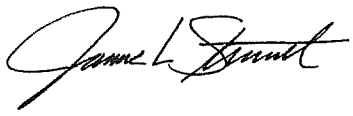
CERTIFICATION PAGE

CITY OF RUSHFORD

PHOSPHORUS MANAGEMENT PLAN

SEPTEMBER 2011

I hereby certify that this report was prepared by me or under my direct supervisions and that I am a duly licensed Professional Engineer under the laws of the State of Minnesota.



September 16, 2011

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Date:

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Table of Contents

Description	*Page*
Step 1: Facility Description and Flow Schematic	2
Step 2: WWTF's Influent and Effluent Phosphorus Concentrations	5
Step 3: WWTF's Phosphorus Reduction Potential	5
Step 4: Phosphorus Reduction Goals for WWTF	7
Step 5: Optimizing the WWTF	9
Step 6: Phosphorus Reduction Potential of Users	10
Step 7: Implementation Plan to Meet Phosphorus Reduction and Removal Goals	11

List of Tables

Tables 1A-E: Monthly WWTF Influent and Effluent Data	16-24
Table 2: Comparable WWTF's in MN versus City of Rushford	7
Table 3: Summary of Phosphorus Sources	25
Table 4: Summary of Phosphorus Reduction/Removal Strategies	14
Exhibit 1: WWTF Influent Flow	26
Exhibit 2: WWTF Influent/Effluent Concentration Comparison	27
Exhibit 3: WWTF Annual Trends	28
Exhibit 4: WWTF Process Schematic	29
Exhibit 5: WWTF & City Topographic Map	30

Facility Name: City of Rushford Wastewater Treatment Facility
Type of WWTF: Activated Sludge with Oxidation Ditch
Name of PMP Preparer: BDM Consulting Engineers, PLC
Date: September 16, 2011
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Introduction

The MPCA imposed corrective actions as a part of a Compliance Evaluation Inspection Report issued in August of 2008 which included the preparation of a Phosphorus Management Plan (PMP) at that time. The time has come to reissue the NPDES Permit for the municipal wastewater discharge in 2012 and therefore the PMP has been updated to reflect more recent data.

As mentioned in the 2008 PMP, during the catastrophic floods in August of 2007 the City of Rushford wastewater treatment plant records were all but lost or destroyed. The City recovered the DMR's from the MPCA beginning in 2003 and is continuing to update and document its records.

The Phosphorus Management Plan is intended to analyze the City's wastewater treatment facility (WWTF) influent/effluent phosphorus concentrations, review the WWTF phosphorus reduction potential, outline WWTF reduction goals, examine potential WWTF optimization, assess phosphorus reduction potential of users, and evaluate reduction and removal goals for the WWTF, industrial, commercial, and residential users.

The Rushford Wastewater Treatment Facility's PMP was developed in part from the seven step PMP guideline provided by the Minnesota Pollution Control Agency and the Minnesota Technical Assistance Program (MnTAP).

Step 1: Facility Description and Flow Schematic

The Rushford WWTF was originally constructed in 1983 as a single oxidation ditch plant with 150,000 gallons per day (gpd) of wastewater treatment capacity. The treatment capacity was upgraded to 330,000 gpd in 1996 and is currently operating as a Class C facility with dual screw pumps, bar screen with automatic cleaning, dual grit chambers, Parshall flume with influent flow meter, two oxidation ditches, three final clarifiers, an ultraviolet disinfection unit, a 90 degree v-notch weir with a flow recorder prior to discharge, influent and effluent 24-hour composite samplers, aerobic digester, and a sludge storage holding tank with a submersible mixer.

There is currently a project underway to improve the facility by removing one of the existing clarifiers, adding a new aerobic digester, a new final clarifier, and modifying the splitter box configuration. It is anticipated that the project will be completed in 2012. The improvements were not intended to increase the design flow of the plant.

(Refer to **Exhibit 4** at the end of the report for a layout of the existing and upgraded portion of the WWTF.)

The design parameters for the existing plant are as follows:

Average Wet Weather (AWW) Flow:	330,000 gpd
Peak Hourly Wet Weather (PHWW) Flow:	432,000 gpd or 300 gpm
Influent BOD:	430 lbs/d
Influent TSS:	505 lbs/d
Effluent BOD:	25 mg/l
Effluent TSS:	30 mg/l
Fecal Coliform:	200/100 ml
pH:	6-9
Receiving Stream:	Root River

The specific design parameters, year built and current conditions of each process unit are summarized in the following chart.

Process Unit	**Year Built**	**Design Parameters**	**Current Conditions**
Influent Lift Station	1983 2005	2-200 gpm, 1 hp screw pumps. 1-200 gpm, submersible pump.	Hydraulic overloading during high flows. No redundancy.
Manual Screen	1983	500 gpm.	Good operating condition.
Fine Screen	1996	1270 gpm, ¼" opening	Good operating condition.
Grit Removal	1983	2 troughs 10" x 6.25'	Fair performance. Labor intensive and ineffective grit removal.
Influent Flow Meter	1983	3-inch Parshall Flume 814 gpm @ 18" head	Good operating condition.
Influent Sampler	1996	Flow paced composite sampler	Good operating condition.
Oxidation Ditches	1983 1996	150,000 gallons 180,000 gallons 2-10 hp 2 speed rotors per ditch.	Structures in good condition. Rotors (aerators) in marginal condition.

Process Unit	Year Built	Design Parameters	Current Conditions
Final Clarifiers	1983 1996	2-18' diameter (one removed with 2011 project) 1- 28' diameter	Hydraulic problems with small clarifiers. Large clarifier in good condition.
Return Act. Sludge Pump	2001	1-7.5 hp, 300 gpm. Level controlled.	Single pump for all 3 clarifiers. Can only return to 1 ditch.
Waste Act. Sludge Pump	1996	10 hp PC pump 175 gpm Centrifugal Pump	Good operating condition. Wasting procedure labor intensive.
UV Disinfection	1996	560 gpm	Good operating condition.
Effluent Flow Meter	1996	V-notch	Good operating condition.
Effluent Sampler	1996	Flow paced composite sampler	Good operating condition.
Effluent Lift Station	1983	2-1200 GPM Pumps	Good operating condition.
Outfall	1983	70 feet of 8" CI forcemain 340 feet of 12"VCP gravity	Good operating condition.
Aerobic Digester	1983	28' dia x 6.5' SWD 30,000 gallons, 120 scfm	Poor performance. Does not meet retention time standards.
Sludge Holding Tank	1996	60' dia x 11' deep 211,500 gallons	No aeration, supernatant capacity limited.
New Aerobic Digester	2012	1 - 45' diameter	Currently under construction.
New Final Clarifier	2012	1- 28' diameter	Currently under construction.
Modified Splitter Box	2012		Currently under construction.

Step 2: The WWTF's Influent and Effluent Phosphorus Concentrations.

