will be employed. If measures employed during the first permit term of Adaptive Management do not show water quality improvement, the Adaptive Management plan will be modified in subsequent permit terms to offset more of the phosphorus load than required for the first permit term.

To calculate the phosphorus load reduction for the second term, the phosphorus load of the receiving water will be monitored and recorded. Once the new load is determined, the allowable load of the receiving water will be subtracted from the new phosphorus loading, and the remaining phosphorus load will be the reduction needed for Permit Term 2. Currently, the Village of Deerfield is planning to have a phosphorus reduction of approximately 4,900 pounds a year (75% of total required reduction) by the end of the second term.

To calculate the phosphorus load reduction for the third permit term, any remaining phosphorus load above the water quality criterion will be the reduction needed for Permit Term 3. The ultimate goal of Permit Term 3 will be to get the receiving water to a phosphorus concentration of 0.075 mg/L. Currently, the Village of Deerfield is planning to have the full quantity of phosphorus reductions required to result in the allowable load of phosphorus in the receiving water, which is 6,535 pounds a year.

3.5 Sensitivity Analysis

In order to estimate the total acreage needed for management measures, a sensitivity analysis was constructed. For each acre of land, varying amounts of phosphorus reduction were assumed in order to calculate total acreage. Table 3-3 shows the total acreage needed to meet the minimum reduction needed for the Deerfield WWTF's first permit term of Adaptive Management if only field-based practices are utilized.

Table 3-3
Phosphorus Reduction Sensitivity Analysis

Pounds of P reduction/ acre	Acres needed for Permit Term 1
0.5	654
1	327
2	163.5
3	109

For the first permit term, a minimum of 109 and 654 acres would be needed for management measures, assuming between 0.5 and 3 pounds per acre reduction. These numbers are based on previous experience with phosphorus reduction in Wisconsin, but soil testing and additional modeling will be completed by the Village and Dane County LWRD to determine the actual reductions from management measures.

4. PROJECT PLANNING

4.1 Partners

The success of Adaptive Management depends on the joint effort of many partners, and it is import to identify the roles and responsibilities of each partner at the onset of the project. For the Deerfield Adaptive Management Plan, the following governmental, professional, and local partners have been identified:

4.1.1 WPDES Permit Holder

The Deerfield WWTF is operated by the Village of Deerfield and treats domestic wastewater from the Village of Deerfield with no significant industries and ample capacity for current and future loads. Treatment includes raw wastewater screening, biological phosphorus removal units, two aeration basins with activated sludge treatment, final clarifiers and effluent post aeration.

The Village of Deerfield will be responsible for financial matters, sampling, stream monitoring, meeting the facility's interim phosphorus limits, generating annual reports, and working with landowners to establish management practices.

4.1.2 Town and Country Engineering

Town and Country Engineering is a consulting firm that was organized in 1981, and works with municipalities in Wisconsin. They have experience in wastewater treatment analysis and design, as well as the design and analysis of water and sewer systems, wells and water treatment facilities, stormwater management, and general municipal engineering.

Town and Country designed the Deerfield WWTF upgrade in 2001 and since has assisted with upgrades and operations. Town & Country works with the Village to ensure that the treatment plant is operating most efficiently, and has assisted the Village with its phosphorus compliance evaluations.

With respect to Adaptive Management, Town & Country's role will include modeling, mapping, budget review, Adaptive Management Plan development, and evaluation of effluent and stream data.

4.1.3 Dane County Land and Water Resources Department

The Dane County Land and Water Resources Department (LWRD) is a governmental agency committed to ensuring the protection and enhancement of Dane County's natural, cultural, and historical resources. The LWRD supports citizens, communities, and local governments in their resource management and protection activities.

Dane County LWRD has worked with other communities with respect to agricultural conservation practices, and was contacted by the Village of Deerfield to assist with several aspects of the adaptive management process.

For non-urban practices Dane County LWRD will act as the broker between the Village and landowners in establishing cost sharing agreements and will assist in field-verifying adaptive management practices. Their responsibilities will include modeling with SnapPlus and BARNY (and any other models required), assisting with grants, mapping, estimating load reductions, and conducting site inspections. A service agreement will be developed in the future for any projects requiring Dane Country LWRD's assistance. A letter of support included in Appendix O.

4.1.4 Local Landowners and Agricultural Producers

Farmers in the Mud Creek watershed are typically dairy farmers, cash croppers, or raise livestock. According to the land use data obtained by L-THIA, agricultural land makes up 61% of land in the Mud Creek watershed.

The Village of Deerfield and the Dane County LWCD will establish contracts with landowners to install or implement management measures. If established in the contract, it will be up to the landowners and farmers to maintain the management measures outlined in their contract, with verification and inspection of the management being conducted by the Dane County LWCD.

4.1.5 Other Stakeholders/Partners

There are several other organizations that could have interest or play a role in future Adaptive Management projects, including:

- *Gathering Waters Conservancy*: is an alliance that helps land trusts, landowners and communities by advocating for funding and policies that support land conservation, and fostering a community of practices that promotes land trust excellence and advancement.

- *Natural Resources Conservation Service (NRCS):* is the federal agency that works with landowners on private lands to conserve natural resources. NRCS is part of the U.S. Department of Agriculture. They were formerly called the Soil Conservation Service or "SCS".

- *Farm Service Agency (FSA):* is a federal agency that administers farm commodity, crop insurance, credit, environmental, conservation, and emergency assistance programs for farmers and ranchers.

- *United States Geological Survey (USGS):* is a scientific agency of the United States government. The USGS works in cooperation with more than 2,000 organizations across the country to provide reliable, impartial scientific information to resource managers, planners, and other customers.

Currently, there is no association between these organizations and the projects for the Deerfield Adaptive Management Plan.

4.1.6 Summary of Partners

The current partners for the Deerfield Adaptive Management plan, along with their roles and responsibilities are summarized in Table 4-1.

Table 4-1
Roles and Responsibilities

Party	Roles/Responsibilities
Deerfield Wastewater Treatment Facility	• Financial matters • Stream and Wastewater Sampling • Stream monitoring • Meeting the facility's interim P limits • Verification of implemented urban practices • Annual Reporting
Town & Country Engineering	• Modeling • Mapping • Budget review • Adaptive Management Plan development • Assisting with grants • Data evaluation (effluent and stream)
Dane County Land and Water Conservation Department	• Modeling • Assisting with grants • Mapping • Estimating load reductions • Conducting site inspections • Negotiating cost-share agreements • Verification of implemented rural practices
Landowners and Agricultural Producers	• Maintaining management measures

4.2 Areas of Phosphorus Reduction

For the Mud Creek watershed, both point and nonpoint source phosphorus reductions will occur. Traditional point source reductions will occur at the Deerfield WWTF, by maximizing the efficiency of the current biological phosphorus removal, in combination with chemical additions when needed. Currently, Deerfield is averaging 0.3 mg/L to 0.5 mg/L of effluent phosphorus, so they are confident they will be able to meet the interim limits assigned to them for each permit term, which are 0.60 mg/L for the first term and second term, and 0.50 mg/L for the third term. Nonpoint source reductions are described in the following sections.

4.3 Nonpoint Source Management Measures

Nonpoint reductions will be obtained using a combination of Best Management Practices (BMPs) that are described in the following sections. Information about BMPs was obtained from the NRCS website. Most of these BMP's apply only to agricultural land, but some may also be used in urban areas.

4.3.1 Nutrient Management Planning

Nutrient management plans match nutrient inputs to crop demand, in order to maximize the return on nutrients while simultaneously limiting the nutrient loss. Typically, nutrient management plans are devised using analysis from SnapPlus modeling. Currently, many farmers are already utilizing nutrient management plans, so there may not be many opportunities to reduce phosphorus loading further with this method. The Dane County LWCD will help identify target areas for nutrient management planning.

4.3.2 Cover Crops

According to the USDA NRCS factsheet, "A cover crop is grasses, legumes, forbs or other herbaceous plants that are established for seasonal cover and conservation purposes. Cover crops are planted in the late summer or fall around harvest and before spring planting of the following year's crops. Common cover crops used in Wisconsin include winter hardy plants such as barley, rye and wheat."

Cover crops are used after harvesting, when the soil is loose and vulnerable to erosion. Roots from the cover crop increase the stability of the soil, while the additional vegetation can act as a filter to separate out suspended soils from stormwater runoff. Additional benefits of cover crops include increased soil porosity and infiltration, reduction of soil compaction, and improved soil health.

For the Mud Creek watershed, cover crops may be used at any locations where cover crops are not currently being utilized. Determination of feasibility for this management measure will be made on a case-by-case basis, following initial site inspections.

4.3.3 Conservation Buffers

Referring to the USDA NRCS factsheet, "Conservation buffers are small areas of land in permanent vegetation, designed to intercept pollutants and manage other environmental concerns. Types of buffers include riparian buffers, filter strips, grassed waterways, contour grass strips, field borders, and vegetative barriers. Strategically placed buffer strips in the agricultural landscape can effectively mitigate the movement of sediment, nutrients, and pesticides within farm fields and from farm fields. When coupled with appropriate upland treatments, buffer strips should allow farmers to achieve a measure of environmental sustainability in their operations.

Buffers slow water runoff, trap sediment, and enhance filtration within the buffer. Buffers also trap fertilizers, pesticides, pathogens, and heavy metals, and they help trap snow and cut down on blowing soil in areas with strong winds."

Several types of conservation buffers may be implemented within the Mud Creek watershed. These buffers include grassed waterways, contour grass strips, and buffer strips. Details about these buffers and how each of these buffers may be utilized in the Mud Creek watershed are provided below.

Grassed Waterways
Grassed waterways are broad, shallow channels designed to move surface water across farmland without causing soil erosion. The vegetative cover in waterways slows the water flow and protects the channel surface from rill and gully erosion. Grassed waterways can be used in conjunction with harvestable buffers and cover crops to increase phosphorus reductions. The current use of grassed waterways and their potential use for the future will be assessed during the site visits.

Contour Grass Strips
Contour grass strips are strips of perennial vegetation alternated down the slope with wider cultivated strips that are farmed on the contour. These strips are usually narrower than the cultivated strips. Vegetation in these strips consists of species of grasses or a mixture of grasses and legumes. Contour grass strips established on the contour can significantly reduce sheet and rill erosion, as well as slow runoff and trap sediment. Since the Mud Creek watershed has some areas of steep slopes, contour grass strips may be a viable option for these parcels. Farm parcels will be evaluated during site visits to determine the effectiveness of contour grass strips.

Buffer Strips
Buffer strips create soil stability between areas that are utilized for crops and streams or water features. They are designed to intercept sediment and other pollutants before they enter the stream. One program that has been used in Dane County is the FSA Conservation Reserve Enhancement Program (CREP) that allows farmers to establish a perennial grass cover in return for an annual payment. Eligible land must have a crop history (been planted with a commodity crop in 2 out of the last 5 years) or meet the qualifications of marginal pastureland. Potential buffer strip areas will be assessed for eligibility during site visits.

4.3.4 Tillage Changes

Changing the tillage practices on cropland can provide effective control to erosion and can improve soil properties and soil quality. A common option is no till practices, which allows a farmer to plant the crop and control weeds without turning the soil. Traditional plowing reduces the farm's long-term productivity by exposing organic-matter-rich top soil to the surface and breaking up clods that slowly and naturally form in the soil.

High organic matter and good clod formation are both crucial aspects of fertile soil. Organic matter attracts and holds onto water, and its slow breakdown releases vital nutrients into the soil. When soil is turned, the organic matter is exposed to the atmosphere and oxidized into carbon dioxide. Less organic matter in the soil means less water retention, less nutrient release and less clod formation. The broken up clods are exposed to rainfall, which further breaks down the clods and forms a soil crust on the field surface, causing surface runoff and soil erosion.

No-till agriculture uses a disk or chisel plow to prepare the field for seeding. These plows create a narrow furrow, just large enough for the seed to be injected. After the seed and fertilizer is injected, an attachment closes up the furrow. This way the farm field can be seeded with minimal soil disturbance and less potential for runoff and nutrient loss. As with other management measures, the potential for no till practices will be evaluated during the preliminary site visits.

4.3.5 Manure Management

Phosphorus is present naturally in animal manure, and when subsequently applied to agricultural land, can be a primary source of phosphorus to surface and groundwater. This phosphorus reaches surface waters by being carried in runoff if the manure is not properly stored. Runoff control practices can be installed to reduce the amount of manure, and therefore phosphorus, entering surface water. The most common practices for manure management include improved collection and storage, as well as optimizing application rates. The need for and feasibility of manure management will be assessed on a case-by-case basis upon recommendations by the Dane County LWCD.

4.3.6 Runoff Control from Barnyards

Barnyards and feedlots can be a substantial source of phosphorus. This is due to the presence of manure and the phosphorus naturally occurring in it, as well as the phosphorus that has accumulated in the soil. If not managed correctly, manure that accumulates in barnyards can be carried via runoff to surface waters from storm events. These storm events can cause erosion and carry a significant amount of soil in the runoff, which is an additional source of phosphorus in the surface water. In order to reduce phosphorus pollution, it is important to manage the runoff coming through barnyards.

Runoff management allows for the direction of rainwater and other runoff water away from manure storage facilities. Additionally, the barnyard should be on a surface that can be cleaned so that manure may be removed, limiting the quantity of manure that can potentially be washed off. Roof gutters, surface water diversions and drip trenches can also keep water clean, and away from the barnyard. The need for and feasibility of barnyard runoff management will be assessed on a case-by-case basis upon recommendations by the Dane County LWCD.

4.3.7 Streambank Restoration

Streambank restoration is accomplished by reinforcing the streambank and reestablishing the general structure and function of the stream. Streambank restoration reduces erosion and phosphorus loading from soil loss, but can be a costly management measure. However, restoration can have other benefits such as improvements of fish habitats and aesthetic improvements that may be desirable to landowners and watershed stakeholders. Streambank restoration can be used in both urban and rural areas and may be feasible for parts of the Mud Creek watershed.

4.3.8 Check Dams and Stormwater Ponds

A check dam is a small, sometimes temporary, dam that is constructed across a swale or a drainage ditch to counter erosion by slowing the velocity of runoff. These check dams can be constructed of rock, gravel bags, sand bags or even logs. Check dams can also improve the water quality of runoff by trapping sediment in the structure, or causing the sediment to settle out in the ponding conditions created behind the check dam.

Runoff can also be collected in stormwater detention or infiltration basins, which are typically installed in urban settings. The most beneficial type of basin for phosphorus reduction is a wet detention basin or pond, which is constructed to collect, detain, treat and release stormwater runoff. A wet detention basin consists of a permanent pool of water with designed dimensions, inlets, outlets and storage capacity.

Potential locations for check dams and ponds will be identified during site visits.

4.4 Prioritization of Management Measures

It is recommended that phosphorus reductions target “critical source areas” or CSAs, which are areas that contribute a disproportional amount of phosphorus to the receiving water. These areas typically store and transport phosphorus, and both factors come into play when locating CSAs. In the process of identifying

CSAs, the EVAAL tool and site visits will be used to find areas of high erosion and significant sources of phosphorus.

During the site visits, source factors and transport factors will be identified. Source factors include phosphorus soil tests, application rate of phosphorus fertilizer and manure, and application method of phosphorus fertilizer and manure. Transport factors include erosion potential (identified visually to be used in conjunction with EVAAL data), runoff, and connectivity to receiving water.

A representative from the Village and Dane County LWCD will conduct site visits with each of the land owners to gather data and assess options for each parcel. Following the enrollment of the initial project partners, the process of identifying CSAs and conducting site visits will be repeated as the Adaptive Management program is expanded.

