Section 6

Millers River Watershed

ENGINEERING FEASIBILITY AND COST ANALYSES OF NITROGEN REDUCTION FROM SELECTED POTWS IN MASSACHUSETTS

SECTION 6 – MILLERS RIVER WATERSHED

6.1 INTRODUCTION

The Millers River begins in the southwestern part of New Hampshire. It flows southward and westward through north central Massachusetts to the Connecticut River. For this study, there is one major POTW that discharges directly to the Millers River. This POTW is the Erving Center Wastewater Treatment Plant with a permitted capacity of 2.7 mgd.

Photograph from www.millersrivertu.org

Figure 6.1-1 shows the Millers River watershed and the facility mentioned above. The impact of nitrogen removal at this facility is presented in this section.

(continued)

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POTW Permitted Flow Range (mgd)

- 0.1-1.0
- 1.1 - 5.0
- 5.1 - 10.0
- 10.1 - 50.0
- 50.1 - 100.0

Watershed

MA Town Boundaries

0 2.5 5 10 Miles

STEARNS & WHELER LLC
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HYANNIS, MASSACHUSETTS

DATE: 10/31/07 JOB No.: 61625

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ENGINEERING FEASIBILITY AND COST ANALYSES OF NITROGEN REDUCTION FROM SELECTED POTWS IN MASSACHUSETTS

Permitted Flows for POTWs in Millers Subwatershed
Figure 6-1-1

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6.2 ERVING CENTER

A. **Introduction.** The Erving Center Wastewater Treatment Plant (WWTP) is located at 45 East Main Street (Route 2) in Erving, MA. It has a permitted average annual capacity of 2.7 and serves the Erving Paper Mill and a limited number of local residents. Septage is also accepted at the facility.

The existing facility went online in 1977. The only changes that have been made to the facility since it was first constructed include equipment upgrades and lagoon repairs.

B. **Existing Facilities.**

1. **Description of Existing Facilities.** All flow enters the facility and passes through a screenings grinder. After pH adjustment consisting of sulfuric acid, the flow enters the primary clarifiers.

After primary treatment, the flow is conveyed by gravity to lagoons.

Aerial photo from www.google.com

The facility has two lagoons totaling ten million gallons – one lagoon is over 3 million gallons and the second is over 6 million gallons. The lagoons have mechanical aerators. The lagoons are followed by two secondary clarifiers. The facility is required to add nutrients to their process. The influent wastewater is nutrient deficient and thus approximately 300 lbs of urea and 50 lbs of diammonium phosphate are added to the lagoon each day.

Secondary effluent flows into the chlorine contact tanks; it is then dechlorinated with sodium bisulfite before being discharged to the Millers River.

Primary and waste activated sludges are combined and dewatered in the belt filter press. The dewatered solids are used for soil amendment and landfill cap material. A process flow schematic is shown in the following Figure 6.2-1.

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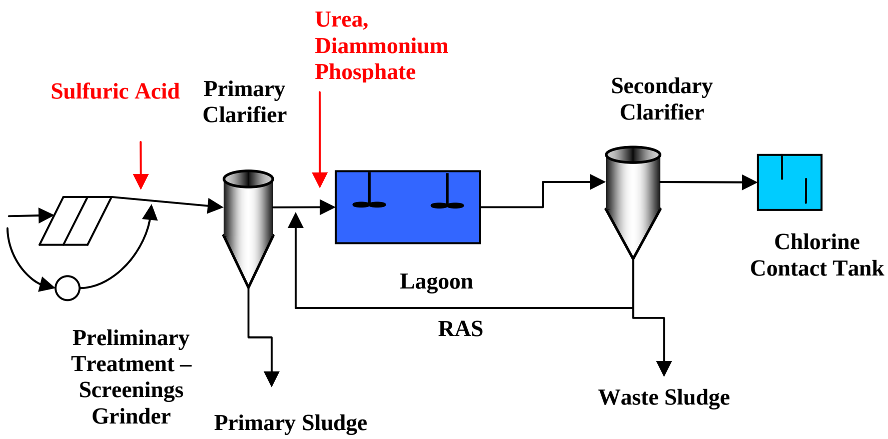

FIGURE 6.2-1: PROCESS FLOW SCHEMATIC – EXISTING FACILITY

This facility on average receives over one million gallons of septage per month. The septage is stored in a septage holding tank and then pumped to the plant influent.

All plant recycle flows are conveyed to the plant influent. The influent sampler is located after the grinder and thus samples include septage and recycle flows. The effluent sampler is located after disinfection.

The plant has exclusively used the 3 million gallon lagoon for the past fifteen years.

There are six full time employees at the wastewater facility plus a supervisor and a part time lab tech. The responsibilities of these employees are for the WWTP only.

Design flows and loads for the most recent upgrade were not made available.