The City has completed influent and effluent monitoring reports on a monthly basis. Measurement of the City of Rushford's WWTF's phosphorus influent and effluent concentrations for the last eight years have been compiled in **Tables 1A-I**. For each of the years an average concentration, and mass loading of influent and effluent has been calculated. The format for the tables and associated graphs relating to this information were originally obtained from the Minnesota Technical Assistance Program (MnTAP).

Here is a sample calculation for the Mass Load of the Effluent in March 2003:

$$Flow\,(MGD) \times Concentration\,(mg/L) \times 3.785(UnitConversion) = MassLoad\,(kg/day)$$

$$0.136\,(MGD) \times 7.20\,(mg/L) \times 3.785 = 3.71\,(kg/day)$$

WWTF Monthly Influent and Effluent Data Tables (1A-E) are located in the appendix of the report.

Step 3: The WWTF's Phosphorus Reduction Potential.

To better understand how phosphorus enters the City's sanitary system, trends and patterns were examined using the data collected each month as shown in Tables 1A through 1I. Graphs showing flow, concentration, or load reveal seasonal trends that could be directly related to activities at the WWTF. Spikes in phosphorus concentration can be the direct result from business patterns like cleaning and chemical use. Below is a summary of the exhibits produced from the monthly data; the actual exhibits can be found at the back of the report.

Exhibit 1-WWTF Influent Flow: Generally, it appears that flow to the WWTF in the winter months (November through February) has very minor variations which are typical since there is little I/I due to the cold temperatures. During the warmer months of the year (March through October) the WWTF experiences spikes in average flow (as seen in the graph of **Exhibit 1**) likely due to large rainfall events and subsequently shows that the City's collection system may be susceptible to inflow and infiltration. Since the catastrophic floods of 2007 and 2008 the City has implemented a program with its engineering consultant to reduce inflow and infiltration by repairing damaged sewer piping, manholes, and other collection system structures. Much of the older portion of the City's sanitary sewer collection system were also reconstructed in 2009-2010 including the replacement of 4500 feet of pipe. **Exhibit 3** shows that the annual influent flow total has been reduced since the completion of the project. The City intends on continuing to complete repairs to the collection system in the hope of reducing flow levels to the WWTF.

Exhibit 2-WWTF Influent/Effluent Concentration Comparison: **Exhibit 2** shows a graph of the WWTF Influent and Effluent Monthly Average Phosphorus Concentrations from 2003 through July of 2011. This graph reveals trends in removal efficiency of the WWTF. It appears that in the month of June, there is a reduced removal percentage but does not appear to be related to an increase in the Influent concentration. In discussions with the City it seems this may be due to sludge decanting operations within the WWTF. The City will take this into consideration during their optimization review as a part of the PMP.

Exhibit 3-WWTF Annual Trends: **Exhibit 3** shows the annual averages including phosphorus concentration, phosphorus load, and total annual influent flow. The data shows the annual influent concentrations and phosphorus loading increased between 2003 and 2009, but the overall trend is lower in 2010 and 2011. This may be attributed to the I/I reduction projects implemented in 2009 as well as operational changes once the new WTP was put online in 2009. The decrease in Phosphorus concentration in the last couple of years may also be attributed to changes or reduction is waste contributions from business, industry, institutions, residents, or all of the above.

One significant contributor to the City's WWTF is the Village of Rushford. The Village of Rushford is a community surrounding the City of Rushford that is not technically part of the City itself but has an agreement with the City to discharge its wastewater to the WWTF. The City currently tracks the total inflow and phosphorus concentration and the Village's contribution is approximately 0.014 MGD and 10.7 mg/L respectively. Taking into consideration the City's total average annual influent flow to the WWTF of 0.140 MGD, the Village contributes about 10% to the inflow. Now, taking into account the WWTF influent phosphorus concentration of 8.39 mg/L and average inflow of 0.140 MGD, the City has an average annual influent phosphorus loading of 3.98 kg/day. Comparing that to the Village's concentration of 10 mg/L, which equates to 0.581 kg/day, the Village contributes approximately 15% of the influent phosphorus load.

Comparison of Typical Phosphorus Treatment at WWTF's in Minnesota

Another important comparison of influent and effluent phosphorus concentrations can be made to typical levels throughout the state. Over the last eight years The City of Rushford has experienced an average phosphorus effluent concentration around 3.99 mg/L (See **Exhibit 3**). An excerpt from Table 2A (shown below) provided in the PMP Plan Guide provided by the MPCA shows the average effluent phosphorus concentrations in WWTFs throughout Minnesota with phosphorus removal technologies. It should be noted that the City of Rushford is above average for influent concentration, as described previously, but is below average for effluent concentration equating to an above average removal percentage (2003 through 2011)

Table 2: Comparable WWTF's in MN versus City of Rushford										
WWTF Type	No. of WWTF's in State of MN	Influent Concentration (mg/L)			Effluent Concentration (mg/L)			Percent Removal		
		Avg.	Min.	Max.	Avg.	Min.	Max.	Avg.	Min.	Max.
Oxidation Ditches	21	7.03	3.11	25.05	4.08	0.95	15.38	44%	17%	77%
City of Rushford	1	8.39			3.99			52%		

The comparisons between the City of Rushford's phosphorus influent concentrations and the average throughout the State of Minnesota suggest that phosphorus reduction strategies should be evaluated according to the MPCA. As stated before, the annual average effluent concentration has stayed relatively constant even through the influent concentration and phosphorus load has had some upward trends over the last eight years (2003 through 2009). Taking this into account, it is unlikely that a change in influent concentration will significantly change the effluent concentration of the WWTF. With that said the City will still work with all contributors including the Village of Rushford to reduce the WWTF influent phosphorus concentration and loading.

Step 4: Phosphorus Reduction Goals for the WWTF

Phosphorus reduction goals in a numeric form are meant to make it easier to plan reduction strategies for the WWTF and to discuss reduction strategies with phosphorus contributors. The goals set below take into consideration the potential of all users to reduce their phosphorus contributions in addition to continued optimization of the WWTF (Step 5). Although, it should be noted that the PMP reduction goals are not linked to an MPCA permit limit and the MPCA does not hold facilities accountable for meeting these goals.

WWTF Effluent Reduction Goal

Effluent levels in the WWTF stayed relatively constant between 2003 and 2006 with and average concentration of 3.92 mg/L over that period. In 2007, the effluent concentration actually decreased to an average of 2.96 mg/L, but since then the concentration has increased somewhat which could be a result of the reduction of influent flow (from the I/I improvements) over that time. The average effluent concentration over the past eight years has been 3.99 mg/L, with an average mass loading of 684 kg/year. See **Tables 1A** through **1I** for yearly averages and along with **Exhibit 3** for WWTF Annual Summary Data.