Currently, the Village plans on targeting those areas close to the confluence of Mud Creek, and throughout the village. These projects could include streambank stabilization, taking land out of production, or buffer strips. Higher priority will be put on projects resulting in long term phosphorus reductions.

4.5 Potential Nonpoint Source Projects

Based on preliminary discussions between the Village and Dane County LWRD, the following practices have been identified as the most likely types of projects for the initial implementation of Adaptive Management in the Mud Creek watershed:

- Streambank Stabilization
- Buffer strips or taking agricultural land out of production
- Stormwater ponds

The Village intends to begin conducting site visits to identify interested landowners and potential projects in early 2018. The Village is also investigating the possibility of implementing some stormwater management and streambank stabilization projects within the Village and will continue to determine if these are viable projects.

The Village has been focusing conversations with farmers located within the watershed and landowners of streambank within the village. The Village has also met with, and will continue to meet with, the Dane County LWRD to help locate future projects within the Mud Creek Watershed.

5. PROJECT IMPLEMENTATION

This section presents the steps that will be taken to implement phosphorus reduction projects during the first permit term of Adaptive Management. As the Village and its partners develop experience with Adaptive Management implementation in the Mud Creek watershed, these project implementation steps may be refined or revised.

5.1 Preliminary Site Visits

Following the identification of potential project areas, the first step to implementation is conducting site visits to evaluate options and feasibility. Prior to any site visit, a relationship should be established with the land owner by the Village or Dane County LWCD, so they are informed about Adaptive Management, and how they could play a role in the plan. Site visits should occur in the spring or fall, when the land cover will be more easily identifiable. Site visits will be arranged by the Village, and could include members of the Village and WWTF staff, Town & Country Engineering, Dane County LWCD, and the land owners themselves.

A typical site visit will usually take approximately 1-2 hours, depending on the size, and consist of a general assessment of areas of concern. These concerns could include streambank erosion, gully erosion, tillage, crop rotations, or nutrient management. General site information and observations will be documented.

5.2 Identification of Reasonable Measures

During the site visits, the most suitable measures for each site will be identified and discussed. Possible management measures are described in Section 4.3. As appropriate, additional management measures may be selected to result in further phosphorus reductions. The reasonable and feasible management measures will depend on the needs of the land owner and the physical properties of the land. These properties include soil type, slope, current land use/cropping practices, and proximity to water bodies/streams. Additional priority may be placed on larger parcels, or parcels with a greater expected phosphorus reduction. This would minimize the initial number of projects in order to gain the same total pounds of phosphorus reduction.

5.3 Data Collection for Modeling

Following the initial site visit, once possible management measures have been identified, there may be a need for additional data. Data collected by the Dane County LWCD will be based on the model being utilized and the resource concern that is being assessed. Typical models used include SnapPlus, BARNY, WinSLAMM, P-8 Urban Catchment Model, Phosphorus Index, gully erosion calculator, and streambank erosion calculator. Data could include soil samples, survey data, crop practices and other information.

5.4 Modeling

Modeling will be used to estimate expected phosphorus reductions for various management measures that are being considered. The models that will most commonly be used are described below.

5.4.1 SnapPlus

SnapPlus (Soil Nutrient Application Planner) was designed as a means to streamline the preparation of Comprehensive Nutrient Management Plans (CNMP) for CAFOs. These CNMPs consist of five components: a conservation plan, a nutrient management plan, a record-keeping program, a manure manager, and feed management. Typically, several software programs were needed to generate these components, so SnapPlus was designed to incorporate these programs into one software package. SnapPlus is used to prepare nutrient management plans in accordance with Wisconsin's Nutrient Management Standard Code 590.

SnapPlus can be used to calculate crop nutrient recommendations for all fields on a farm, a rotational Phosphorus Index (PI) value for all fields as required for using the PI for phosphorus management, and a rotational phosphorus balance using soil test P as the criteria for phosphorus management. The PI is calculated by estimating average runoff phosphorus delivery from each field to the nearest surface water in a year given the field's soil conditions, crops, tillage, manure and fertilizer applications, and long-term weather patterns. The higher the PI number, the greater the likelihood that that field is contributing phosphorus to local water bodies.

For this application, SnapPlus will be used to calculate the expected phosphorus reductions for field-based management measures compared to the baseline for current practices. All SnapPlus modeling will be completed by the Dane County LWCD.

5.4.2 BARNY

The Wisconsin Barnyard Runoff Model (BARNY) is used to estimate loads of phosphorus and chemical oxygen demand in stormwater runoff from individual barnyards. It can also evaluate the impacts of buffers on reducing these loads. The main use of the BARNY model is to evaluate phosphorus transportation from barnyards and evaluate phosphorus load reductions due to barnyard management activities.

If it is determined that barnyard improvements could be an efficient source of phosphorus reductions, the Dane County LWCD will run BARNY modeling to estimate the reduction in phosphorus loads.

5.4.3 WinSLAMM

WinSLAMM (Source Loading and Management Model for Windows) was developed to evaluate nonpoint source pollutant loadings in urban areas using small storm hydrology. The model determines the runoff from a series of normal rainfall events and calculates the pollutant loading created by these rainfall events. The user is also able to apply a series of control devices, such as infiltration/biofiltration, street sweeping, wet detention ponds, grass swales, porous pavement, or catch basins to determine how effectively these devices remove pollutants.

If urban stormwater practices are planned within the Village, WinSLAMM may be used by Town & Country Engineering to estimate phosphorus reductions.

5.4.4 P-8 Urban Catchment Model

P-8 is a model for predicting the generation and transport of storm water runoff pollutants in urban watersheds. The model has been developed for use in designing and evaluating runoff treatment schemes for existing or proposed urban developments. Simulated BMP types include detention ponds (wet, dry, extended), infiltration basins, swales, and buffer strips. The model is used to examine the water quality implications of alternative treatment objectives.

If urban stormwater practices are planned within the Village, P-8 may be used by Town & Country Engineering to estimate phosphorus reductions.

5.5 Determine Load Reduction

Once the planned management measures have been identified, the load reductions will be determined using the modeling previously discussed. Then the Village and Dane County LWCD will be able to determine the total load reduction expected for each project area. As stated in Section 3.4, the Village is required to provide a reduction of at least 327 pounds/year of phosphorus during the first permit term of Adaptive Management. If the calculated reductions for the planned management measures are less than the required amount, the Village will seek out additional project partners. After the first permit term of Adaptive Management, the Village may need to install additional management measures if the initial measures do not provide a sufficient reduction in phosphorus loading to Mud Creek.

5.6 Cost-Share Agreements

Cost share agreements or contracts will be established between the landowners and the Village for the management measures to be installed. Contracts will be drawn up by the Village or Dane County LWCD and made with landowners for a term 15 years or perpetuity. Once the contract is signed, the landowner will be paid with a lump sum incentive and annual payments for the length of the contract.

It will be up to the Village to determine the rates for each type of management measure. These rates will be based on typical cost-share models and information provided by the Dane County LWCD. Cost-share rates that have not been previously established will be estimated based on demand, local land rental rates, and crop yields.

These cost-share agreements could serve as trade agreements to allow for the ability to transition to Water Quality Trading (WQT). Additionally, practices will be registered upon implementation to further ease the transition from Adaptive Management to WQT. Example cost share contracts from the LWRD are included in Appendix L.

5.7 Installation of Management Measures

Once the cost share agreements have been signed between the landowner and the Village, it will be the responsibility of the landowner to install and maintain the agreed upon management measures. These measures may consist of one or more of the practices previously described in Section 4.3.

5.8 Verification of Installed Management Measures

Dane County LWCD will verify the status of rural practices installed for management measures. The Village will be responsible for verifying urban management measures installed within Village limits. These practices will be verified once per year after initial establishment has been verified. Annual inspections will be conducted by landowners, in which they will report and photograph the condition of the management measure to the Village. Annual inspection forms will be created by Dane County LWRD and the Village for use by landowners. In addition, in-stream phosphorus monitoring will be conducted by the WWTF staff to monitor the progress toward meeting the WQC, as described in Section 3.3.2.

Records and data for these practices will be cataloged by Town and County, with practices recorded spatially though GIS software along with LWCD's Conservation Planning System software.

Inspection of the installed management measures will include various steps to ensure that these measures are valid, and that the phosphorus reductions can be claimed for the Adaptive Management program. The steps for these inspections are as follows.

1. *Determine status of management measure*
2. *Issue status determination to landowner*
3. *Take corrective measures as needed*
4. *Document that required corrective measures (if any) are completed*
5. *Update data for modeling, as needed*

5.9 Annual Reporting

In order to ensure the Village's accountability, the DNR requires annual reporting on Adaptive Management progress. These reports should evaluate the monitoring data that has been collected (including instream phosphorus loadings as well as effluent loadings), describe the management measures that have been installed in the prior year, and describe any outreach and education that has been completed. Annual reporting will be completed by the Village, with assistance from Town & Country Engineering and the Dane County LWCD, as needed.

These annual reports can also be used to help adjust Adaptive Management actions, such as any changes that would require permit modifications. Changes that would require permit modification would include changes to the action area size, adjustments to the minimum monitoring requirements, and changes to the amount of phosphorus being offset in the current permit term. In summary, these reports will be used as a line of communication between the Village and the DNR.

5.10 Implementation Schedule

In order to ensure that the Village meets the minimum required phosphorus loading reduction for the first Adaptive Management permit term, they will follow the implementation schedule in Table 5-1. This schedule will ensure that any management measures will be installed, verified, and inspected during the first permit term. Additionally, annual reporting will be performed to maintain communication between the Village and the DNR, as well as to reinforce accountability.

Table 5-1
Permit Term 1 Implementation Schedule

Action	Date
Site Inspections	Spring 2018-Fall 2018
Begin Monthly In-stream Sampling	Spring 2018
Data Collection and Modeling	Spring 2018
Cost Share Agreements Signed	Fall 2018
Management Measures Installed	Spring 2019-2023
Annual Adaptive Annual Report	September 30, 2019
Annual Adaptive Annual Report	September 30, 2020
Annual Adaptive Annual Report	September 30, 2021
Annual Adaptive Annual Report	September 30, 2022
Minimum Phosphorus Reduction of 327 lbs/year	September 30, 2023
End of Permit Term 1	September 30, 2023

Permit Term 2 Implementation Schedule

Action	Date
Data Collection and Modeling	Spring 2024 – Fall 2028, as needed
Cost Share Agreements Signed	Fall 2023 – Fall 2028, as needed
Management Measures Installed	Spring 2024, 2025, and as needed
Annual Adaptive Annual Report	September 30, 2024
Annual Adaptive Annual Report	September 30, 2025
Annual Adaptive Annual Report	September 30, 2026
Annual Adaptive Annual Report	September 30, 2027
Total Phosphorus Reduction of 4,900 lbs/year	September 30, 2028
End of Permit Term 2	September 30, 2028

Permit Term 3 Implementation Schedule

Action	Date
Data Collection and Modeling	Spring 2029 - Fall 2033, as needed
Cost Share Agreements Signed	Fall 2028 - Fall 2033, as needed
Management Measures Installed	Spring 2029, 2030, and as needed
Annual Adaptive Annual Report	September 30, 2029
Annual Adaptive Annual Report	September 30, 2030
Annual Adaptive Annual Report	September 30, 2031
Annual Adaptive Annual Report	September 30, 2032
Total Phosphorus Reduction of 6,535 lbs/year	September 30, 2033
Mud Creek meets in stream criteria of 0.075 mg/L of phosphorus	September 30, 2033
End of Permit Term 3	September 30, 2033

6. FINANCIAL EVALUATION

The section presents the projected costs for implementation of Adaptive Management for the first permit term and well as certification of the financial security of the Adaptive Management Program.

6.1 Cost Estimate

Table 6-1 presents a breakdown of estimated annual costs associated with Adaptive Management in the Mud Creek watershed for the next permit term. Costs include the implementation of nonpoint source management measures, outreach and education, modeling, sampling, and other administrative duties. Factors relating to these costs and the responsible parties are listed in Table 6-1.

6.2 Funding Sources

Currently, the Deerfield WWTF will assume sole financial responsibility for Adaptive Management in the Mud Creek watershed and will fund these costs through user fees and cash on hand, but additional sources of funding will be explored. Grants and other funding opportunities will be researched to see if they are applicable to programs for Deerfield's Adaptive Management program. Possible grant sources include the following:

- NRCS Regional Conservation Partnership Program (RCPP),
- NRCS Environmental Quality Incentives Program (EQIP),
- Department of Agriculture, Trade and Consumer Protection (DATCP), Producer-Led Watershed Protection Grants
- Wisconsin DNR Targeted Runoff Management (TRM) Grants,
- FSA Conservation Reserve Enhancement Program (CREP).

The Dane County LWCD will assist the Village with identifying and applying for applicable grants.

6.3 Financial Security

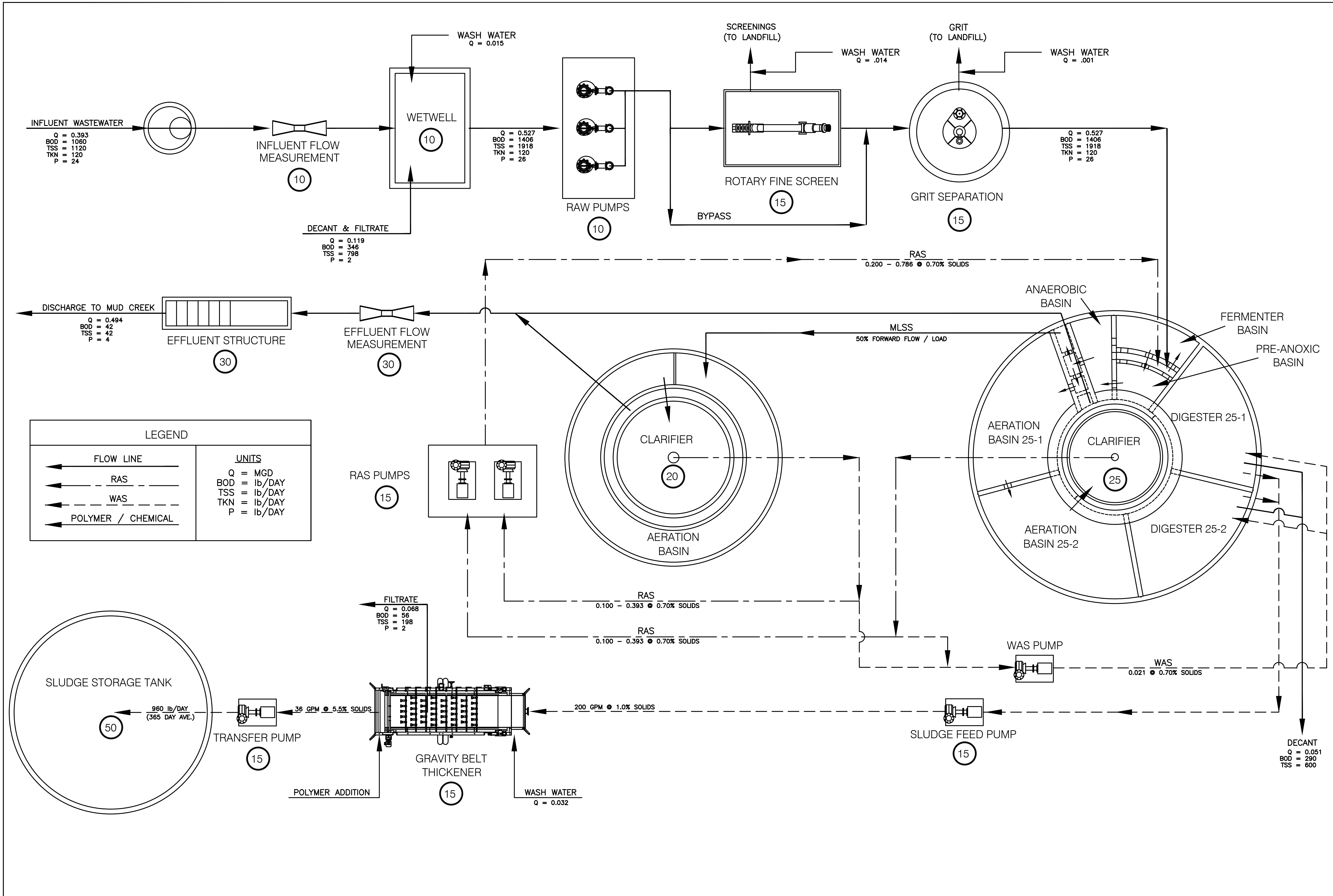
As required by the DNR, this Adaptive Management Plan contains a written statement from the Village validating that the financial needs to implement Adaptive Management are feasible. This statement is provided in Appendix K.