2. **Summary of Plant Data.** Data from January 2004 through December 2006 was provided by the Town for this study. A summary of the monthly data is shown in Table 6.2-1. Seasonal and annual average maximum month data are summarized in the table.

Table 6.2-1

ERVING WWTP

Erving, Massachusetts

Monthly Averages 2004-2006

GENERAL		INFLUENT				EFFLUENT					
DATE		INF	pH	BOD	TSS	DO	BOD	TSS	FECAL	TKN	TN
Month	Year	MGD		mg/L	mg/L	mg/L	mg/L	Mg/L	COLI.	Mg/L	mg/L
January	2004										
February	2004										
March	2004										
April	2004										
May	2004										
June	2004										
July	2004										
August	2004										
September	2004										
October	2004									2.20	
November	2004										
December	2004										
January	2005									3.90	
February	2005										
March	2005										
April	2005									2.50	
May	2005										
June	2005										
July	2005									2.88	
August	2005										
September	2005										
October	2005									2.60	
November	2005										
December	2005										
January	2006	1.82	7.10	1495	6016	4.9	89	96		5.80	16.02
February	2006	1.84	7.00	1414	5539	3.8	102	95			18.36
March	2006		7.00			2.4					
April	2006		7.10			5.2			9	1.50	
May	2006	1.86	7.00	1363		4.9	63		3.9		11.36
June	2006	1.80	6.90	1124	3674	4.2	38	27	2.5		6.90
July	2006	1.76	7.15	1038	4094	4.5	11	18	2.8	2.60	1.91
August	2006	1.73	7.20	1097	4759	3.9	10	28	6.4		1.78
September	2006	1.67	7.35	1379	3643	5.2	11	26	1.3		1.91
October	2006	1.72	7.35	1311	4624	6.8	16	30		4.30	2.90
November	2006	1.83	7.10	1318	4641	4.6	17	42			3.07
December	2006	1.74	7.25	1577	4966	5.9	40	48			7.17
Min. Month		1.67	6.90	1038	3643	2.40	10	18			
Seasonal Average		**1.51**	**6.14**	**1045**	**3466**	**4.21**	**21.23**	**21.43**			
Average		**1.78**	**7.13**	**1312**	**4662**	**4.69**	**39.65**	**45.52**			
Max. Month		1.86	7.35	1577	6016	6.80	102.00	95.74			

With a current average annual flow of 1.8 mgd and a permitted capacity of 2.7 mgd, this facility is operating at over 67% of its permitted capacity.

Based on the average BOD concentration of 1312 mg/L, this wastewater would be considered very strong. The influent TN/BOD ratio is nearly zero.

The data shows that the plant has maintained an average effluent TN of less than 4 mg/L.

3. **Permit Requirements and Current Performance.** The current permit for this facility has been in effect since May 21, 2004. Monthly permit limits that are relevant to this study are shown below in Table 6.2-2.

Table 6.2-2

SELECT MONTHLY PERMIT LIMITS

PARAMETER	LIMIT
BOD_5	
November – March	1700 lb/d
April - October	900 lbs/d
TSS	
November – March	2350 lb/d
April - October	900 lbs/d
Ammonia-Nitrogen	
December – April	15 mg/L
May, November	10 mg/L
June - October	5 mg/L
Ammonia, TKN, Nitrate, Nitrite	Report

4. **Nitrogen Removal Performance.** This facility is nutrient deficient and thus they add nutrients in quantities that are required to sustain biological treatment.

C. **Nitrogen Removal Alternatives.** Because this facility is nutrient deficient, the amount of nutrients in the effluent is directly a result of the amount of nutrients added by the facility. The only changes to the existing facility that would be recommended to ensure that the facility always were to meet an effluent TN limit would be to meter nutrients into the process and potentially flow pace the addition.

D. **Plant and Cost Summary.**

Table 6.2-3 presents flow data for the Erving Center WWTP as well as the current nitrogen removal performance of the plant.

Table 6.2-3

PLANT FLOW AND EFFLUENT LIMIT SUMMARY

PARAMETER	VALUE
Permitted Flow (mgd)	2.7
Existing Flow (2004-6)	1.8
% of existing capacity	67
Current average seasonal effluent TN (mg/L)	Negligible[1]
Current average annual effluent TN (mg/L)	Negligible[1]
Permit Limits	
Seasonal Nitrification (mg/L)	Yes (5)
Year-round nitrification (mg/L)	Yes (10-15)
Seasonal TN Limit	Report
Annual TN Limit	Report

Notes:

1. The facility has negligible influent nitrogen. Any nitrogen that is discharged is due to overdosing nutrients that are added to the treatment process.

The costs associated with meeting effluent TN limits of 8 and 5 mg/L TN include an allowance of $500,000 (capital only) to cover an automated chemical feed system including pumps, tanks and containment for the two nutrients that are added to the treatment process.