The intent of the PMP is to set up an attainable goal for effluent reduction. The Rushford WWTF currently uses an oxidation ditch processes to reduce phosphorus. The City intends to perform a phosphorus reduction analysis on its existing wastewater treatment plant and identify options for further phosphorus reduction. The City also wants to conduct public education and promote uses of non-phosphorus cleaning products to reduce the influent concentrations. In discussions with the City a goal of 3.0 mg/L may be achievable through treatment process optimization at the WWTF and source reduction.

WWTF Influent Reduction Goal

Now that the effluent objective is set at 3.0 mg/L, a reasonable influent goal can be established. The most accurate way to determine the influent goal is to begin with the WWTF's annual average phosphorus removal rate. The following equation was used to calculate removal rate for each year of available data.

$$Removal\ Rate = \frac{Average\ Annual\ Influent - Average\ Annual\ Effluent}{Average\ Annual\ Influent}$$

Complete data for the years 2003 through 2011 is shown in **Exhibit 3** located at the end of the report. The average removal percentage over this time period is 52%. It is important to note that at the time this report was drafted, not all data was available for 2011.

The influent goal for phosphorus removal can now be determined by dividing the effluent goal by 1 minus the removal rate. The removal rate was determined in the following step (Step 5) of the PMP, based on an average of the years 2003 to 2011.

$$Influent\ Goal\ for\ Phosphorus\ Removal = \frac{Effluent\ Goal}{1 - Removal\ Rate}$$

$$Influent\ Goal\ for\ Phosphorus\ Removal = \frac{3.0\,(mg/L)}{1 - 0.63} = 8.1\,(mg/L)$$

During the time period between 2003 and 2011 the City of Rushford had an influent phosphorus concentration of 8.39 mg/L on an annual average basis. The City intends to actively promote phosphorus reduction at the sources and reduce the influent phosphorus concentration to 8.1 mg/L on an average annual basis over the next five years.

Step 5: Optimizing the WWTF

It may be possible to fine tune the operation of the WWTF to maximize its phosphorus removal capabilities. The City is considering a few possibilities concerning upgrading and/or optimizing the system to facilitate additional phosphorus removal rates.

As stated in Step 3, **Exhibit 2** suggests that there is an internal process that is causing the phosphorus concentration to increase for a short period of time. In discussions with the City it is believed that it may be due to a sludge decanting operation during this time. Prior to the removal of sludge from the storage tank, the City decants the clear water and reintroduces it to the plant for treatment. The decant water typically contains high concentration of phosphorus. The City has discussed a couple of options for the treatment of the decanted water including decanting over a longer period of time and a chemical phosphorus removal process prior to the reintroduction of the water back to the plant.

A second option is to reduce the amount of suspended solids (which also contains phosphorus) exiting the final clarifiers. This could be accomplished by controlling mix liquor suspended solids (MLSS) concentration in the oxidation ditches. Low MLSS reduces the sludge retention time and prevents excessive growth of filamentous organism. The City is also considering adding a "sludge selector" ahead of oxidation ditches for controlling the filamentous organism. We do not recommend shock chlorination for filamentous organism control. Chlorination could potentially upset the system and cause discharge violations. The City is in the process of constructing an additional final clarifier to improve the solids capture rate.

Setting a WWTF Optimization Goal

Now that the influent and effluent reduction goals were determined in Step 4, it would seem prudent to select an achievable goal for optimizing the phosphorus removal capabilities of the WWTF.

The MPCA published a document titled "Appendix A – Phosphorus Removal by Minnesota Municipal Wastewater Treatment Facilities" describing specific attributes of treatment plants in the State of Minnesota with oxidation ditch processes for removing phosphorus. According to the article, a WWTF with an effluent concentration between 3.0 and 4.0 mg/L averages an influent concentration of 6.66 mg/L and average percent removal of 42%. As stated earlier (and shown in **Exhibit 3**), the City of Rushford average influent, effluent, and percent removal is 8.39 mg/L, 3.799 mg/L, and 52% respectively. Compared to the averages in the State of Minnesota, the City of Rushford has a greater average influent concentration but also has a greater average percent removal allowing for the effluent concentration to trend around the region of the State average.

Over the last eight years, the trend in the City's removal percentage has varied from 47% in 2003/2008 to 64% in 2007 with an average of 52%. Now if the average is

taken between the years 2005 and 2007, the average is approximately 60% but since that time the removal efficiency has been declining. Once the City finishes the WWTF upgrades in 2012, a goal upwards of 60% by the year 2013 does not seem unreasonable. The City would like to set a goal for an average annual phosphorus removal percentage over the next five years of 63%. It should be noted that this goal could not be reached without facility upgrades such as a chemical phosphorus removal system, a sludge selector and a final clarifier. Some of these upgrades are currently under construction including the sludge selector and final clarifier.

Step 6: Phosphorus Reduction Potential of Users

In order to lower the concentration of the phosphorus influent that reaches the WWTF, it will be necessary to evaluate the businesses having the greatest potential for reducing phosphorus. According to the information provided by the MPCA and MnTAP, the types of businesses most likely to contribute phosphorus to the WWTF include: agricultural co-ops, car/truck washing facilities, dairies, food processing plants, meat packing/ locker plants, metal finishing facilities, municipal water plants that add phosphorus to drinking water, nursing homes, schools, and any other business that uses phosphorus.

Rushford has many of the business and institutional types that have the potential for releasing phosphorus into the City's wastewater network. As a base point, the businesses, industry, and institutions with the largest wastewater contribution (from City billings) were looked at first. Some of these businesses and institutions include, Rushford-Peterson School, The Good Shepherd Nursing Home, D&D Car Wash, The Corner gas station and convenience store, Stumpy's Restaurant and Bar, and The Creamery restaurant. In addition, the Village of Rushford has been identified as a significant contributor of phosphorus to Rushford's WWTF. **Table 3** contains a complete list of phosphorus contributors in Rushford that have the potential for the reduction of phosphorus wastes.

A letter was sent to these contributors to inform the business owners of the City's intent to reduce phosphorus in the wastewater stream and to provide the MnTAP website where pertinent reference material can be found. Following the letter notification, the City's public utilities director performed a walk through at many of businesses to identify opportunities for phosphorus reduction. **Table 3** outlines reduction potentials for the businesses, but many of them are based on experience since the not all of the walk-throughs have been completed. Assessments were completed in 2009 after the publication of the original PMP in 2008. The City would like to revisit the critical contributors and update the assessments within the next 5 years.

The City intends to practice good phosphorus management at the source of commercial, industrial, and institutional operations. The portion of the WWTF's influent originating from businesses is referred to as the total allowable phosphorus

(TAP). To evaluate the amount of phosphorus that can be allocated to the local businesses, an equation calculating the quantity of TAP was used below.