Table 6-1
Adaptive Management Cost Estimate

Permit Year	Responsible	0	1	2	3	4	5
Year	Party	2017	2018	2019	2020	2021	2022
Treatment Upgrades Capital Cost	Village						
Treatment Operating and Maintenance Costs							
Additional Sludge Hauling	Village						
Additional Chemicals	Village						
Adaptive Management Planning							
Report Preparation/Revision	T&C	$15,000					
Site Visits and Practice Identification	T&C	$5,000	$3,000	$3,000	$3,000	$3,000	$5,000
Modeling and Technical Support							
Dane County Modeling Costs	County		$3,000	$2,000	$2,000	$2,000	$2,000
Engineering Support	T&C		$3,000	$2,000	$2,000	$2,000	$2,000
BMP Implementation Costs							
Practice Brokering	County	$3,000	$3,000	$1,000	$1,000	$1,000	$1,000
Practice Brokering/Implementation Support	T&C	$2,000	$2,000	$1,000	$1,000	$1,000	$1,000
Cost Share Rates	Village		$50,000	$20,000	$20,000	$20,000	$20,000
Outreach and Education							
Meetings with Public/Stakeholders	T&C		$1,000	$1,000	$1,000	$1,000	$1,000
Communication about AM in watershed	Village		$1,000	$1,000	$1,000	$1,000	$1,000
In-Stream and Effluent Sampling							
Sample Collection	Village	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000
Sample Analysis	Village	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000
Compliance Checking							
Practice Verification	County		$5,000	$5,000	$5,000	$5,000	$5,000
Compliance Notifications	Village		$1,000	$1,000	$1,000	$1,000	$1,000
Administration							
Annual Reports	Village		$5,000	$5,000	$5,000	$5,000	$5,000
Meetings/Correspondence with DNR	T&C		$2,000	$2,000	$2,000	$2,000	$2,000
Total		**$31,000**	**$85,000**	**$50,000**	**$50,000**	**$50,000**	**$52,000**

Appendix A

Site Plan and Process Flow



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QUANTITATIVE FLOW DIAGRAM
GENERAL

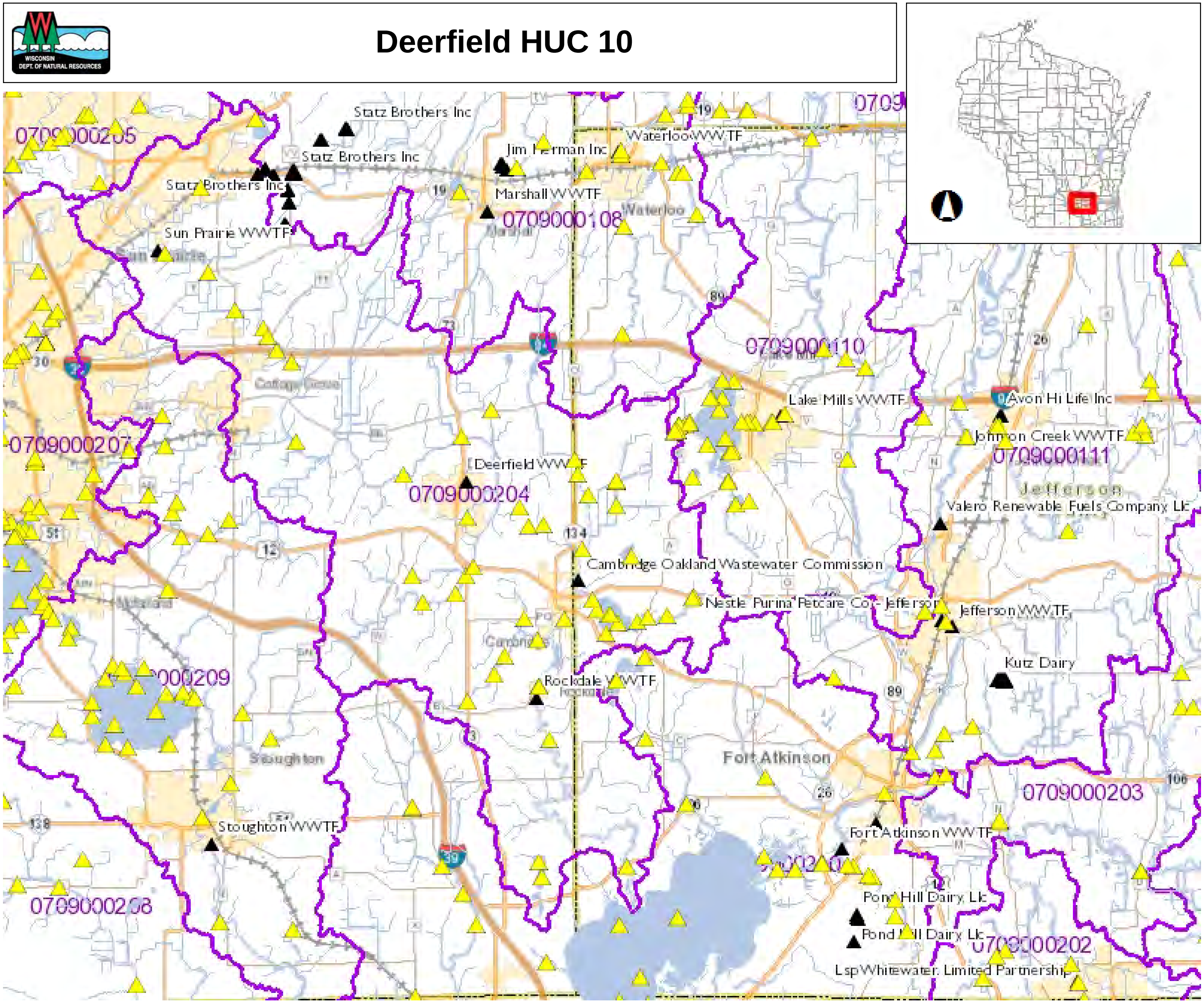
2001 WASTEWATER TREATMENT PLANT MODIFICATIONS
Village of Deerfield, Wisconsin

PROJECT NO.:	DE 47/DE 52
DRAWING FILE:	00-G-06.DWG
DRAWN BY:	G.J.D.
CHECKED BY:	E.A.L.
DATE:	9/01
REVISIONS:	11/01
SCALE:	N.T.S.
SHEET	00-G-06

Appendix B

Watershed Maps

Deerfield HUC 10



Legend

- Station Points with Recent Data (10 years)
- Surface Water Outfalls
- 10-digit HUCs (Watersheds)
- Municipality
- State Boundaries
- County Boundaries
- Major Roads
  - Interstate Highway
  - State Highway
  - US Highway
- County and Local Roads
  - County HWY
  - Local Road
- Railroads
- Tribal Lands
- Rivers and Streams
- Intermittent Streams
- Lakes and Open water

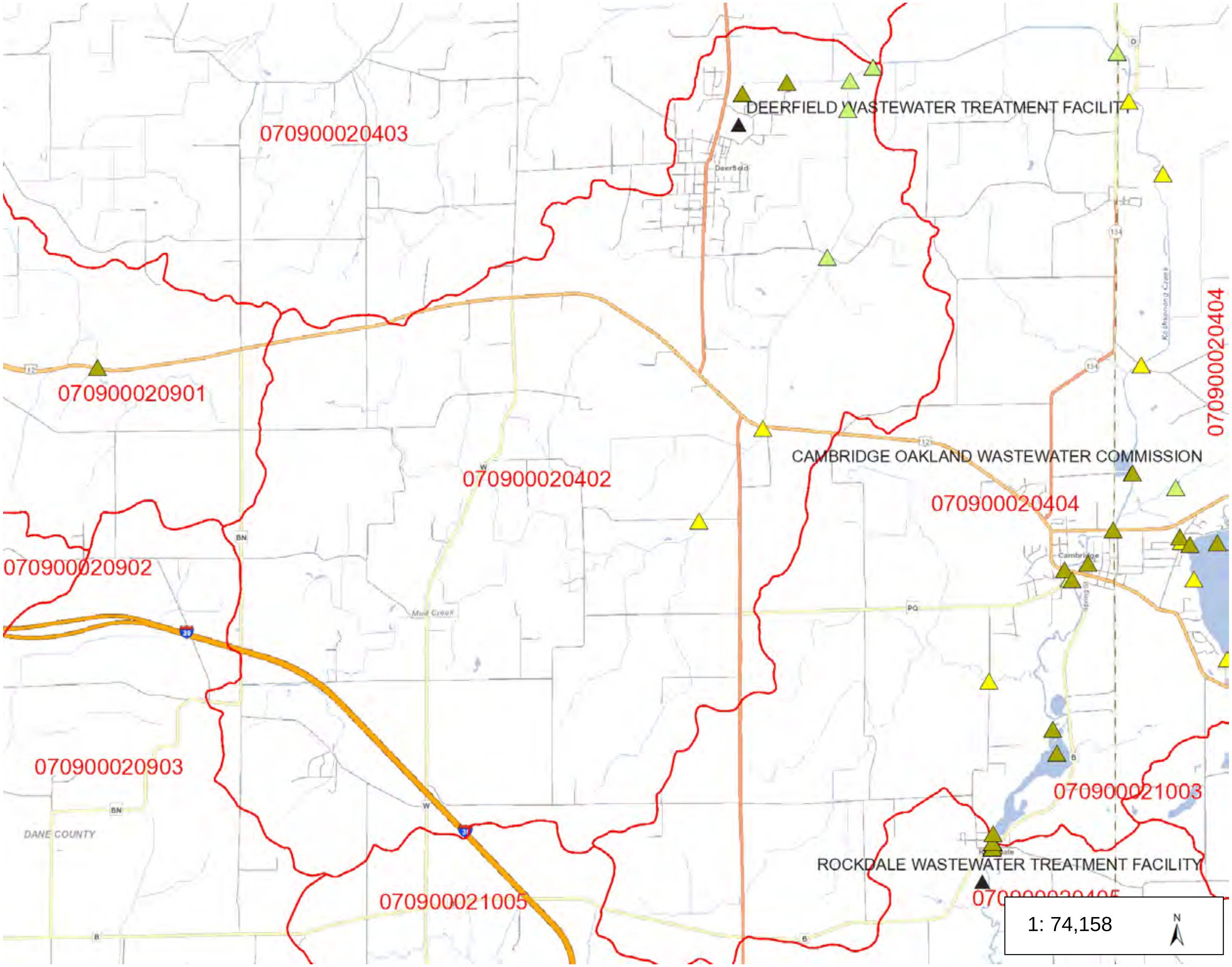
Notes

8.0 0 4.00 8.0 Miles

NAD_1983_HARN_Wisconsin_TM

1: 253,440

Deerfield WWTP HUC 12 Watershed



Legend

- SWIMS Station Point with Hist
- Station Points with Recent Dat
- SWIMS Monitoring Station Poi
  - New Station, Pending.
  - Active, Usable.
- Surface Water Outfalls
- 12-digit HUCs (Subwatersheds
- Rivers and Streams
- Open Water

1: 74,158

Notes

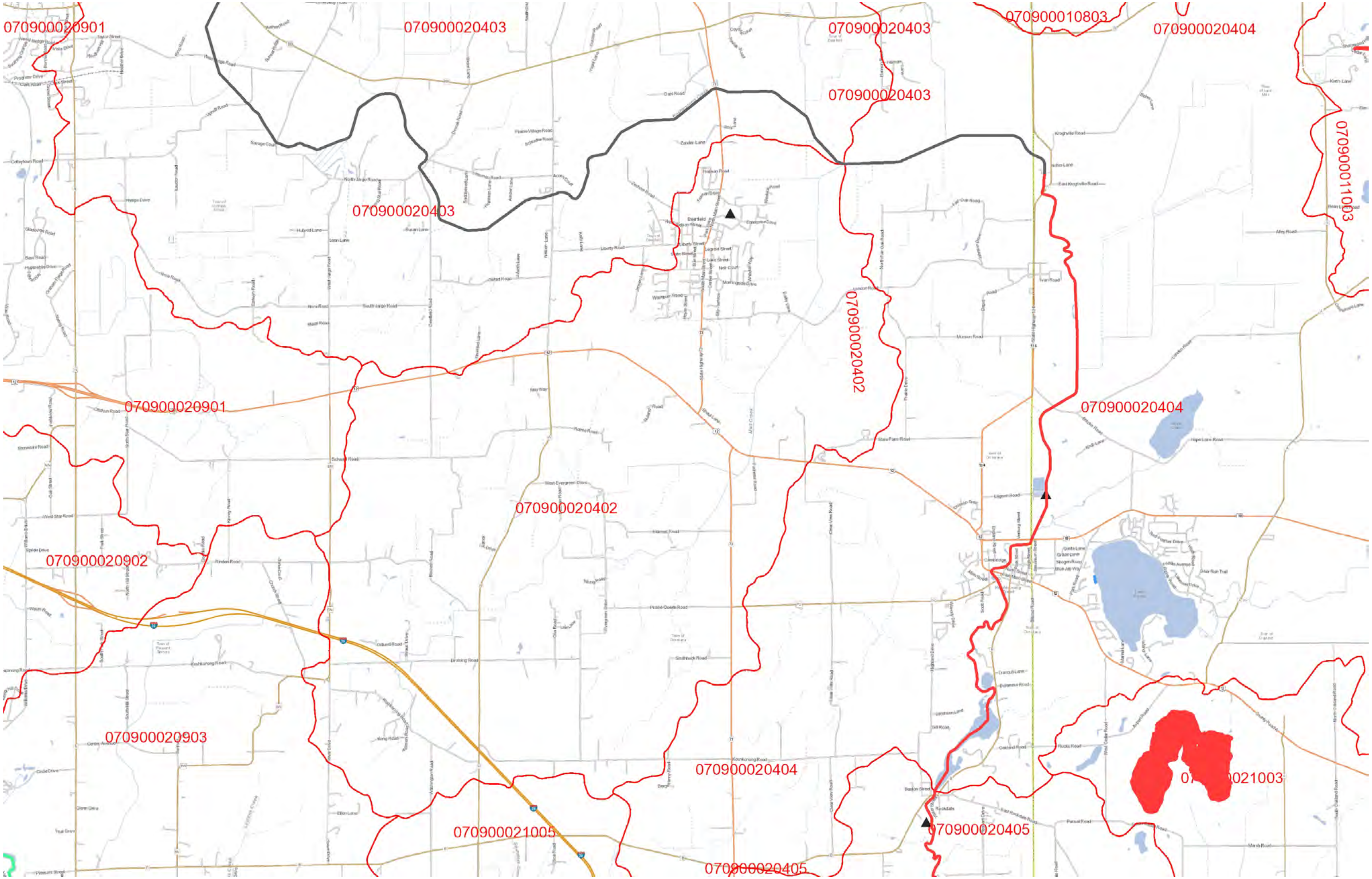
2.3 | 0 | 1.17 | 2.3 Miles

NAD_1983_HARN_Wisconsin_TM

Appendix C

Receiving Water Information

Impaired Waters



Legend

Impaired Waters River Status
- Other or Multiple TMDLs
- Proposed for List
- 303d Listed
- Addition
- TMDL Development
- TMDL Approved
- TMDL Implementation
- Deletion
- Delist
- Water Delisted
- EAP Project