Effluent Goals for Multiple Industrial Users:
The following equation represents the total domestic phosphorus and subsequent business effluent goal.

$$Domestic\,Total\,Phosphorus\,Loading(kg/day) = \frac{Municipal\,Population \times 0.8\,(kg/yr/person)}{365\,Days}$$

$$Domestic\,Total\,Phosphorus\,Loading = \frac{1781\,People \times 0.8\,(kg/yr/person)}{365\,Days} = 3.9(kg/day)$$

Convert Influent Goal from milligrams per liter to kilograms per day: The average flow for the last eight years (2003-2010) has been 0.140 MGD (derived from **Exhibit 3**):

$$Flow\,(MGD) \times Concentration\,(mg/L) \times 3.785(UnitConversion) = MassLoad(kg/day)$$

$$0.140\,(MGD) \times 8.1(mg/L) \times 3.785 = 4.3\,(kg/day)$$

Calculate Total Allowable Phosphorus for businesses:

$$TotalAllowablePhosphorus = WWTF\ Influent\ Goal - Domestic\,Total\,Phosphorus$$

$$TotalAllowablePhosphorus = 4.3\,(kg/day) - 3.9\,(kg/day) = 0.4\,(kg/day)$$

By taking the phosphorus reduction goal and using the calculations above we can see that the total allowable phosphorus which could be allocated to the City of Rushford's business and industry is 0.4 kilograms per day. At the present time, the City does not have the facilities and the manpower to monitor phosphorus discharges from the local businesses, industry, and institutions.

Since few of the local businesses are significant contributors of phosphorus, instead of allocating the total allowable phosphorus to the local businesses, the City would like to encourage both the local businesses and residents to switch their cleaning agents to non-phosphorus based products.

Step 7: The Implementation Plan to Meet Phosphorus Reduction and Removal Goals

Phosphorus can be reduced at the source by eliminating or minimizing it through product substitution or other means. Preventative approaches alone may not meet the

phosphorus goals of the PMP. An approach combining prevention and pretreatment at businesses and at the WWTF will offer the best solution to minimize phosphorus wastes.

Since the catastrophic floods of 2007 and 2008 the City has implemented a program to reduce Infiltration and Inflow by repairing damaged sewer piping, manholes, and other collection system structures. Much of the older portion of the City's sanitary sewer collection system were also reconstructed in 2010 including the replacement of 4500 feet of pipe. The City intends on continuing to complete repairs to the collection system in the hope of reducing phosphorus levels.

Phosphorus Reduction and Best Practice Strategies:

There are four main areas of concern dealing with phosphorus reduction strategies in the City of Rushford. They are as follows.

1. *Commercial, Industrial, and Institutional Operations:*

   Businesses that contribute phosphorus may be able to change a process, substitute a product, institute a materials recovery plan or improve staff training to target phosphorus reduction potential. One of the major contributors to phosphorus wastes come from cleaning and sanitizing processes. Most of the businesses in Rushford use some type of cleaning process and should consider the following:

   - Establish purchasing criteria for cleaning products
   - Use low or non-phosphate cleaners and detergents
   - Use proper concentrations of cleaners and detergents
   - Use cleaners and detergents as directed by the manufacturer
   - Do not accept sample cleaners from vendors

   Many traditional cleaning chemicals use phosphorus components, like phosphoric acid or trisodium phosphate, as active ingredients for effective cleaning. Sample cleaners from suppliers can also present disposal problems because they may contain unwanted components like phosphorus and may not list ingredients on the label.

   In 2008/2009, the City sent out letters to local businesses, schools, and the Village of Rushford regarding the phosphorus management plan and a potential reduction at point sources. During that time, the City met with the users to complete assessments and discuss source reduction. Follow up meetings may be scheduled in the next 5 years to update the users and re-assess their phosphorus reduction policies.

2. *Municipal:*

The City conducted an analysis on the WWTF in 2009 through the completion of a Facility Plan to determine ways to improve phosphorus removal and overall process performance on the plant. This report was a precursor to the project that is currently underway which includes improvements including the addition of final clarifier, aerobic digester, and modified splitter box. It is anticipated these modifications will have a positive affect on the overall phosphorus removal efficiencies once the improvements are online in 2012.

Since the startup of the water treatment plant in the early part of 2009, the City has ceased the use of polyphosphates. The amount of phosphorus reduction will continue to be evaluated.

3. *Satellite Communities:*
   The City of Rushford will discuss with the Village of Rushford its contribution to the phosphorus levels to the WWTF and suggest similar options as stated in Part 1 under the Commercial, Industrial, and Institutional Operations.

4. *Residential or Domestic Sources:*
   Residential users may benefit from information about environmentally preferable purchasing of low or non-phosphorus products, and other practices. The City intends to provide educational materials on the City website, public access television stations, and in articles in the local newspaper.

Phosphorus Monitoring and Source Reduction

The City of Rushford sent out a letter in December of 2008 to the businesses with phosphorus reduction potential. The letter contained an overview of the City's concerns with regard to phosphorus. The letter also included references to the information provided by MnTAP. The City's Public Utilities Director is currently conducting facility walk-throughs at selected local businesses identified as having potential for source reduction. See **Table 3** for a list of the businesses which were assessed during onsite visits completed at that time.

The City would like to continue to monitor the most significant point sources of phosphorus. The City also intends to monitor the WWTF closely, to maintain a high level of efficient solids control. The potential for new phosphorus contributors is low due to the slow population growth and size of the City.

It is the City's intention to meet with the businesses again within the next 5 years to see if any of their processes have changed since the initial meetings. In following years, it is the City's objective to speak with businesses on an annual basis to monitor and maintain an interest level in the reduction of phosphorus.

Table 4 - Summary of Phosphorus Reduction/Removal Strategies	
Business, Industrial, Commercial, and Institutional Users	
Past Five Years:	Little to no reduction activities implemented
Next Five Years:	Increase reduction activities through education and monitoring
Municipal Sources	
Past Five Years:	Little to no reduction activities implemented
Next Five Years:	Increase I/I reduction procedures and educate employees
Satellite Communities	
Past Five Years:	Little to no reduction activities implemented
Next Five Years:	Increase reduction activities through education and monitoring
Domestic Users	
Past Five Years:	Little to no reduction activities implemented
Next Five Years:	Increase reduction activities through education and monitoring
WWTF Reduction Strategies	
Past Five Years:	Process optimization and monitoring, WWTF upgrades
Next Five Years:	Continued process optimization, monitoring, and upgrades

Education

The PMP will be available to all businesses and residents in the City Hall, upon request.

New phosphorus reduction strategy information, such as types of fertilizers and soaps not containing phosphorus, are expected to be posted in the City Hall on the current message boards for anyone to view.

MnTAP has provided very useful information to the City for public education. The information includes:

- "Storm Drain Marking Project"
- Non-phosphorus based fertilizers
- "Phosphates in Automatic Dishwashing Detergent."
- List of non-phosphorus based dish soaps

The City intends to inform its wastewater collection system users about phosphorus reduction strategies through educational materials provided on the

City's website, public access television stations, and articles in the local newspaper.

Annual Review

The City would also like hold annual phosphorus review meetings with the plant operators and the engineers to review the effectiveness of the phosphorus management plan. In this way, it can be determined if the strategies have been effective in carrying out the milestones outlined on the PMP. Staff from MnTAP will be invited to this meeting to provide technical guidance.

WWTF Monthly/Quarterly Influent and Effluent Data

Table 1A	2003					
	Influent			Effluent		
Month	flow (MGD)	concentration (mg/L)	mass (kg/day)	flow (MGD)	concentration (mg/L)	mass (kg/day)
Jan	0.147	8.85	4.92	0.147	3.10	1.72
Feb	0.134	11.50	5.83	0.134	5.20	2.64
Mar	0.136	7.20	3.71	0.136	4.05	2.08
Apr	0.127	5.60	2.69	0.127	3.87	1.86
May	0.138	7.99	4.17	0.138	4.12	2.15
Jun	0.126	5.58	2.66	0.126	6.34	3.02
Jul	0.133	5.70	2.87	0.133	4.36	2.19
Aug	0.129	4.92	2.40	0.129	4.47	2.18
Sep	0.136	5.87	3.02	0.136	2.27	1.17
Oct	0.129	9.75	4.76	0.129	1.08	0.53
Nov	0.128	7.75	3.75	0.128	6.60	3.20
Dec	0.126	8.80	4.20	0.126	1.65	0.79
Annual Avg	0.132	7.46	3.75	0.132	3.93	1.96

Annual Influent Flow	48.3 million gallons/year
Annual Effluent Flow	48.3 million gallons/year
Annual Influent Phosphorus Load	1364.8 kg/year
Annual Effluent Phosphorus Load	718.2 kg/year
Phosphorus Percent Removal	47%

WWTF Monthly/Quarterly Influent and Effluent Data

Table 1B	2004					
	Influent			Effluent		
Month	flow (MGD)	concentration (mg/L)	mass (kg/day)	flow (MGD)	concentration (mg/L)	mass (kg/day)
Jan	0.131	8.85	4.39	0.131	4.40	2.18
Feb	0.128	8.55	4.14	0.128	2.25	1.09
Mar	0.132	8.75	4.37	0.132	3.40	1.70
Apr	0.126	8.80	4.20	0.126	3.60	1.72
May	0.132	9.95	4.97	0.132	3.40	1.70
Jun	0.259	5.80	5.69	0.259	8.70	8.53
Jul	0.176	6.10	4.06	0.176	2.20	1.47
Aug	0.145	8.75	4.80	0.145	4.45	2.44
Sep	0.202	5.75	4.40	0.202	2.20	1.68
Oct	0.147	7.70	4.28	0.147	3.25	1.81
Nov	0.140	8.40	4.45	0.140	5.00	2.65
Dec	0.146	7.35	4.06	0.146	4.15	2.29
Annual Avg	0.155	7.90	4.48	0.155	3.92	2.44
Annual Influent Flow			56.7 million gallons/year			
Annual Effluent Flow			56.7 million gallons/year			
Annual Influent Phosphorus Load			1693.7 kg/year			
Annual Effluent Phosphorus Load			840.2 kg/year			
Phosphorus Percent Removal			50%			

WWTF Monthly/Quarterly Influent and Effluent Data

Table 1C	2005					
	Influent			Effluent		
Month	flow (MGD)	concentration (mg/L)	mass (kg/day)	flow (MGD)	concentration (mg/L)	mass (kg/day)
Jan	0.144	7.55	4.1	0.144	3.10	1.69
Feb	0.160	15.60	9.4	0.160	5.20	3.15
Mar	0.151	8.45	4.8	0.151	4.05	2.31
Apr	0.150	6.95	3.9	0.150	3.87	2.19
May	0.137	8.15	4.2	0.137	4.12	2.14
Jun	0.135	9.90	5.1	0.135	6.34	3.24
Jul	0.137	11.50	6.0	0.137	4.36	2.26
Aug	0.136	7.95	4.1	0.136	4.47	2.30
Sep	0.144	8.85	4.8	0.144	2.27	1.23
Oct	0.143	7.95	4.3	0.143	1.08	0.58
Nov	0.145	8.80	4.8	0.145	6.60	3.62
Dec	0.148	8.75	4.9	0.148	1.65	0.92
Annual Avg	0.144	9.2	5.04	0.144	3.93	2.14
Annual Influent Flow			52.6 million gallons/year			
Annual Effluent Flow			52.6 million gallons/year			
Annual Influent Phosphorus Load			1830.3 kg/year			
Annual Effluent Phosphorus Load			780.9 kg/year			
Phosphorus Percent Removal			57%			

WWTF Monthly/Quarterly Influent and Effluent Data

Table 1D	2006					
	Influent			Effluent		
Month	flow (MGD)	concentration (mg/L)	mass (kg/day)	flow (MGD)	concentration (mg/L)	mass (kg/day)
Jan	0.143	13.00	7.04	0.143	3.95	2.14
Feb	0.142	8.80	4.73	0.142	2.25	1.21
Mar	0.139	8.50	4.47	0.139	2.05	1.08
Apr	0.188	8.30	5.91	0.188	3.65	2.60
May	0.160	8.70	5.27	0.160	0.30	0.18
Jun	0.133	7.35	3.70	0.133	7.90	3.98
Jul	0.136	8.00	4.12	0.136	5.35	2.75
Aug	0.138	12.60	6.58	0.138	4.35	2.27
Sep	0.146	7.85	4.34	0.146	4.45	2.46
Oct	0.141	10.55	5.63	0.141	3.35	1.79
Nov	0.140	8.75	4.64	0.140	6.25	3.31
Dec	0.141	8.05	4.30	0.141	3.00	1.60
Annual Avg	0.146	9.20	5.06	0.146	3.90	2.11
Annual Influent Flow			53.1 million gallons/year			
Annual Effluent Flow			53.1 million gallons/year			
Annual Influent Phosphorus Load			1850.7 kg/year			
Annual Effluent Phosphorus Load			785.0 kg/year			
Phosphorus Percent Removal			58%			