Impaired Waters Lake Status
- Other or Multiple TMDLs
- Proposed for List
- 303d Listed
- Addition
- TMDL Development
- TMDL Approved
- TMDL Implementation
- Deletion
- Delist
- Water Delisted
- EAP Project

Surface Water Outfalls
12-digit HUCs (Subwatersheds)
Municipality
State Boundaries
County Boundaries

Major Roads
- Interstate Highway
- State Highway
- US Highway

County and Local Roads
- County HWY
- Local Road

Railroads
Tribal Lands
Rivers and Streams
Intermittent Streams

2.0 0 1.00 2.0 Miles

1:63,360

NAD_1983_HARN_Wisconsin_TM

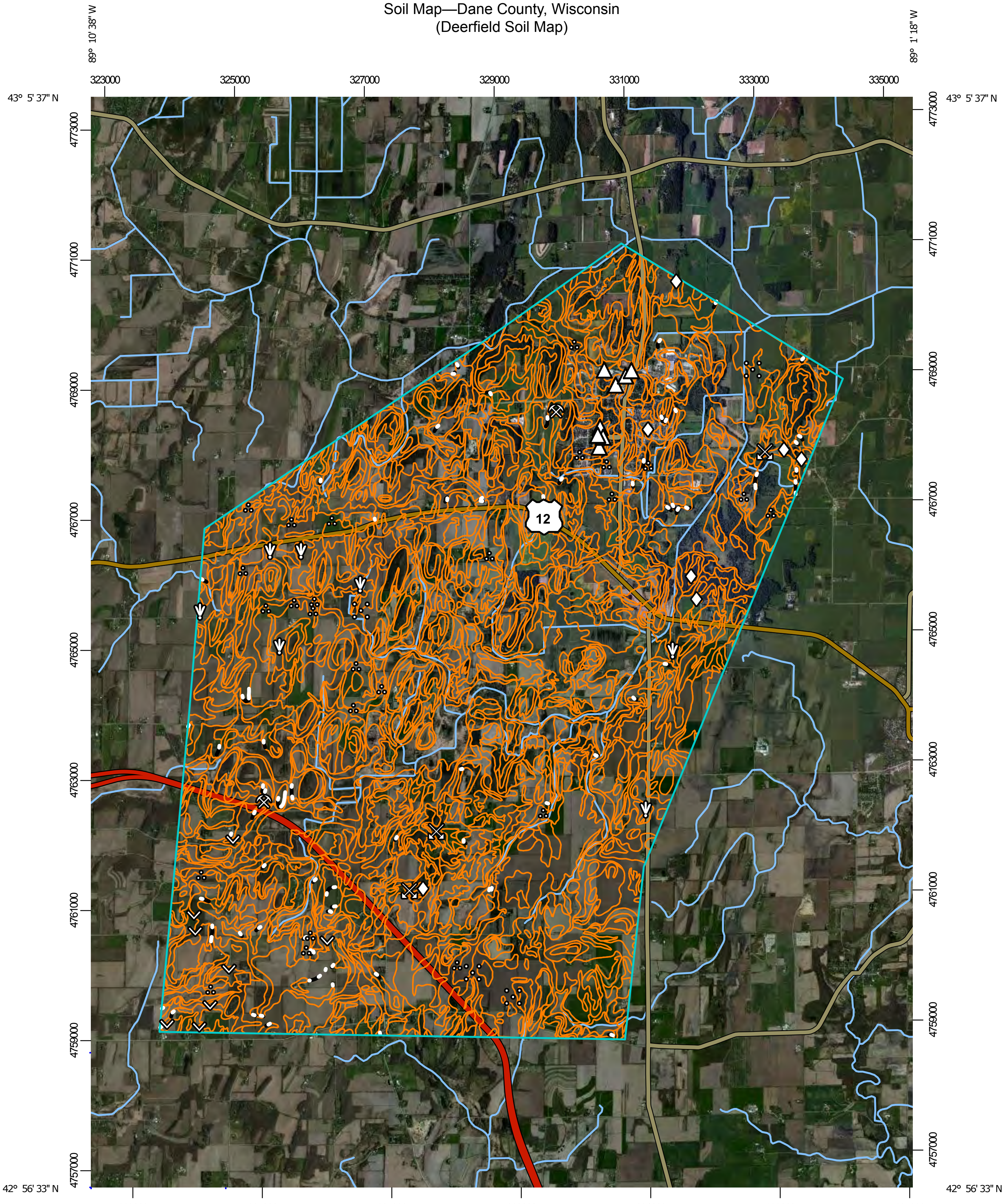
DISCLAIMER: The information shown on these maps has been obtained from various sources, and are of varying age, reliability and resolution. These maps are not intended to be used for navigation, nor are these maps an authoritative source of information about legal land ownership or public access. No warranty, expressed or implied, is made aregarding accuracy, applicability for a particular use, completeness, or legality of the information depicted on this map. For more information, see the DNR Legal Notices web page: http://dnr.wi.gov/legal/

Notes

Appendix D

Watershed Soils Data

Soil Map—Dane County, Wisconsin
(Deerfield Soil Map)



Map Scale: 1:81,700 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 1000, 2000, 4000, 6000

Feet: 0, 3500, 7000, 14000, 21000

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

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

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

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

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

Soil Survey Area: Dane County, Wisconsin
Survey Area Data: Version 15, Sep 27, 2016

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

Date(s) aerial images were photographed: Apr 29, 2011—Sep 10, 2011

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
1180E	Newglarus-Dunbarton, very stony, silt loams, 20 to 30 percent slopes, very rocky	3.9	0.0%
Ad	Adrian muck	144.0	0.7%
Af	Alluvial land, wet	37.5	0.2%
BaC2	Basco silt loam, 6 to 12 percent slopes, eroded	3.4	0.0%
BbA	Batavia silt loam, gravelly substratum, 0 to 2 percent slopes	64.8	0.3%
BbB	Batavia silt loam, gravelly substratum, 2 to 6 percent slopes	432.3	2.1%
BbC2	Batavia silt loam, gravelly substratum, 6 to 12 percent slopes, eroded	65.9	0.3%
BoB	Boyer sandy loam, 2 to 6 percent slopes	82.3	0.4%
BoC2	Boyer sandy loam, 6 to 12 percent slopes, eroded	241.1	1.1%
BoD2	Boyer sandy loam, 12 to 20 percent slopes, eroded	126.9	0.6%
Co	Colwood silt loam, 0 to 2 percent slopes	233.8	1.1%
Cu	Cut and fill land	15.6	0.1%
DnB	Dodge silt loam, 2 to 6 percent slopes	721.0	3.4%
DnC2	Dodge silt loam, 6 to 12 percent slopes, eroded	298.8	1.4%
DrD2	Dresden loam, 12 to 20 percent slopes, eroded	143.9	0.7%
DrE2	Dresden loam, 20 to 30 percent slopes, eroded	70.8	0.3%
DsB	Dresden silt loam, 2 to 6 percent slopes	392.5	1.9%
DsC2	Dresden silt loam, 6 to 12 percent slopes, eroded	746.8	3.5%
EdB2	Edmund silt loam, 2 to 6 percent slopes, eroded	17.5	0.1%
EdC2	Edmund silt loam, 6 to 12 percent slopes, eroded	53.1	0.3%
EdD2	Edmund silt loam, 12 to 20 percent slopes, eroded	20.0	0.1%
EfB	Elburn silt loam, 0 to 3 percent slopes	472.0	2.2%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
EgA	Elburn silt loam, gravelly substratum, 0 to 3 percent slopes	277.1	1.3%
EmD2	Elkmound sandy loam, 12 to 20 percent slopes, eroded	5.7	0.0%
Ev	Elvers silt loam	48.4	0.2%
Gn	Granby loamy sand	14.3	0.1%
GP	Gravel pit	37.9	0.2%
GsB	Grays silt loam, 2 to 6 percent slopes	15.4	0.1%
GwB	Griswold loam, 2 to 6 percent slopes	113.3	0.5%
GwC	Griswold loam, 6 to 12 percent slopes	668.8	3.2%
GwD2	Griswold loam, 12 to 20 percent slopes, eroded	77.5	0.4%
HaA	Hayfield silt loam, 0 to 3 percent slopes	187.2	0.9%
Ho	Houghton muck	1,129.5	5.4%
HuB	Huntsville silt loam, 2 to 6 percent slopes	1.6	0.0%
KdB	Kidder loam, 2 to 6 percent slopes	15.8	0.1%
KdC2	Kidder loam, 6 to 12 percent slopes, eroded	352.5	1.7%
KdD2	Kidder loam, 12 to 20 percent slopes, eroded	594.7	2.8%
KeA	Kegonsa silt loam, 0 to 2 percent slopes	93.8	0.4%
KeB	Kegonsa silt loam, 2 to 6 percent slopes	927.3	4.4%
KrD2	Kidder soils, 10 to 20 percent slopes, eroded	73.7	0.4%
KrE2	Kidder soils, 20 to 35 percent slopes, eroded	256.0	1.2%
Mc	Marshan silt loam	181.0	0.9%
MdB	McHenry silt loam, 2 to 6 percent slopes	274.7	1.3%
MdC2	McHenry silt loam, 6 to 12 percent slopes, eroded	826.4	3.9%
MdD2	McHenry silt loam, 12 to 20 percent slopes, eroded	105.3	0.5%
MhC2	Military loam, 6 to 12 percent slopes, eroded	12.7	0.1%
MhD2	Military loam, 12 to 20 percent slopes, eroded	20.9	0.1%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
MoA	Montgomery silty clay loam, 0 to 3 percent slopes	63.6	0.3%
Os	Orion silt loam, wet	87.4	0.4%
Ot	Otter silt loam	63.7	0.3%
Pa	Palms muck, 0 to 2 percent slopes	583.7	2.8%
PnA	Plano silt loam, till substratum, 0 to 2 percent slopes	519.0	2.5%
PnB	Plano silt loam, till substratum, 2 to 6 percent slopes	1,674.4	7.9%
PnC2	Plano silt loam, till substratum, 6 to 12 percent slopes, eroded	43.6	0.2%
PoA	Plano silt loam, gravelly substratum, 0 to 2 percent slopes	150.3	0.7%
PoB	Plano silt loam, gravelly substratum, 2 to 6 percent slopes	268.8	1.3%
PoC2	Plano silt loam, gravelly substratum, 6 to 12 percent slopes, eroded	5.6	0.0%
QUA	Quarry	31.0	0.1%
RaA	Radford silt loam, 0 to 3 percent slopes	259.3	1.2%
RnB	Ringwood silt loam, 2 to 6 percent slopes	1,897.0	9.0%
RnC2	Ringwood silt loam, 6 to 12 percent slopes, eroded	174.6	0.8%
RoB	Rockton silt loam, 2 to 6 percent slopes	396.7	1.9%
RoC2	Rockton silt loam, 6 to 12 percent slopes, eroded	378.9	1.8%
RoD2	Rockton silt loam, 12 to 30 percent slopes, eroded	10.3	0.0%
RpE	Rodman sandy loam, 12 to 35 percent slopes	54.6	0.3%
SaA	Sable silty clay loam, 0 to 2 percent slopes	654.7	3.1%
ScA	St. Charles silt loam, 0 to 2 percent slopes	26.9	0.1%
ScB	St. Charles silt loam, 2 to 6 percent slopes	441.9	2.1%
ScC2	St. Charles silt loam, 6 to 12 percent slopes, eroded	58.7	0.3%
ScD2	St. Charles silt loam, 12 to 20 percent slopes, eroded	2.8	0.0%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
SeB	Salter sandy loam, 2 to 6 percent slopes	5.6	0.0%
SeC2	Salter sandy loam, 6 to 12 percent slopes, eroded	3.9	0.0%
SfA	Salter silt loam, 0 to 2 percent slopes	26.1	0.1%
ShA	Salter sandy loam, wet variant, 0 to 3 percent slopes	104.7	0.5%
SoD	Sogn silt loam, 2 to 20 percent slopes	4.1	0.0%
SpC	Spinks and Plainfield loamy sands, 6 to 12 percent slopes	5.7	0.0%
TrB	Troxel silt loam, 1 to 3 percent slopes	513.4	2.4%
VrB	Virgil silt loam, 1 to 4 percent slopes	97.4	0.5%
VwA	Virgil silt loam, gravelly substratum, 0 to 3 percent slopes	450.9	2.1%
W	Water	5.7	0.0%
Wa	Wacousta silty clay loam, 0 to 2 percent slopes	911.2	4.3%
WrB	Warsaw silt loam, 2 to 6 percent slopes	156.4	0.7%
WrC2	Warsaw silt loam, 6 to 12 percent slopes, eroded	88.6	0.4%
WwE2	Whalan loam, 20 to 30 percent slopes, eroded	6.5	0.0%
WxB	Whalan silt loam, 2 to 6 percent slopes	27.6	0.1%
WxC2	Whalan silt loam, 6 to 12 percent slopes, eroded	72.8	0.3%
WxD2	Whalan silt loam, 12 to 20 percent slopes, eroded	42.4	0.2%
Totals for Area of Interest		**21,069.4**	**100.0%**

Appendix E

Land Use Data

Deerfield WWTP - HUC 12 Land Usage

Land use	Soil group	Area (acres)	Combined Acres	% of Total Acres
Open Water	B	0.89	76.5	0.5%
Open Water	D	75.61		
Open Space/Park	A	3.34	642.51	4.3%
Open Space/Park	B	569.78		
Open Space/Park	C	2.89		
Open Space/Park	D	66.5		
Low-Density Residential	A	1.33	599.13	4.0%
Low-Density Residential	B	532.64		
Low-Density Residential	C	4.45		
Low-Density Residential	D	60.71		
High-density Residential	B	120.54	137	0.9%
High-density Residential	C	0.67		
High-density Residential	D	15.79		
Commercial/Industrial/Transportation	B	19.57	24.69	0.2%
Commercial/Industrial/Transportation	D	5.12		
Barren Land	B	2	2	0.0%
Deciduous Forest	A	36.7	1426.67	9.4%
Deciduous Forest	B	1109.75		
Deciduous Forest	C	24.69		
Deciduous Forest	D	255.53		
Evergreen Forest	B	19.57	22.46	0.1%
Evergreen Forest	D	2.89		
Mixed Forest	A	0.22	9.78	0.1%
Mixed Forest	B	9.12		
Mixed Forest	D	0.44		
Shrub;	A	3.56	207.27	1.4%
Shrub;	B	194.37		
Shrub;	C	0.67		
Shrub;	D	8.67		
Grassland; Herbaceous	A	1.56	99.64	0.7%
Grassland; Herbaceous	B	79.62		
Grassland; Herbaceous	D	18.46		
Pasture/Hay	A	1.78	1595.91	10.6%
Pasture/Hay	B	1405.98		
Pasture/Hay	C	15.79		
Pasture/Hay	D	172.36		
Cropland Generalized Agriculture	A	48.04	9159.33	60.6%
Cropland Generalized Agriculture	B	6997.43		
Cropland Generalized Agriculture	C	53.15		
Cropland Generalized Agriculture	D	2060.71		
Woody Wetlands (swamp)	A	1.33	271.98	1.8%
Woody Wetlands (swamp)	B	17.79		
Woody Wetlands (swamp)	C	4		
Woody Wetlands (swamp)	D	248.86		
Emergent Wetlands (marsh)	A	0.44	836.87	5.5%
Emergent Wetlands (marsh)	B	67.16		
Emergent Wetlands (marsh)	C	4.45		
Emergent Wetlands (marsh)	D	764.82		
Total		***15,112***	**acres**	