WWTF Monthly/Quarterly Influent and Effluent Data

Table 1E	2007					
	Influent			Effluent		
Month	flow (MGD)	concentration (mg/L)	mass (kg/day)	flow (MGD)	concentration (mg/L)	mass (kg/day)
Jan	0.138	8.00	4.18	0.138	4.15	2.17
Feb	0.137	10.95	5.68	0.137	4.40	2.28
Mar	0.178	8.30	5.59	0.178	3.20	2.16
Apr	0.150	7.65	4.34	0.150	3.05	1.73
May	0.132	9.20	4.60	0.132	4.35	2.17
Jun	0.132	7.84	3.92	0.132	4.24	2.12
Jul	0.138	9.13	4.77	0.138	1.45	0.76
Aug	0.181	2.42	1.66	0.181	2.08	1.42
Sep	0.117	7.50	3.32	0.117	1.90	0.84
Oct	0.161	2.75	1.68	0.161	1.50	0.91
Nov	0.118	15.20	6.79	0.118	2.20	0.98
Dec	0.119	9.95	4.48	0.119	2.95	1.33
Avg	0.142	8.24	4.25	0.142	2.96	1.57
Annual Influent Flow			51.8 million gallons/year			
Annual Effluent Flow			51.8 million gallons/year			
Annual Influent Phosphorus Load			1615.7 kg/year			
Annual Effluent Phosphorus Load			579.5 kg/year			
Phosphorus Percent Removal			64%			
20						

WWTF Monthly/Quarterly Influent and Effluent Data

Table 1F	2008					
	Influent			Effluent		
Month	flow (MGD)	concentration (mg/L)	mass (kg/day)	flow (MGD)	concentration (mg/L)	mass (kg/day)
Jan	0.122	7.50	3.46	0.122	3.65	1.69
Feb	0.123	9.89	4.60	0.123	3.53	1.64
Mar	0.145	6.95	3.81	0.145	2.75	1.51
Apr	0.199	4.75	3.58	0.199	12.10	9.11
May	0.141	6.41	3.42	0.141	4.65	2.48
Jun	0.323	5.50	6.72	0.323	2.24	2.74
Jul	0.137	6.00	3.11	0.137	4.70	2.44
Aug	0.121	9.80	4.49	0.121	4.24	1.94
Sep	0.117	9.20	4.07	0.117	3.70	1.64
Oct	0.141	8.60	4.59	0.141	4.01	2.14
Nov	0.117	11.35	5.03	0.117	2.80	1.24
Dec	0.129	13.40	6.54	0.129	4.02	1.96
Avg	0.151	8.28	4.45	0.151	4.37	2.54
Annual Influent Flow			55.1 million gallons/year			
Annual Effluent Flow			55.1 million gallons/year			
Annual Influent Phosphorus Load			1727.9 kg/year			
Annual Effluent Phosphorus Load			911.2 kg/year			
Phosphorus Percent Removal			47%			

WWTF Monthly/Quarterly Influent and Effluent Data

Table 1G	2009					
	Influent			Effluent		
Month	flow (MGD)	concentration (mg/L)	mass (kg/day)	flow (MGD)	concentration (mg/L)	mass (kg/day)
Jan	0.121	5.30	2.43	0.121	5.30	2.43
Feb	0.128	9.20	4.46	0.128	5.26	2.55
Mar	0.116	7.70	3.38	0.116	3.41	1.50
Apr	0.135	15.54	7.94	0.135	3.90	1.99
May	0.117	14.55	6.44	0.117	3.60	1.59
Jun	0.117	8.72	3.86	0.117	3.70	1.64
Jul	0.121	14.10	6.46	0.121	4.42	2.02
Aug	0.118	9.60	4.29	0.118	4.90	2.19
Sep	0.118	7.70	3.44	0.118	6.44	2.88
Oct	0.126	7.96	3.80	0.126	3.30	1.57
Nov	0.118	7.70	3.44	0.118	3.50	1.56
Dec	0.127	7.75	3.73	0.127	5.00	2.40
Avg	0.122	9.65	4.47	0.122	4.39	2.03
Annual Influent Flow			44.5 million gallons/year			
Annual Effluent Flow			44.5 million gallons/year			
Annual Influent Phosphorus Load			1623.8 kg/year			
Annual Effluent Phosphorus Load			739.2 kg/year			
Phosphorus Percent Removal			54%			

WWTF Monthly/Quarterly Influent and Effluent Data

Table 1H	2010					
	Influent			Effluent		
Month	flow (MGD)	concentration (mg/L)	mass (kg/day)	flow (MGD)	concentration (mg/L)	mass (kg/day)
Jan	0.127	6.15	2.96	0.127	3.60	1.73
Feb	0.127	9.00	4.33	0.127	4.14	1.99
Mar	0.138	8.80	4.60	0.138	3.70	1.93
Apr	0.115	9.80	4.27	0.115	4.51	1.96
May	0.117	8.85	3.92	0.117	3.20	1.42
Jun	0.126	9.53	4.54	0.126	7.43	3.54
Jul	0.122	7.00	3.23	0.122	7.04	3.25
Aug	0.115	8.00	3.48	0.115	5.77	2.51
Sep	0.148	7.70	4.31	0.148	5.18	2.90
Oct	0.131	4.90	2.43	0.131	4.33	2.15
Nov	0.121	7.21	3.30	0.121	3.80	1.74
Dec	0.115	8.79	3.83	0.115	3.18	1.38
Avg	0.125	7.98	3.77	0.125	4.66	2.21
Annual Influent Flow			45.7 million gallons/year			
Annual Effluent Flow			45.7 million gallons/year			
Annual Influent Phosphorus Load			1379.0 kg/year			
Annual Effluent Phosphorus Load			805.0 kg/year			
Phosphorus Percent Removal			42%			

WWTF Monthly/Quarterly Influent and Effluent Data

Table 11	2011					
	Influent			Effluent		
Month	flow (MGD)	concentration (mg/L)	mass (kg/day)	flow (MGD)	concentration (mg/L)	mass (kg/day)
Jan	0.126	9.80	4.67	0.126	2.76	1.32
Feb	0.121	8.76	4.01	0.121	3.31	1.52
Mar	0.173	8.20	5.37	0.173	3.60	2.36
Apr	0.153	5.40	3.13	0.153	1.70	0.98
May	0.140	5.63	2.98	0.140	5.63	2.98
Jun	0.135	7.15	3.65	0.135	5.10	2.61
Jul	0.122	8.10	3.74	0.122	4.80	2.21
Aug						
Sep						
Oct						
Nov						
Dec						
Avg	0.139	7.58	3.94	0.139	3.84	2.00
Annual Influent Flow			29.4 million gallons/year			
Annual Effluent Flow			29.4 million gallons/year			
Annual Influent Phosphorus Load			843.7 kg/year			
Annual Effluent Phosphorus Load			427.8 kg/year			
Phosphorus Percent Removal			49%			
24						