Deerfield WWTF -Mud Creek Watershed

Land use	Soil group	Area (acres)	Combined Acres	% of Total Acres
Open Water	B	0.89	70.05	0.5%
Open Water	D	69.16		
Open Space/Park	A	3.34	642.51	4.3%
Open Space/Park	B	569.78		
Open Space/Park	C	2.89		
Open Space/Park	D	66.5		
Low-Density Residential (general 1/3 - 2 ac lots)	A	1.33	599.13	4.0%
Low-Density Residential (general 1/3 - 2 ac lots)	B	532.64		
Low-Density Residential (general 1/3 - 2 ac lots)	C	4.45		
Low-Density Residential (general 1/3 - 2 ac lots)	D	60.71		
High-density Residential (townhomes to 1/4 ac lots)	B	120.54	137	0.9%
High-density Residential (townhomes to 1/4 ac lots)	C	0.67		
High-density Residential (townhomes to 1/4 ac lots)	D	15.79		
Commercial/Industrial/Transportation	B	19.57	24.69	0.2%
Commercial/Industrial/Transportation	D	5.12		
Barren Land	B	2	2	0.0%
Deciduous Forest	A	36.7	1426.67	9.5%
Deciduous Forest	B	1109.75		
Deciduous Forest	C	24.69		
Deciduous Forest	D	255.53		
Evergreen Forest	B	19.57	22.46	0.1%
Evergreen Forest	D	2.89		
Mixed Forest	A	0.22	9.78	0.1%
Mixed Forest	B	9.12		
Mixed Forest	D	0.44		
Shrub; Scrub	A	3.56	207.27	1.4%
Shrub; Scrub	B	194.37		
Shrub; Scrub	C	0.67		
Shrub; Scrub	D	8.67		
Grassland; Herbaceous	A	1.56	99.64	0.7%
Grassland; Herbaceous	B	79.62		
Grassland; Herbaceous	D	18.46		
Pasture/Hay	A	1.78	1595.91	10.6%
Pasture/Hay	B	1405.98		
Pasture/Hay	C	15.79		
Pasture/Hay	D	172.36		
Cropland generalized agriculture	A	48.04	9132.2	60.6%
Cropland generalized agriculture	B	6997.43		
Cropland generalized agriculture	C	53.15		
Cropland generalized agriculture	D	2033.58		
Woody Wetlands (swamp)	A	1.33	271.98	1.8%
Woody Wetlands (swamp)	B	17.79		
Woody Wetlands (swamp)	C	4		
Woody Wetlands (swamp)	D	248.86		
Emergent Wetlands (marsh)	A	0.44	833.31	5.5%
Emergent Wetlands (marsh)	B	67.16		
Emergent Wetlands (marsh)	C	4.45		
Emergent Wetlands (marsh)	D	761.26		
Total		***15074.5***	***acres***	

City of Deerfield WWTP
Watershed Data

From L-THIA (Long-Term Hydrologic Impact Assessment) Output
https://engineering.purdue.edu/mapserve/www/lthia_wi/

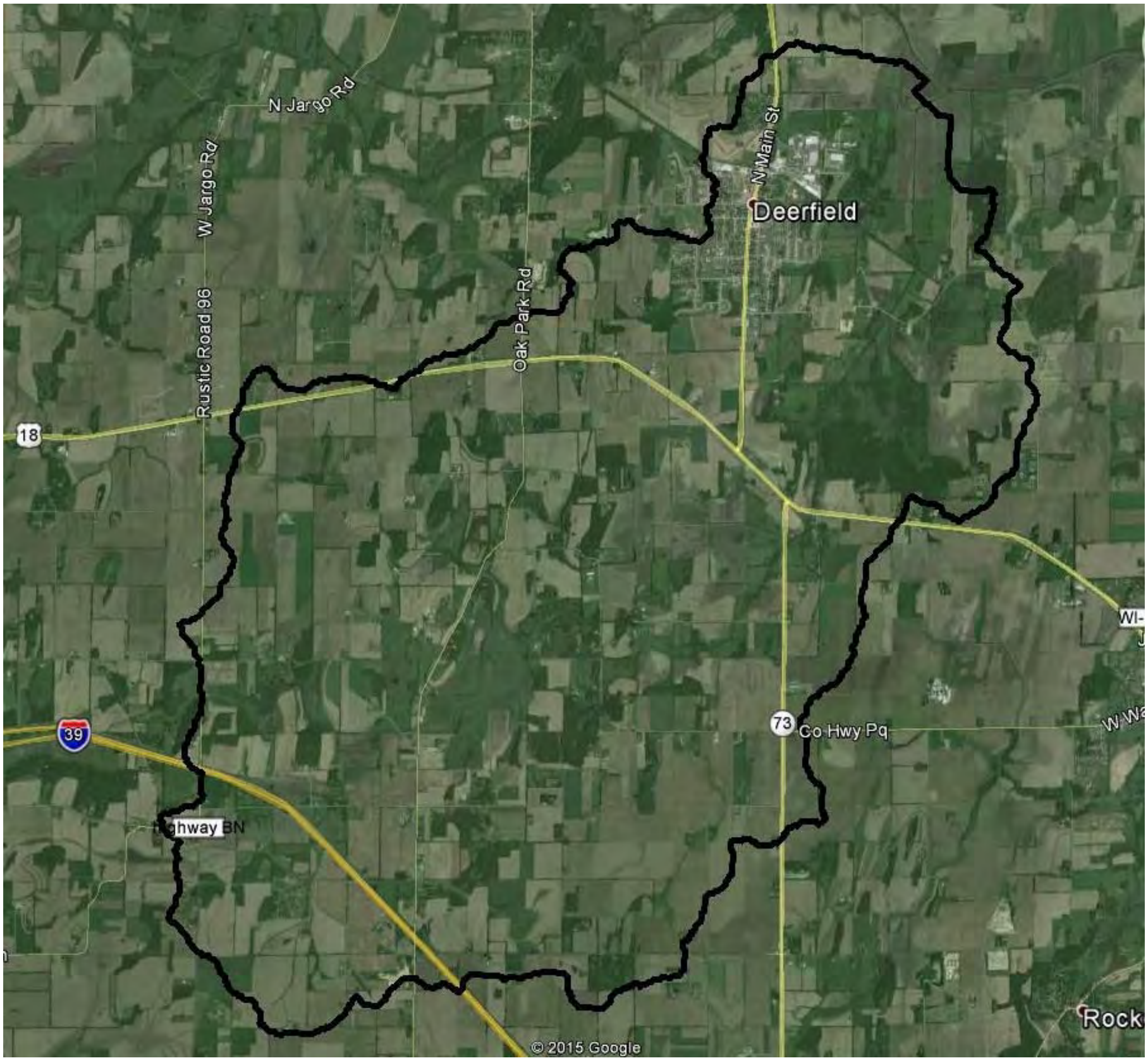
Watershed Delineated for Current Outfall – Compliance Point at Mud Creek
Apparent outlet point coordinate (In GCS_WGS_1984): Lat = 43.061802019784494
Lng = -89.0522575378418
Watershed contained within the HUC8 07090002

Land use	Soil group	Area(acres)
Open Water	B	0.89
Open Water	D	71.83
Open Space/Park	A	3.34
Open Space/Park	B	569.78
Open Space/Park	C	2.89
Open Space/Park	D	66.50
Low-Density Residential (general 1/3 - 2 ac lots)	A	1.33
Low-Density Residential (general 1/3 - 2 ac lots)	B	532.64
Low-Density Residential (general 1/3 - 2 ac lots)	C	4.45
Low-Density Residential (general 1/3 - 2 ac lots)	D	60.71
High-density Residential (townhomes to 1/4 ac lots)	B	120.54
High-density Residential (townhomes to 1/4 ac lots)	C	0.67
High-density Residential (townhomes to 1/4 ac lots)	D	15.79
Commercial/Industrial/Transportation	B	19.57
Commercial/Industrial/Transportation	D	5.12
Barren Land	B	2.00
Deciduous Forest	A	36.70
Deciduous Forest	B	1109.75
Deciduous Forest	C	24.69
Deciduous Forest	D	255.53
Evergreen Forest	B	19.57
Evergreen Forest	D	2.89
Mixed Forest	A	0.22
Mixed Forest	B	9.12
Mixed Forest	D	0.44

Shrub; Scrub	A	3.56
Shrub; Scrub	B	194.37
Shrub; Scrub	C	0.67
Shrub; Scrub	D	8.67
Grassland; Herbaceous	A	1.56
Grassland; Herbaceous	B	79.62
Grassland; Herbaceous	D	18.46
Pasture/Hay	A	1.78
Pasture/Hay	B	1405.98
Pasture/Hay	C	15.79
Pasture/Hay	D	172.36
Cropland generalized agriculture	A	48.04
Cropland generalized agriculture	B	6997.43
Cropland generalized agriculture	C	53.15
Cropland generalized agriculture	D	2040.03
Woody Wetlands (swamp)	A	1.33
Woody Wetlands (swamp)	B	17.79
Woody Wetlands (swamp)	C	4.00
Woody Wetlands (swamp)	D	248.86
Emergent Wetlands (marsh)	A	0.44
Emergent Wetlands (marsh)	B	67.16
Emergent Wetlands (marsh)	C	4.45
Emergent Wetlands (marsh)	D	763.48
Total		**15085.93**

LAL and LFF Watershed – Village of Deerfield WWTP

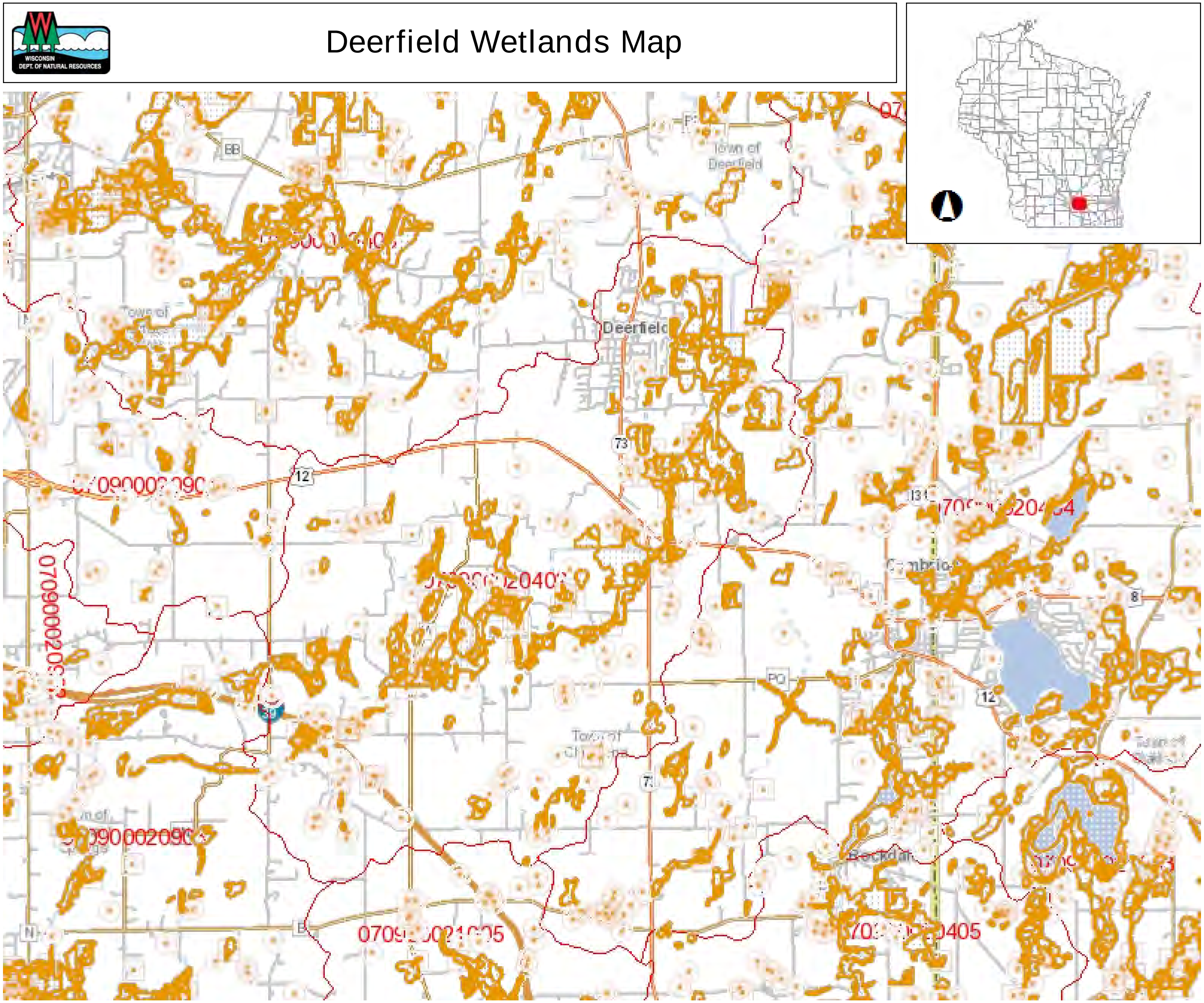
Compliance Point at Mud Creek



Appendix F

Wetlands Information

Deerfield Wetlands Map



Legend

- Wetland Class Points
  - Dammed pond
  - Excavated pond
  - Filled excavated pond
  - Filled/drained wetland
  - Wetland too small to delineate
- Filled Points
- Wetland Class Areas
  - Wetland
  - Upland
- Filled Areas
- NRCS Wetspots
- Wetland Indicators
- 12-digit HUCs (Subwatersheds)
- Municipality
- State Boundaries
- County Boundaries
- Major Roads
  - Interstate Highway
  - State Highway
  - US Highway
- County and Local Roads
  - County HWY
  - Local Road
- Railroads
- Tribal Lands
- Rivers and Streams
- Intermittent Streams
- Lakes and Open water

Notes

3.0 0 1.50 3.0 Miles

NAD_1983_HARN_Wisconsin_TM

1: 95,040

Appendix G

WWTF Effluent Phosphorus Data

Village of Deerfield
WWTP Phosphorus Data

2012	Influent			Effluent		
	Flow MGD	Phos MG/L	Phos LB	Flow MGD	Phos MG/L	Phos LB
January						
February						
March						
April						
May	0.157	7.93	10.4	0.178	0.47	0.70
June	0.153	7.73	9.8	0.180	0.51	0.77
July	0.142	8.20	9.7	0.175	0.49	0.72
August	0.144	7.73	9.3	0.179	0.47	0.70
September	0.144	7.90	9.5	0.152	0.49	0.61
October	0.149	6.57	8.2	0.177	0.46	0.67
November	0.145	7.57	9.1	0.205	0.45	0.77
December	0.151	7.53	9.5	0.166	0.32	0.44
Average	**0.148**	**7.65**	**9.4**	**0.176**	**0.46**	**0.67**

2013	Influent			Effluent		
	Flow MGD	Phos MG/L	Phos LB	Flow MGD	Phos MG/L	Phos LB
January	0.158	7.43	9.8	0.180	0.27	0.40
February	0.156	6.57	8.6	0.187	0.38	0.60
March	0.178	7.60	11.3	0.225	0.32	0.60
April	0.220	8.00	14.7	0.254	0.42	0.89
May	0.192	7.50	12.0	0.238	0.41	0.81
June	0.199	7.90	13.1	0.237	0.69	1.37
July	0.183	8.60	13.1	0.236	0.71	1.39
August	0.173	7.70	11.1	0.217	0.72	1.30
September	0.157	7.13	9.3	0.175	0.57	0.84
October	0.157	8.15	10.7	0.181	0.58	0.87
November	0.154	8.00	10.3	0.189	0.33	0.51
December	0.155	7.85	10.1	0.201	0.40	0.67
Average	**0.174**	**7.70**	**11.2**	**0.210**	**0.48**	**0.85**

2014	Influent			Effluent		
	Flow MGD	Phos MG/L	Phos LB	Flow MGD	Phos MG/L	Phos LB
January	0.157	7.60	10.0	0.197	0.22	0.36
February	0.162	7.27	9.8	0.201	0.21	0.36
March	0.170	8.00	11.3	0.202	0.50	0.84
April	0.159	7.60	10.1	0.168	0.48	0.67
May	0.165	5.30	7.3	0.231	0.47	0.91
June	0.196	7.37	12.1	0.213	0.63	1.12
July	0.166	6.93	9.6	0.224	0.69	1.28
August	0.151			0.222	0.70	1.35
September	0.155			0.223	0.47	0.87
October	0.155			0.213	0.73	1.21
November	0.153			0.187	0.55	1.01
December	0.157			0.174	0.41	0.64
Average	**0.162**	**7.15**	**10.0**	**0.205**	**0.50**	**0.88**

Village of Deerfield
WWTP Phosphorus Data

2015	Influent			Effluent		
	Flow MGD	Phos MG/L	Phos LB	Flow MGD	Phos MG/L	Phos LB
January	0.150			0.170	0.79	1.10
February	0.154			0.184	0.36	0.59
March	0.146			0.164		
April	0.152			0.217		
May	0.147			0.254	0.78	1.71
June	0.144			0.221	0.28	0.70
July	0.136			0.246	0.25	0.50
August	0.144	6.30	7.0	0.208	0.30	0.58
September	0.153	5.35	6.0	0.235	0.27	0.59
October	0.148	6.00	7.8	0.190	0.23	0.40
November	0.158	6.45	7.9	0.204	0.10	0.19
December	0.170	5.20	7.1	0.225	0.06	0.13
Average	**0.150**	**5.86**	**7.1**	**0.210**	**0.34**	**0.65**

2016	Influent			Effluent		
	Flow MGD	Phos MG/L	Phos LB	Flow MGD	Phos MG/L	Phos LB
January	0.165			0.207	0.15	0.28
February	0.161	6.3	8.7	0.201	0.39	0.68
March	0.169			0.197	0.07	0.12
April	0.173			0.217	0.26	0.51
May	0.159			0.204	1.11	1.95
June	0.153			0.226	0.24	0.44
July	0.146			0.264	0.22	0.55
August	0.153			0.259	0.09	0.23
September	0.171			0.211	0.15	0.26
October	0.167			0.211	0.30	0.63
November	0.185			0.227	0.14	0.28
December	0.167			0.198	0.11	0.19
Average	**0.164**	**6.30**	**8.7**	**0.219**	**0.27**	**0.51**

2017	Influent			Effluent		
	Flow MGD	Phos MG/L	Phos LB	Flow MGD	Phos MG/L	Phos LB
January	0.194			0.216	0.06	0.11
February	0.176			0.195	0.06	0.10
March	0.177			0.191	0.07	0.11
April	0.203			0.235	0.34	0.70
May	0.209			0.261	0.19	0.44
June	0.187			0.246	0.08	0.19
July	0.185			0.306	0.21	0.58
August	0.181			0.288	1.00	2.31
September	0.163			0.171	0.10	0.15
October	0.172			0.185	0.19	0.34
November	0.165			0.192	0.14	0.24
December						
Average	**0.183**			**0.226**	**0.22**	**0.48**

Village of Deerfield
WWTP Phosphorus Data

	Influent Summary			Effluent Summary		
Year	**Flow**	**Phos mg/L**	**Phos lb**	**Flow**	**Phos mg/L**	**Phos lb**
2012	0.148	7.6	9.4	0.176	0.46	0.67
2013	0.174	7.7	11.2	0.210	0.48	0.85
2014	0.162	7.2	10.0	0.205	0.50	0.88
2015	0.150	5.9	7.1	0.210	0.34	0.65
2016	0.161			0.219	0.27	0.51
2017	0.183			0.226	0.22	0.48
Average	**0.159**	**7.1**	**9.4**	**0.204**	**0.41**	**0.71**

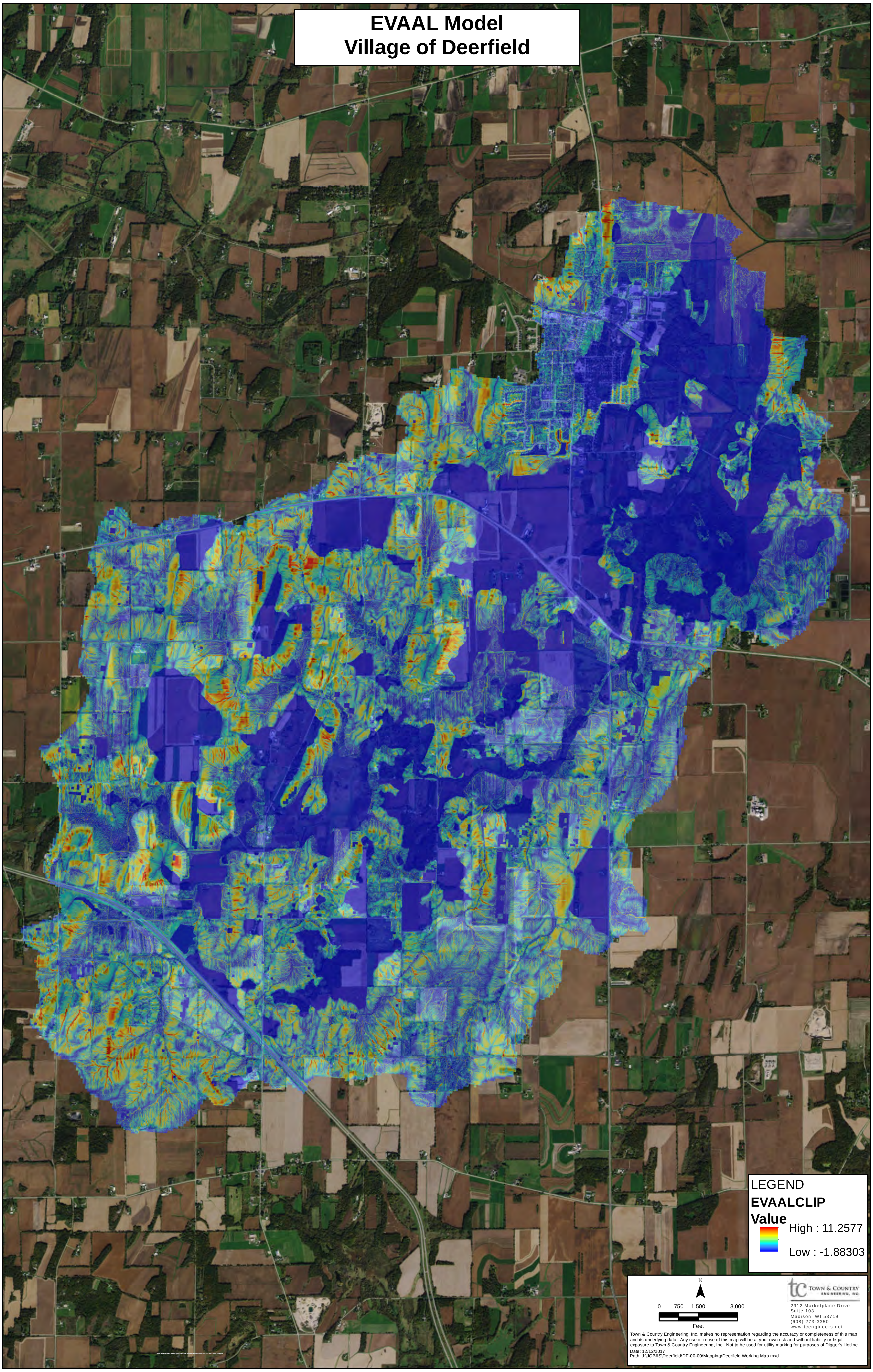
Monthly Max	**0.220**	**8.60**	**14.68**	**0.264**	**1.11**	**1.95**
Monthly Min	**0.136**	**5.20**	**6.05**	**0.152**	**0.06**	**0.12**

Deerfield WWTF
Watershed Adaptive Management Plan
In-Stream Phosphorus Concentrations

Date	Upstream Concentration (mg/L)	Downstream Concentration (mg/L)
10/5/2017	0.13	0.13
5/15/2018	0.12	0.14
5/24/2018	0.14	0.11
6/1/2018	0.12	0.13
6/14/2018	0.11	0.12
6/25/2018	0.16	0.12
Average	0.13	0.13

Appendix H

EVAAL Results

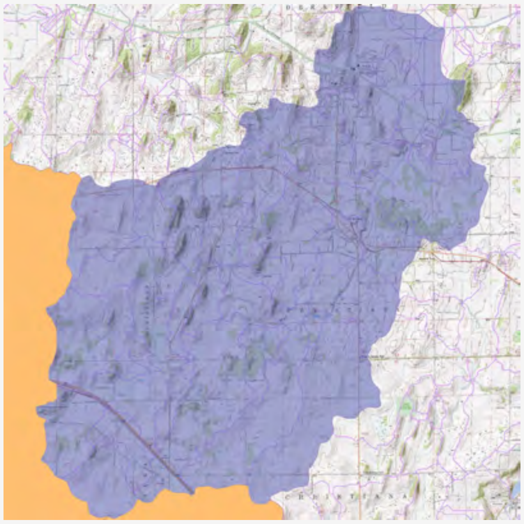

EVAAL Model
Village of Deerfield
LEGEND
EVAALCLIP
Value
High : 11.2577
Low : -1.88303
N
0 750 1,500 3,000
Feet
TOWN & COUNTRY ENGINEERING, INC.
2912 Marketplace Drive
Suite 103
Madison, WI 53719
(608) 273-3350
www.tcengineers.net
Town & Country Engineering, Inc. makes no representation regarding the accuracy or completeness of this map and its underlying data. Any use or reuse of this map will be at your own risk and without liability or legal exposure to Town & Country Engineering, Inc. Not to be used for utility marking for purposes of Digger's Hotline.
Date: 12/12/2017
Path: J:\JOB#S\Deerfield\DE-00-00\Mapping\Deerfield Working Map.mxd

Appendix I

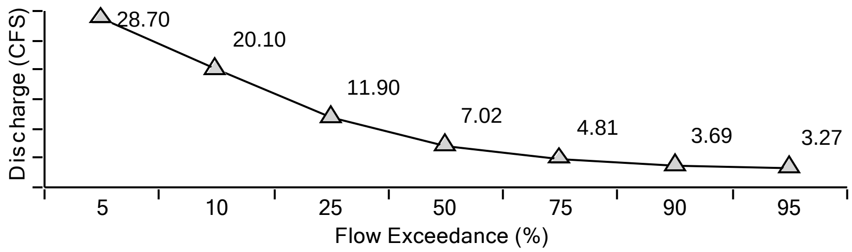
Presto-Lite Watershed Delineation Report

PRESTO-Lite Watershed Delineation Report

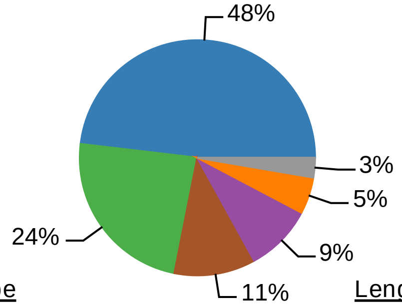
Reach ID: 200025041	
Watershed Name: Mud Creek	
Waterbody Name: Mud Creek	
HUC08: Lower Rock River	
Watershed Area: 23.59 mi²	
Average Annual Precipitation: 33.86in	



Stream Flow

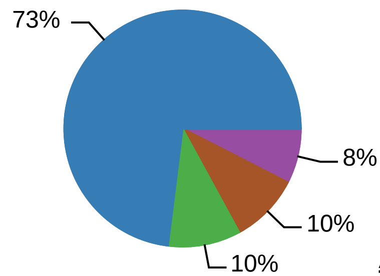


Tributary Stream Type



Type	Length
Cool-Cold Headwater	27112 ft
Cold Headwater	13373 ft
Macroinvertebrates	6282 ft
Coldwater	5215 ft
Cool-Cold Mainstem	2839 ft
Warm Headwater	1507 ft
Cold Mainstem	0 ft
Large River	0 ft
Warm Mainstem	0 ft

Landcover



Type	Area
Agriculture	16.79 mi²
Forest	2.28 mi²
Urban	2.19 mi²
Wetland	1.73 mi²
Barren	0.33 mi²
Grassland	0.16 mi²

PRESTO Phosphorus Load Estimate

Avg. Annual Nonpoint Phosphorous Load (80% Confidence Interval)	7,491 (3,048 - 18,412) lbs
Number of Facilities (Individual Facility Information below)	1
Avg. Annual Point-source Phosphorous Load (2010 - 2012 total of all facilities)	290lbs
Most Likely Point : Nonpoint Phosphorous Ratio	4% : 96%
Low Estimate Point : Nonpoint Phosphorous Ratio (Adaptive Management)	2% : 98%

Adaptive Management Results

Facilities Discharging to the Mud Creek Watershed:

Facility Name	Permit #	Outfall #	Waste Type	Receiving Water	Avg. Phosphorus Load (lbs.) (2010 - 2012)
DEERFIELD WASTEWATER TREATMENT FACILITY	0023744	001	Municipal	Unnamed	290