Table 3: Summary of Phosphorus Sources

Year: 2008	Walk-through inventory	Sampling results				Assessment
Businesses (industrial, commercial, institutional)	**Phosphorus sources**	**Grab (G) or Composite (C) Manhole # if applies**	**Flow (MGD)**	**Phosphorus (mg/L)**	**Total mass load (Kg/day)**	**Reduction potential high, medium, low**
Rushford - Peterson School	Cleaning/Sanitizing Chemicals	N/A	N/A	N/A	N/A	High
Good Shepherd Nursing Home	Cleaning/Sanitizing Chemicals	N/A	N/A	N/A	N/A	Medium
JMW	None	N/A	N/A	N/A	N/A	Low
Riverstar	Supplies from outsourced cleaning company, no metal phosphatizing operations.	N/A	N/A	N/A	N/A	Medium
Rushford Dental Clinic	Cleaning/Sanitizing Chemicals	N/A	N/A	N/A	N/A	Low
Valley Veterinary Clinic	Cleaning/Sanitizing Chemicals	N/A	N/A	N/A	N/A	Low
D&D Car Wash	Various types of cleaners	N/A	N/A	N/A	N/A	High
Dahl's Auto Works	Cleaning/Sanitizing Chemicals	N/A	N/A	N/A	N/A	Low
Bernard Bus Garage	Cleaning/Sanitizing Chemicals	N/A	N/A	N/A	N/A	Low
The Corner	Cleaning/Sanitizing Chemicals	N/A	N/A	N/A	N/A	Low
East Avenue Hair	Cleaning/Sanitizing Chemicals	N/A	N/A	N/A	N/A	Low
Hoff Funeral Home	None	N/A	N/A	N/A	N/A	Low
IGA	Cleaning/Sanitizing Chemicals	N/A	N/A	N/A	N/A	Low
Litscher Meats	Cleaning/Sanitizing Chemicals, Trimmings/Blood caught and rendered offsite	N/A	N/A	N/A	N/A	Low
Stumpy's	Cleaning/Sanitizing Chemicals, Food Disposal	N/A	N/A	N/A	N/A	Medium
The Creamery	Cleaning/Sanitizing Chemicals, Food Disposal	N/A	N/A	N/A	N/A	Medium
Municipal sources	**Phosphorus sources**	**Grab (G) or Composite (C) Manhole # if applies**	**Flow (MGD)**	**Phosphorus (mg/L)**	**Total mass load (kg/day)**	**Reduction potential high, medium or low**
City Hall	Cleaning/Sanitizing Chemicals	N/A	N/A	N/A	N/A	Low
City Garage	None	N/A	N/A	N/A	N/A	Low
Satellite communities	**Phosphorus sources**	**Grab (G) or Composite (C) Manhole # if applies**	**Flow (MGD)**	**Phosphorus (mg/L)**	**Total mass load (kg/day)**	**Reduction potential high, medium or low**
The Village of Rushford	Municipal Waste to Rushford WWTF	N/A	N/A	N/A	N/A	High
Domestic (population served #)	**Phosphorus sources**	**Grab (G) or Composite (C) Manhole # if applies**	**Flow (MGD)**	**Phosphorus (mg/L)**	**Total mass load (kg/day)**	**Reduction potential high, medium or low**
1781	Cleaning Chemicals, Garbage Disposals	N/A	N/A	N/A	N/A	Low
		Total All	0.000		0.00	

Exhibit 1 - Average Monthly Flow

Month Average Flow (MGD)									
Month	2003	2004	2005	2006	2007	2008	2009	2010	2011
Jan	0.147	0.131	0.144	0.143	0.138	0.122	0.121	0.127	0.126
Feb	0.134	0.128	0.160	0.142	0.137	0.123	0.128	0.127	0.121
Mar	0.136	0.132	0.151	0.139	0.178	0.145	0.116	0.138	0.173
Apr	0.127	0.126	0.150	0.188	0.150	0.199	0.135	0.115	0.153
May	0.138	0.132	0.137	0.160	0.132	0.141	0.117	0.117	0.140
Jun	0.126	0.259	0.135	0.133	0.132	0.323	0.117	0.126	0.135
Jul	0.133	0.176	0.137	0.136	0.138	0.137	0.121	0.122	0.122
Aug	0.129	0.145	0.136	0.138	0.181	0.121	0.118	0.115	
Sep	0.136	0.202	0.144	0.146	0.117	0.117	0.118	0.148	
Oct	0.129	0.147	0.143	0.141	0.161	0.141	0.126	0.131	
Nov	0.128	0.140	0.145	0.140	0.118	0.117	0.118	0.121	
Dec	0.126	0.146	0.148	0.141	0.119	0.129	0.127	0.115	