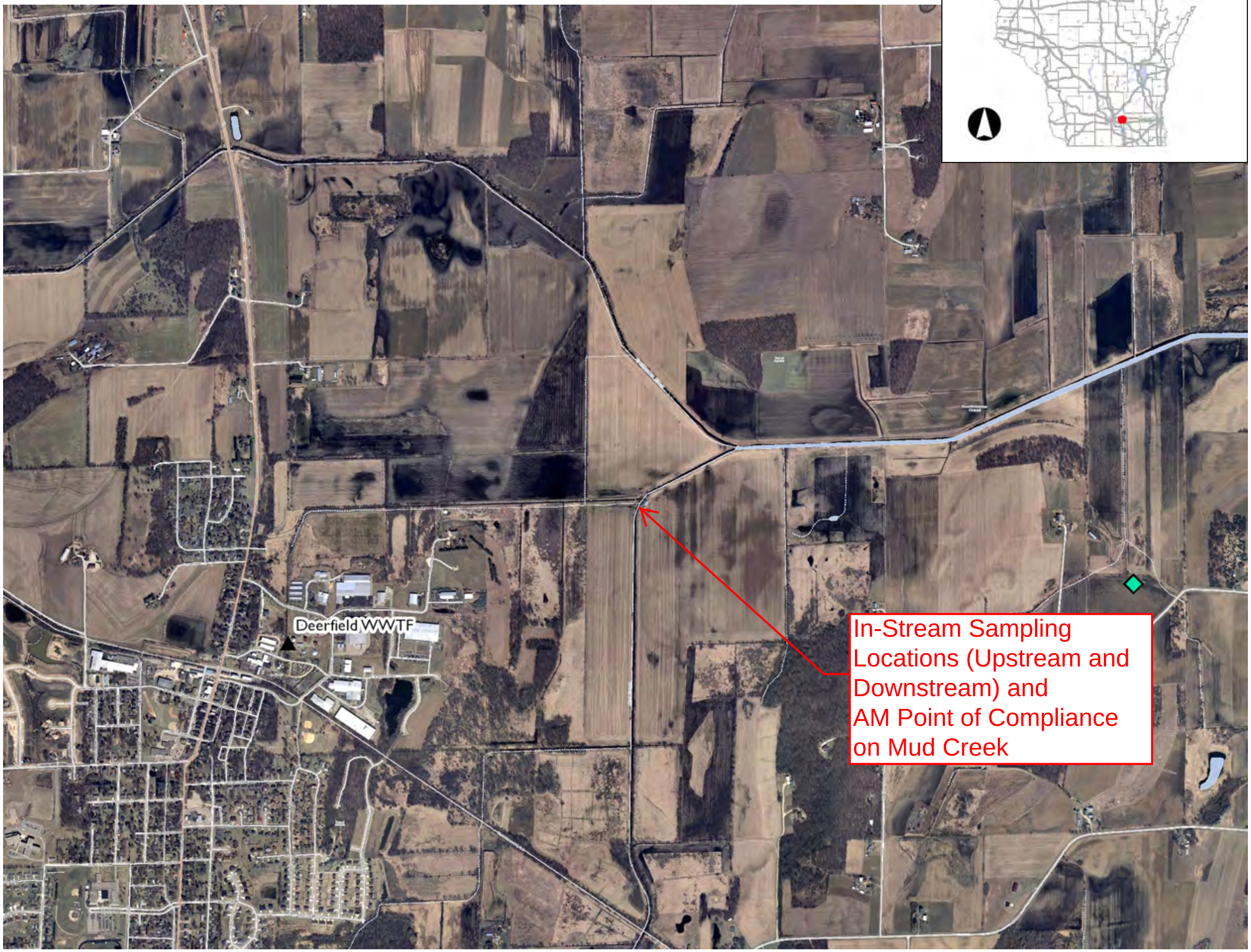
Watershed Analysis Limitations

- This analysis relies on pre-defined catchments from the Wisconsin Hydrography Data-Plus and may not delineate from the exact location required. When assessing phosphorus loads for specific facility in support of efforts such as adaptive management, care should be taken to ensure that additional downstream point sources do not exist. For adaptive management information related to specific facilities please reference the PRESTO website http://dnr.wi.gov/topic/surfacewater/presto.html
- Delineation of watersheds is based on a topographic assessment and therefore do not account for modified drainage networks such as stormwater sewer systems and ditched agriculture.
- If a watershed requires delineation from an exact location the user may use the desktop version of PRESTO that requires ESRI ArcGIS. The PRESTO tool and default datasets can be downloaded at http://dnr.wi.gov/topic/surfacewater/presto.html
- Data sources for this report originate from the WDNR's Wisconsin Hydrography Data-Plus value-added dataset and the point and non-point source loading information including in the WDNR's PRESTO model.
- If you have questions about the report generated from the PRESTO-Lite application please contact: DNRWATERQUALITYMODELING@wisconsin.gov

Appendix J

Proposed In-Stream Sampling Locations

Deerfield WWTF Outfall Location



Legend

- Wetland Identifications and Confirmations
- Surface Water Outfalls
- Municipality
- State Boundaries
- County Boundaries
- Major Roads
  - Interstate Highway
  - State Highway
  - US Highway
- County and Local Roads
  - County HWY
  - Local Road
- Railroads
- Tribal Lands
- Rivers and Streams
- Intermittent Streams
- Lakes and Open water
- Index to EN_Image_Basemap_Leaf_Off

Notes

0.8 0 0.38 0.8 Miles

NAD_1983_HARN_Wisconsin_TM

1: 23,760


Deerfield WWTF
Proposed In-stream Phosphorus Sampling Locations
Legend
In-stream flow measurement Location 43°03'41.15"N 89°03'11.14"W
Mud Creek
Downstream Sample Location (250-350 feet downstream of confluence, where accessable.) 43°03'42.37"N 89°03'08.00"W
Unnamed Tirbutary (WWTF Outfall Upstream)
Upstream Sample Location 43°03'40.04"N 89°03'012.32"W
Google Earth
N
200 ft


Deerfield WWTF
Flow Measurement Locations
Access Road Flow Measurement Location
43°03'41.15"N
89°03'11.14"W
(1 mile east of State Highway 73)
Bridge Street Flow Measurement Location
43°03'41.49"N
89°00'32.95"W
(300 feet west of WI-134)
Deerfield
London
WI-134
Google Earth
© 2018 Google
1 mi
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Appendix K

Financial Security Statement

VILLAGE OF DEERFIELD
STATEMENT OF FINANCIAL SERCURITY

WHEREAS, the Village of Deerfield, Dane County, Wisconsin (the "Village") owns and operates a municipal wastewater treatment system; and

WHEREAS, the Commission intends to implement an Adaptive Management Program (the "Project"); to comply with the water quality based effluent limits for phosphorus established by NR 102 and NR 217 and its Wisconsin Pollutant Discharge Elimination System (WPDES) permit; and

WHEREAS, the Commission expects to finance the Project with existing funds and user charges;

NOW, THEREFORE, the Village of Deerfield, Dane County, Wisconsin confirms that the Commission has the financial means to implement the project during the next WPDES permit term, beginning in July 2018.

Signed this 27th day of December, 2017.

Director of Public Works - Village of Deerfield

Appendix L

LWRM Contract Template

COST-SHARE CONTRACT NO.:

SOIL AND WATER RESOURCE MANAGEMENT GRANT PROGRAM

Sec. 92.14, Wis. Stats

COST-SHARE CONTRACT

(DATCP approval required for cost-share amounts over $50,000)

This contract is made and entered into by and between **Dane** County Land Conservation Committee, and landowner(s) ______________and grant recipient(s)N/A. **This contract is complete and valid as of the date signed by the county representative.**

In consideration of the terms and conditions herein, the parties agree to this contract as set forth in the following Sections 1, 2, and 3, and any addenda that are annexed and made a part hereof.

NOTE 1: It is **not** necessary to notarize the spouse's signature unless this contract will be recorded. However, the spouse must sign his or her own name. If there are additional landowners or any grant recipients, check here ☐ and attach Exhibit A1. **NOTE 2:** Only properly authorized person(s) can sign in a representative capacity and must sign in such capacity if the landowner is a corporation, trust, estate, partnership, limited partnership, or limited liability company.

Recording Area

Agency Name & Return Address
Dane County Land & Water Resources
5201 Fen Oak Drive, Room 208
Madison, WI 53718

Parcel Identification Number

LANDOWNER/REPRESENTATIVE	DATE	LANDOWNER/REPRESENTATIVE	DATE
PRINT OR TYPE NAME: JAMES M. LUNDE		PRINT OR TYPE NAME: SHARON LUNDE	

State of Wisconsin)
) ss.
_____County)

This instrument was acknowledged before me on _____ (date)

by_____ (name of landowner or representative)

as _____ (representative's position or type of authority, if applicable)

for _____ (name of entity on behalf of whom instrument was executed, if applicable)

SIGNATURE ______ **PRINT NAME** _____
Notary Public, State of Wisconsin
My commission expires _____ (is permanent).

State of Wisconsin)
) ss.
_____County)

This instrument was acknowledged before me on _____ (date)

by _____ (name of landowner or representative)

as _____ (representative's position or type of authority, if applicable)

for_____ (name of entity on behalf of whom instrument was executed, if applicable)

SIGNATURE ______ **PRINT NAME** _____
Notary Public, State of Wisconsin
My commission expires _____ (is permanent).

SIGNATURE OF COUNTY REPRESENTATIVE ______ **DATE**
PRINT OR TYPE NAME: _____

State of Wisconsin)
) ss.
_____County)
This instrument was acknowledged before me on _____ (date)

by _____ (name of county representative)

as_____of _____

SIGNATURE ______ **PRINT NAME** _____
Notary Public, State of Wisconsin
My commission expires _____ (is permanent)

This document was drafted by the Wisconsin Department of Agriculture, Trade and Consumer Protection.

Personal information you provide may be used for purposes other than that for which it was originally collected (Sec. 15.04(1) (m), Wis. Stats.)

COST-SHARE CONTRACT NO.:

SECTION 1A. COUNTY INFORMATION	
NAME OF COUNTY AGENCY Dane County Land & Water Resources	TELEPHONE NUMBER 608-224-3730
ADDRESS 5201 Fen Oak Drive, Room 208	CITY, STATE, ZIP CODE Madison WI 53718
NAME OF AUTHORIZED REPRESENTATIVE Amy Callis – County Conservationist	
SECTION 1B. LANDOWNER and GRANT RECIPIENT INFORMATION	
TOTAL DATCP COST-SHARE AMOUNT (refer to page 5)	NON-DATCP FUNDING BY SOURCE (refer to page 5) ☐ County $ ☐ Other State Agency $ ☐ Federal $ ☐ Non-Profit or Other $
NAME OF LANDOWNER (Check the description that best applies: ☒ Individual (Note: Spouse must be included) ☐ Corporation ☐ Limited Liability Company ☐ Trust, Estate or Partnership ☐ Local Unit of Government)	
ADDRESS	
CITY, STATE, ZIP CODE WI	TELEPHONE NUMBER
LOCATION OF COST-SHARED PRACTICE(S) (Locate by providing parcel numbers(s) or coordinates below or attach required information as Exhibit B) Parcel Identification Number(s): Latitude and longitude (degrees and minutes): ° . ' N ° ' W Note: If this document will be recorded, attach a legal description of the location of the cost-shared practice(s) that meets the requirements of ss. 706.05(2m)(a) and 66.0217(1)(c), Wis. Stats.	
NAME OF GRANT RECIPIENT, if different than above. NOTE: SPOUSE MUST BE INCLUDED N/A	
ADDRESS	
CITY, STATE, ZIP CODE	TELEPHONE NUMBER

INSTALLATION PERIOD

Each practice must be installed, and all costs associated with the practice must be incurred, by December 31st of the cost-share contract year, or December 31st of the year of an approved extension. This contract may provide cost-sharing for more than one year for the following items as long as the parties record the number of years of cost-sharing in the appropriate column in Section 3:

a. **To install and maintain contour farming, cover and green manure crop, nutrient management, pest management, residue management, and strip-cropping (up to 4 years).**

b. **For land taken out of production for 10 years or other period specified in Section 3.**

c. **For riparian land taken out of production for 15 years or in perpetuity as specified in Section 3.**

Disclosure of non-DATCP funding: By signing this contract, the landowner or grant recipient agrees to disclose all information related to any non-DATCP funding that has been or will be obtained to pay for practices described in this contract, and to authorize the county and DATCP to access files related to this funding, including release of county and federal files in accordance with the provisions of 16 U.S.C. 3844(b) (2) (D) (i).

Appeal Rights: The landowner or grant recipient may appeal to the county, in writing, any decision of the county land conservation department regarding this grant. The county will determine if the grantee is eligible for a hearing under Chapter 68, Wis. Stats.

Landowner Initials	Date	Spouse Initials	Date	Grant Recipient Initials	Date	Spouse Initials	Date	County Reps. Initials	Date

ADDENDA MAY BE ATTACHED TO THIS DOCUMENT TO RECORD SPECIAL CONDITIONS

COST-SHARE CONTRACT NO.:

A. The landowner/grant recipient agrees:

1. To install and maintain cost-shared practice(s) listed in Section 3, consistent with the plans and specifications referenced in Section 3, during periods identified in Section 3.
2. To make all payments for which the landowner/grant recipient (hereinafter referred to as "landowner") is obligated under this contract, as specified in Section 3. Landowners are responsible for all payments for state or local administrative permit fees.
3. To provide the county with evidence of payment, as applicable, for services, supplies, and practices performed or installed pursuant to this contract. Proof of payment may be in the form of a statement or invoice, or receipts or cancelled checks with the related vendor contract. For services provided by the landowner, the landowner shall submit a detailed invoice or cost-estimate for those services.
4. To maintain the cost-shared practice for at least 10 years from the date of installation, except for these "soft" practices: contour farming, cover and green manure crop, nutrient management, pest management, residue management, and strip-cropping. Soft practices must be maintained for each year cost-share funds are provided, as specified in Section 3. Extended maintenance periods apply if land is taken out of production for more than 10 years, as specified in Section 3.
5. To operate and maintain each cost-shared practice for the required maintenance period following the certification of installation or replace it with an equally effective practice. To refrain, during the maintenance period, from actions that may reduce a practice's effectiveness, or result in water quality problems. The landowner agrees to follow an operation and maintenance (O&M) plan or other maintenance requirements including those in ATCP 50.62, Wis. Admin. Code. All nutrient management plans must comply with s. ATCP 50.04(3), Wis. Admin. Code.
6. To repay cost-share funds immediately, upon demand by the county, if the landowner fails to operate and maintain the cost-shared practice according to the contract. Repayment of grant funds shall not be required if a practice(s) is rendered ineffective during the required maintenance period due to circumstances beyond the control of the landowner.
7. To the recording of this contract, including the legal description of the subject property, with the deed to the subject property, if cost-sharing exceeds $14,000 unless this contract cost-shares only practices listed in s. ATCP 50.08 (5) (b). This contract shall be recorded before the county makes any cost-share payment to the landowner. Upon recording, this contract constitutes a covenant running with the land described in Section 1B, and is binding on subsequent owners, heirs, executors, administrators, successors, trustees, and assigns, and users of the land for the period set forth in Section 3.
8. To comply with (i) the performance standards, prohibitions, conservation practices and technical standards under s. 281.16, Stats., (ii) plans approved under ss. 92.14, 92.15 (1985 Stats.), 92.10 and 281.65, Stats., and (iii) the practices necessary to meet the requirements of this contract, and to continue such compliance after the term of this contract, without further cost-sharing, if the landowner has received cost-sharing for compliance at least equal to the cost-sharing required under s. ATCP 50.08, Wis. Admin. Code. There is no requirement for continuing compliance for land that is taken out of production unless cost-sharing is provided.
9. To acknowledge receipt of a notice provided by the county explaining continuing compliance requirements arising out of the installation of specific cost-shared practices. (Initial here _____, ______, _____, ______.)
10. Not to discriminate against contractors because of age, race, religion, color, handicap, gender, physical condition, developmental disability, or national origin, in the performance of responsibilities under this contract.
11. To make any changes to this contract, including changes in project components and costs, according to the procedures set forth in Section 2.C.3.
12. To the county's right to stop work, or withhold cost-share grant funds, if it is found that the landowner, grant recipient, or construction contractor in their employ has violated ch. 92, Wis. Stats., ch. ATCP 50, Wis. Admin. Code, or has breached this contract.

Landowner Initials	Date	Spouse Initials	Date	Grant Recipient Initials	Date	Spouse Initials	Date	County Reps. Initials	Date

B. The county agency agrees:

1. To enter this cost-share contract only after the Land Conservation Committee has authorized the cost-sharing of this project.
2. To provide technical assistance for the design, construction, and installation of cost-shared practice(s) according to applicable standards in ch. ATCP 50, Wis. Admin. Code. The county agrees to provide written notice, when applicable, to inform each landowner and grant recipient of the full ramifications of a cost-share contract, including future compliance obligations. The county further agrees to ensure that cost-shared practices are maintained as required in II. A. 4 by securing O&M plans and performing site checks as needed.
3. To use the most cost-effective methods to address the water quality concerns of this project, and apply cost containment procedures, consistent with ch. ATCP 50, Wis. Admin. Code, when estimating and paying for cost-shared practice(s).
4. To provide cost-share funds to the landowner, in the amounts specified in Section 3 and any amendments, upon proof that (i) the landowner has made all payments for which the landowner is responsible under the contract, (ii) the practice(s) are designed and installed according to standards in ch. ATCP 50, Wis. Admin. Code and this contract, including compliance with applicable construction site erosion control standards, and (iii) nutrient management plans comply with s. ATCP 50.04(3) Wis. Admin. Code. The county may make payments to third parties as provided in s. ATCP 50.40(13), Wis. Admin. Code.
5. To collect and retain all contract-related documents regarding operation and maintenance, proof of certification of design and installation, change orders, receipts and payments, and other referenced materials for a minimum of three years after making the last cost-share payment to the landowner, or for the duration of the maintenance period of this contract, whichever is longer. Records may be retained longer to demonstrate that a landowner meets the cost-sharing exemption under s. ATCP 50.08(5), Wis. Admin Code. Payment records from the landowner and county must provide proof of payment in full for all cost-shared practices installed. Copies of records shall be made available to DATCP upon request.
6. To record this contract, including the legal description of the subject property, with the deed to the subject property, as required under Section 2.A.7. Contracts may be recorded if not required under Section 2.A.7.
7. To coordinate eligibility for DATCP cost-share funding, and to follow required reimbursement procedures to facilitate timely cost-share payment(s) to the landowner, including the submission of certification forms to DATCP documenting that cost-shared practice(s) have been properly installed in accordance with this contract and paid for.

C. General conditions of the contract

1. State cost-share reimbursement amounts in Section 3 are contingent on receiving DATCP funding. The county may cancel this contract, in whole or in part, due to non-availability of DATCP funds. A county is responsible for contract grant amounts when the county makes cost-share commitments beyond the amount of its DATCP annual allocation or the county fails to obtain DATCP approval required under 2.C.2.
2. Written approval from DATCP shall be obtained before this contract is executed or amended if the DATCP cost-share amount exceeds $50,000, and such approval shall be attached to, and made part of, this contract.
3. This contract may be amended, by mutual written agreement of the parties, during the installation or maintenance periods, if the proposed changes will provide equal or greater control of water pollution. For any changes in practice components or costs, the county will determine eligibility and whether to approve such changes. Counties must use a “Cost-Share Contract Change Order” form (ARM-LR-166) for changes prior to or during the installation and maintenance periods. Except as otherwise provided in the “Change Order” form, any completed “Change Order” form must be attached to, and made part of, this contract. Changes to this contract that increase the DATCP cost-share amount over $14,000 or $50,000 are subject to requirements in Sections 2.A.7., regarding recording and 2.C.2., regarding DATCP approval, respectively.
4. This contract is void if, prior to installation, the county determines that due to a material change in circumstances the proposed practices will not provide cost-effective water quality benefits.

Landowner Initials	Date	Spouse Initials	Date	Grant Recipient Initials	Date	Spouse Initials	Date	County Reps. Initials	Date

COST-SHARE CONTRACT NO.: LWRM #2 (2017)

SECTION 3. PRACTICES, COST, COST-SHARE AMOUNTS, AND INSTALLATION SCHEDULE

The parties agree to the following related to the conservation practices, technical design and specifications, eligible costs, cost-share rates and amounts, and rate set forth below.

Name of Person Preparing Technical Design: **Representing:** (COUNTY OR PRIVATE ENGINEERING FIRM) **Dane County Land & Water Resources**	**Technical Standards Used in the Design:** (LIST NAME AND DATE OF NRCS, DNR OR OTHER STANDARDS EMPLOYED IN THE DESIGN)	**USE OF THE 3 BOXES BELOW IS OPTIONAL**	
		REPRESENTING:	**DATE OF APPROVAL:**
		AMOUNT OF COST-SHARE CONTRACT APPROVED: $	

*	Cost-Shared Item Description ss. ATCP 50.62 to 50.98, 50.40 (15) & (18), & 50.08 (3) and (4)	Yrs of CS**	Quantity (Use Standard Units)	Unit Cost or Flat Rate $	Estimated Total Cost $	COST-SHARE RATE State %***	COST-SHARE RATE Grantee %	COST-SHARE RATE County/ other %	ESTIMATED COST-SHARE AMOUNTS DATCP $	ESTIMATED COST-SHARE AMOUNTS Grantee $	ESTIMATED COST-SHARE AMOUNTS County/other $
☐											
☐											
☐											
☐											
☐											
☐											
☐											
				TOTALS							

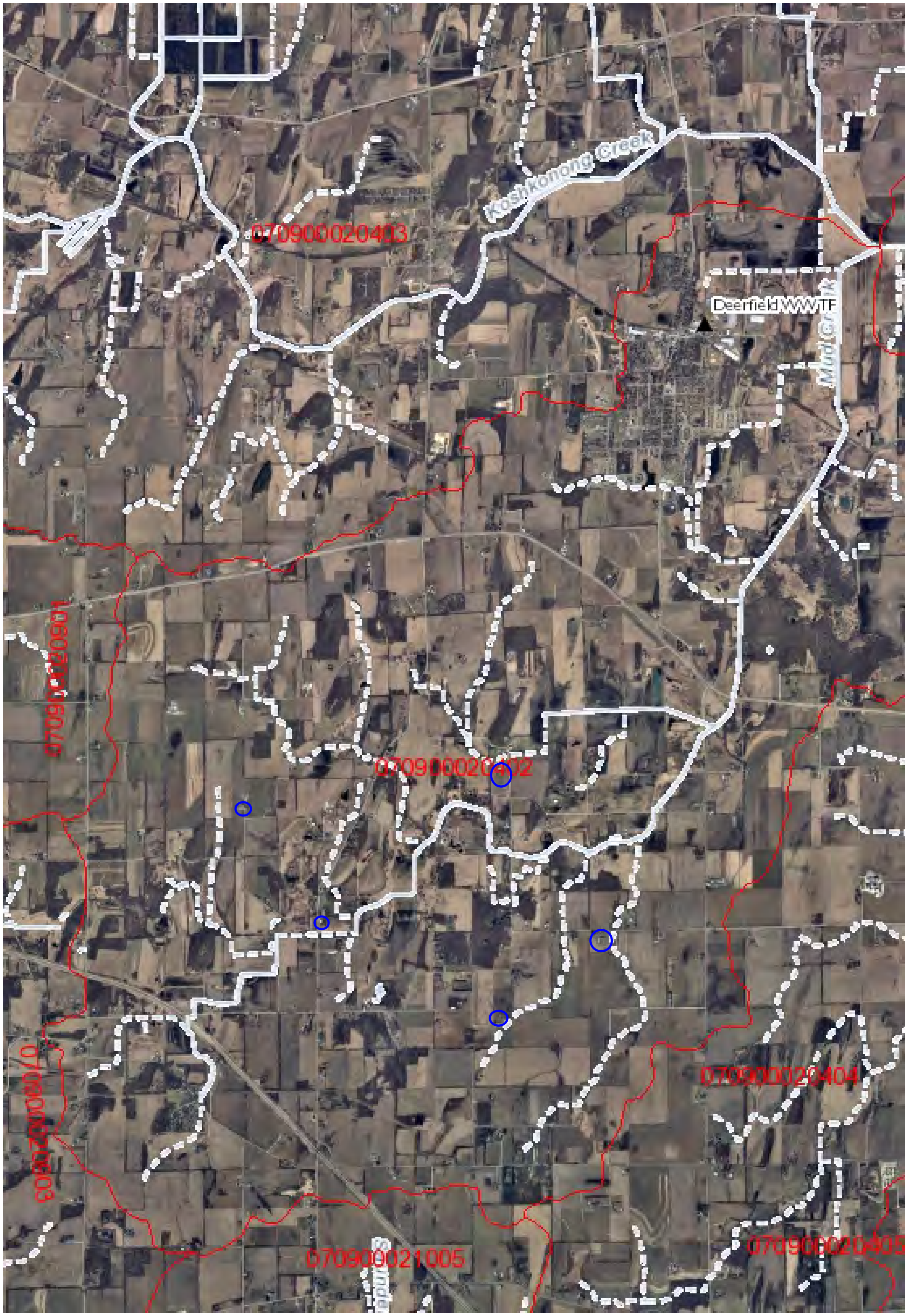
* Must check if the 50% maximum rate applies based on the installation of a practice after January 1, 2014 under one of these two conditions:
a. The practice is installed on land owned by a local governments
b. Cost-sharing is provided for access roads (ATCP 50.65) , roof runoff system (ATCP 50.85), stream bank or shoreline protection (ATCP 50.88), stream crossing (s. ATCP 50.885), or wetland development or restoration (ATCP 50.98) and the practice does not implement a farm performance standard.
** Enter the number of years the practice is cost-shared only if the contract provides for (a) more than one year of cost-sharing for soft practices (contour farming, cover and green manure crop, nutrient management, pest management, residue management, and strip-cropping), (b) land taken out of production for more than one year, or (c) CREP equivalent payments for riparian land taken out of production. For "soft practice" payments, the landowner receives the full contract amount after the practice is certified, and has a contractual obligation to maintain the practice for the number of years cost-shared. For "land out of production" payments under ATCP 50.08(3) (d), the landowner receives the sum of the landowner's annual cost for the period specified in the contract. A landowner's annual cost equals the number of affected acres multiplied by the per-acre weighted average soil rental rate in the county on the date of the cost-share contract. For CREP equivalent payments authorized under ATCP 50.08(4), the landowner receives an amount equal to the amount that would be offered under the CREP program if the affected lands were enrolled in that program. To receive a CREP- equivalent payment, a landowner must keep riparian land out of production for 15 years, or in perpetuity, and must agree to contract terms similar to those imposed by the CREP program. Insert "P" if the land is taken out of production in perpetuity. Cost-share practices must be operated and maintained in accordance with O&M plans and other requirements that may apply
*** May exceed 70 percent only if the farm landowner qualifies for economic hardship.

Landowner Initials	Date	Spouse Initials	Date	Grant Recipient Initials	Date	Spouse Initials	Date	County Rep. Initials	Date

Appendix M

Potential Barnyard Inventory

Deerfield Watershed
Barnyard Map



Legend

- ▲ Surface Water Outfalls
- 12-digit HUCs (Subwatersheds)
- Rivers and Streams
- Intermittent Streams
- Lakes and Open water
- Index to EN_Image_Basemap_Leaf_Off

2.0 0 1.00 2.0 Miles

1: 63,360

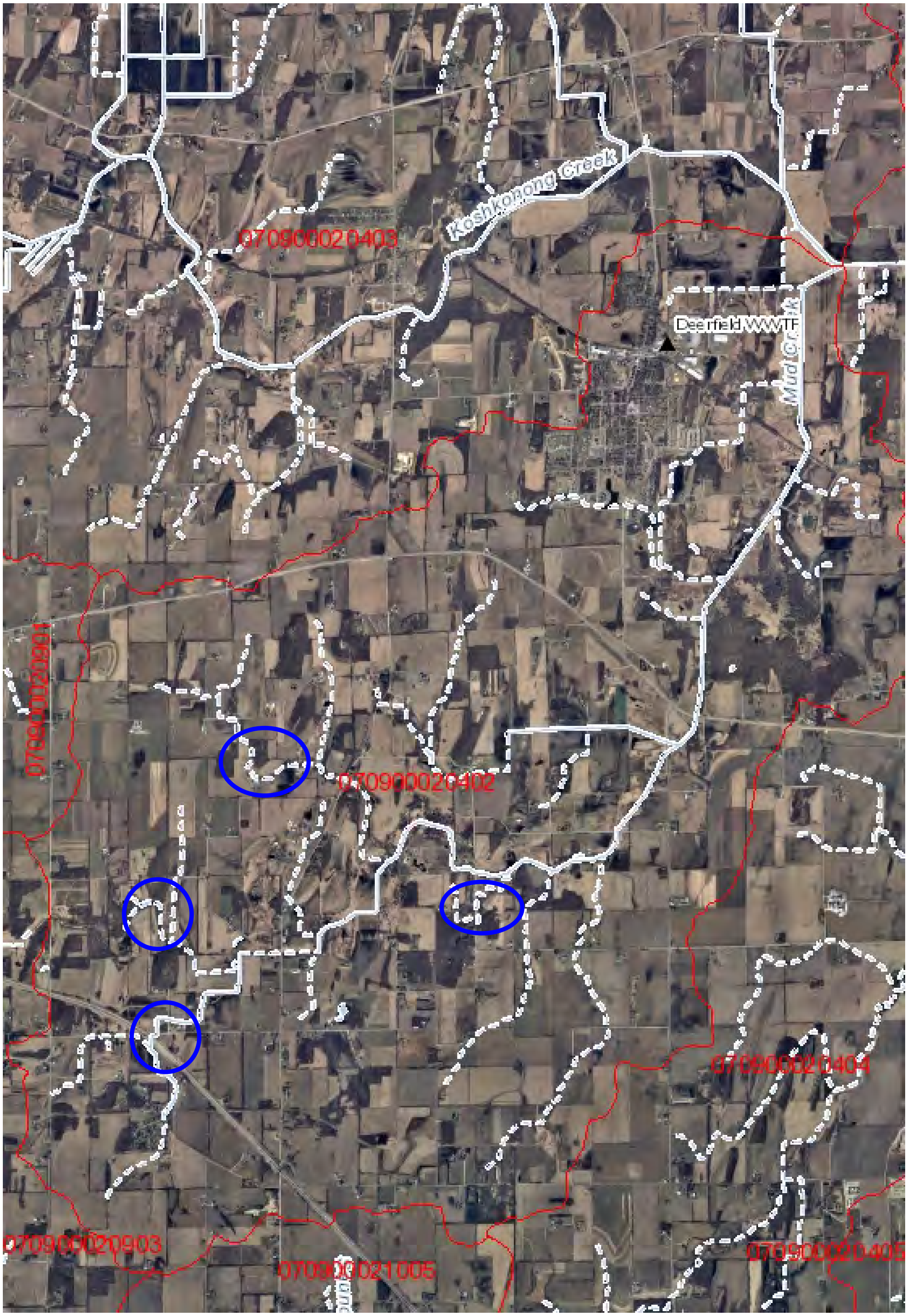
NAD_1983_HARN_Wisconsin_TM

Notes

Appendix N

Potential Steambank CSAs

Deerfield Watershed
Mud Creek Map



Legend

- ▲ Surface Water Outfalls
- 12-digit HUCs (Subwatersheds)
- Rivers and Streams
- Intermittent Streams
- Lakes and Open water
- Index to EN_Image_Basemap_Leaf_Off

2.0 0 1.00 2.0 Miles

1: 63,360

NAD_1983_HARN_Wisconsin_TM

Notes

Appendix O

Dane County LWRD Letter of Intent

August 21, 2018

Ms. Cassie Elmer
Town & Country Engineering, Inc.
2912 Marketplace Drive, Suite 103
Madison, Wisconsin 53719

SUBJECT: Deerfield Adaptive Management Plan

Dear Ms. Elmer:

Dane County Land & Water Resources Department (LWRD) intends to assist the Deerfield Wastewater Treatment Plant and Commission with implementation of their proposed adaptive management plan within the scope of the services typically provided by LWRD to landowners. A service agreement is proposed be developed between Deerfield WWTP and Dane County and approved by the appropriate boards and commissions identifying services to be provided by LWRD as a broker for the Deerfield adaptive management plan.

If you have additional questions, please contact me at (608) 224-3740 or callis.amy@countyofdane.com.

Sincerely,

Amy S. Callis, County Conservationist
Land Conservation Division
Dane County Land & Water Resources Department

cc: Amy Garbe, Wisconsin Department of Natural Resources