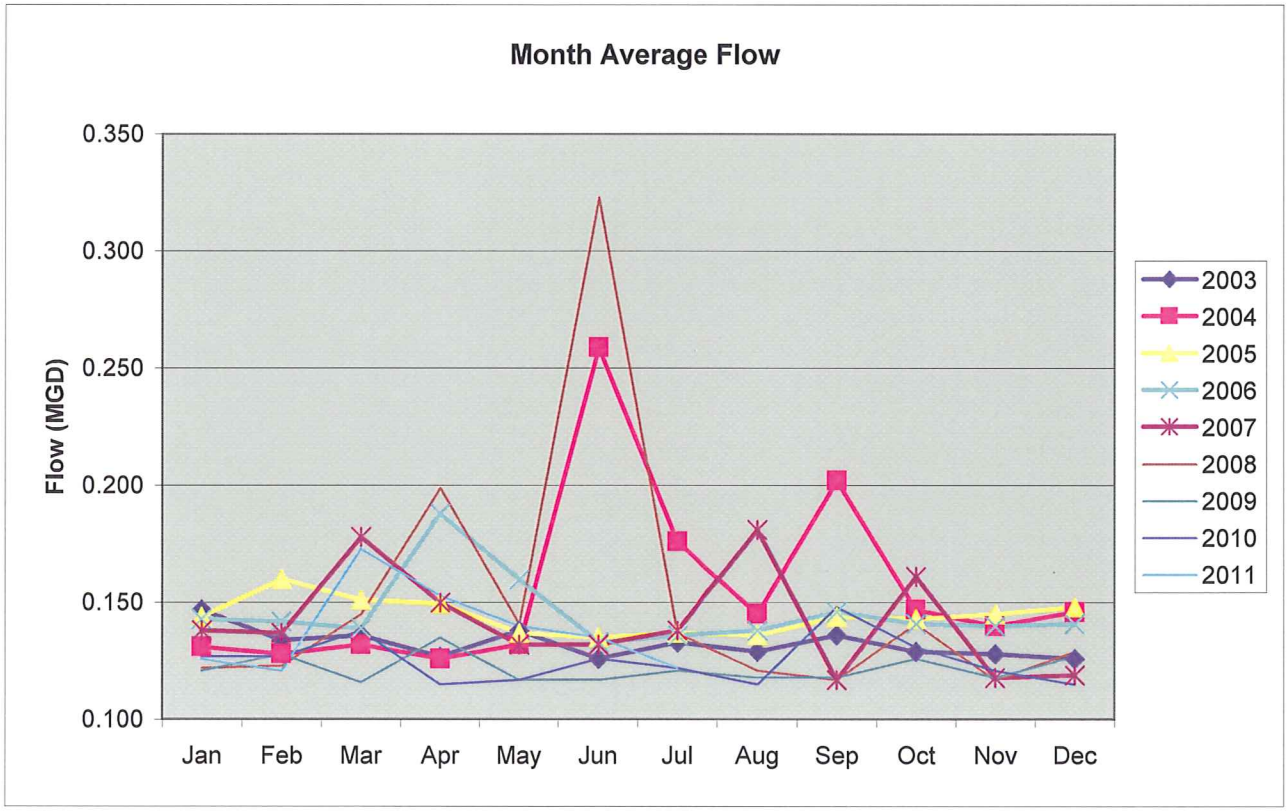
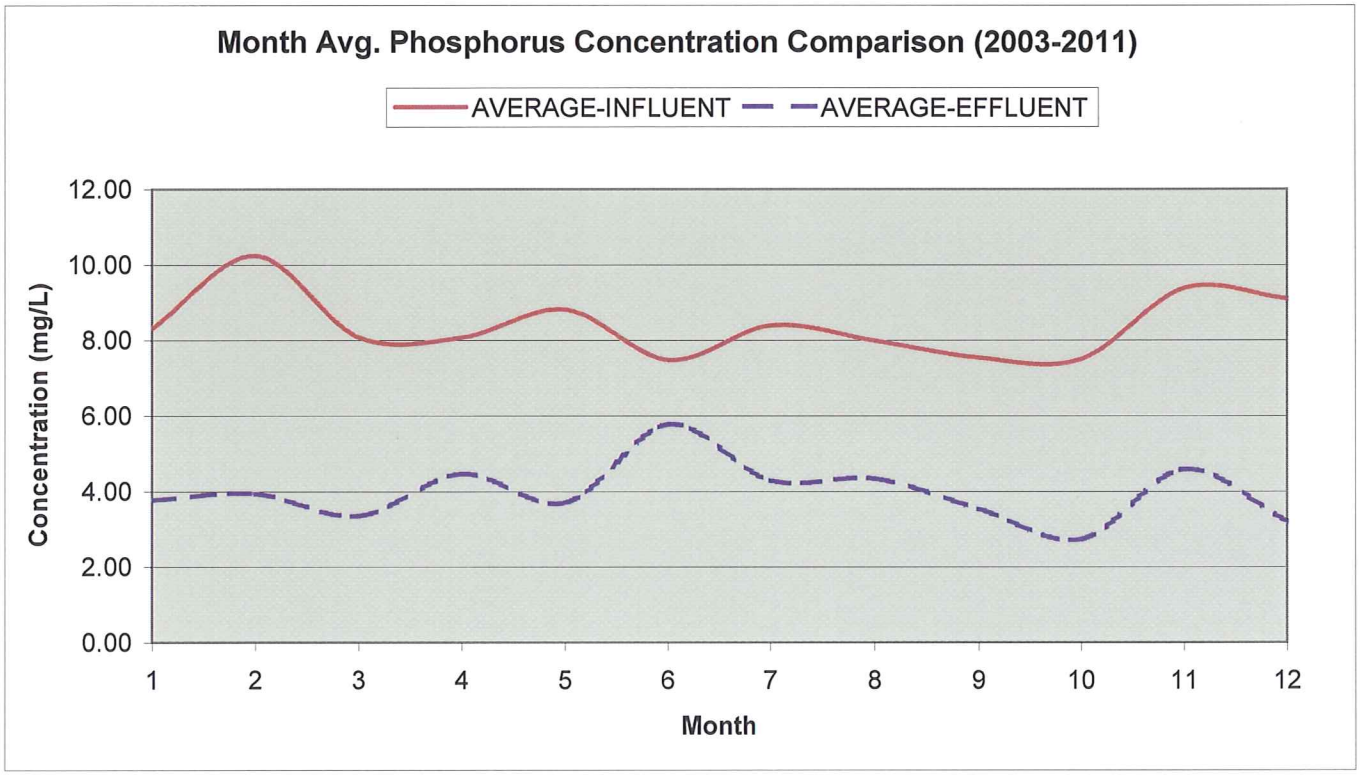


Exhibit 2 - Average Monthly Influent & Effluent Phosphorus Concentration

Month Average Influent Concentration (mg/L)										
Month	2003	2004	2005	2006	2007	2008	2009	2010	2011	AVERAGE
Jan	8.85	8.85	7.55	13.00	8.00	7.50	5.30	6.15	9.80	8.33
Feb	11.50	8.55	15.60	8.80	10.95	9.89	9.20	9.00	8.76	10.25
Mar	7.20	8.75	8.45	8.50	8.30	6.95	7.70	8.80	8.20	8.09
Apr	5.60	8.80	6.95	8.30	7.65	4.75	15.54	9.80	5.40	8.09
May	7.99	9.95	8.15	8.70	9.20	6.41	14.55	8.85	5.63	8.83
Jun	5.58	5.80	9.90	7.35	7.84	5.50	8.72	9.53	7.15	7.49
Jul	5.70	6.10	11.50	8.00	9.13	6.00	14.10	7.00	8.10	8.40
Aug	4.92	8.75	7.95	12.60	2.42	9.80	9.60	8.00		8.01
Sep	5.87	5.75	8.85	7.85	7.50	9.20	7.70	7.70		7.55
Oct	9.75	7.70	7.95	10.55	2.75	8.60	7.96	4.90		7.52
Nov	7.75	8.40	8.80	8.75	15.20	11.35	7.70	7.21		9.40
Dec	8.80	7.35	8.75	8.05	9.95	13.40	7.75	8.79		9.10

Month Average Effluent Concentration (mg/L)										
Month	2003	2004	2005	2006	2007	2008	2009	2010	2011	AVERAGE
Jan	3.10	4.40	3.10	3.95	4.15	3.65	5.30	3.60	2.76	3.78
Feb	5.20	2.25	5.20	2.25	4.40	3.53	5.26	4.14	3.31	3.95
Mar	4.05	3.40	4.05	2.05	3.20	2.75	3.41	3.70	3.60	3.36
Apr	3.87	3.60	3.87	3.65	3.05	12.10	3.90	4.51	1.70	4.47
May	4.12	3.40	4.12	0.30	4.35	4.65	3.60	3.20	5.63	3.71
Jun	6.34	8.70	6.34	7.90	4.24	2.24	3.70	7.43	5.10	5.78
Jul	4.36	2.20	4.36	5.35	1.45	4.70	4.42	7.04	4.80	4.30
Aug	4.47	4.45	4.47	4.35	2.08	4.24	4.90	5.77		4.34
Sep	2.27	2.20	2.27	4.45	1.90	3.70	6.44	5.18		3.55
Oct	1.08	3.25	1.08	3.35	1.50	4.01	3.30	4.33		2.74
Nov	6.60	5.00	6.60	6.25	2.20	2.80	3.50	3.80		4.59
Dec	1.65	4.15	1.65	3.00	2.95	4.02	5.00	3.18		3.20