

Improving Denitrification Using Carbon-Based Chemical Addition

Presented at the Wisconsin Wastewater
Operators Association Annual Meeting
October 20, 2010

Overview

- Pilot study conducted at Northland Baptist Bible College
- Review Historic Plant Data
- Problems with Nitrogen Removal
- Pilot Study
- Operating Costs
- Lessons Learned

Northland Baptist Bible College

- Four-year college near Dunbar, WI
 - 180 staff and faculty
 - 600 students
 - 450 students during summer

WASTEWATER TREATMENT FACILITY

Pike Plains Rd

Pioneer Dr

Pine View Dr

Lakeview Dr

Pike River Rd







Existing Loadings

- Flows
 - 0.030 mgd average
 - 0.070 mgd max
 - 0.006 mgd min
- Loadings
 - 39 lbs/day average
 - 74 lbs/day max
 - 4 lbs/day min

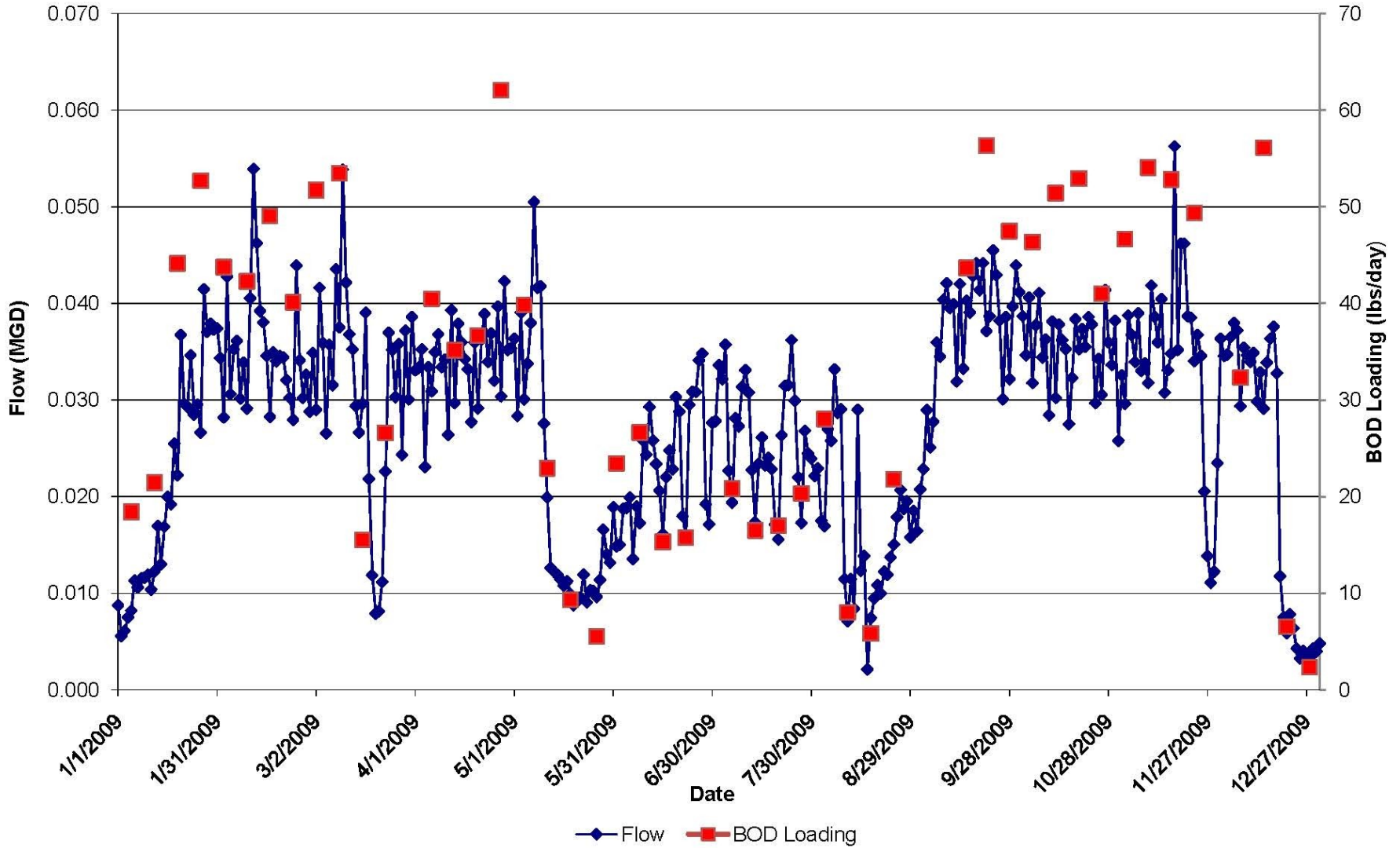
Effluent Requirements

- Groundwater Discharge
 - BOD = 50 mg/L
 - Total Nitrogen = 10 mg/L
 - Chloride = 250 mg/L

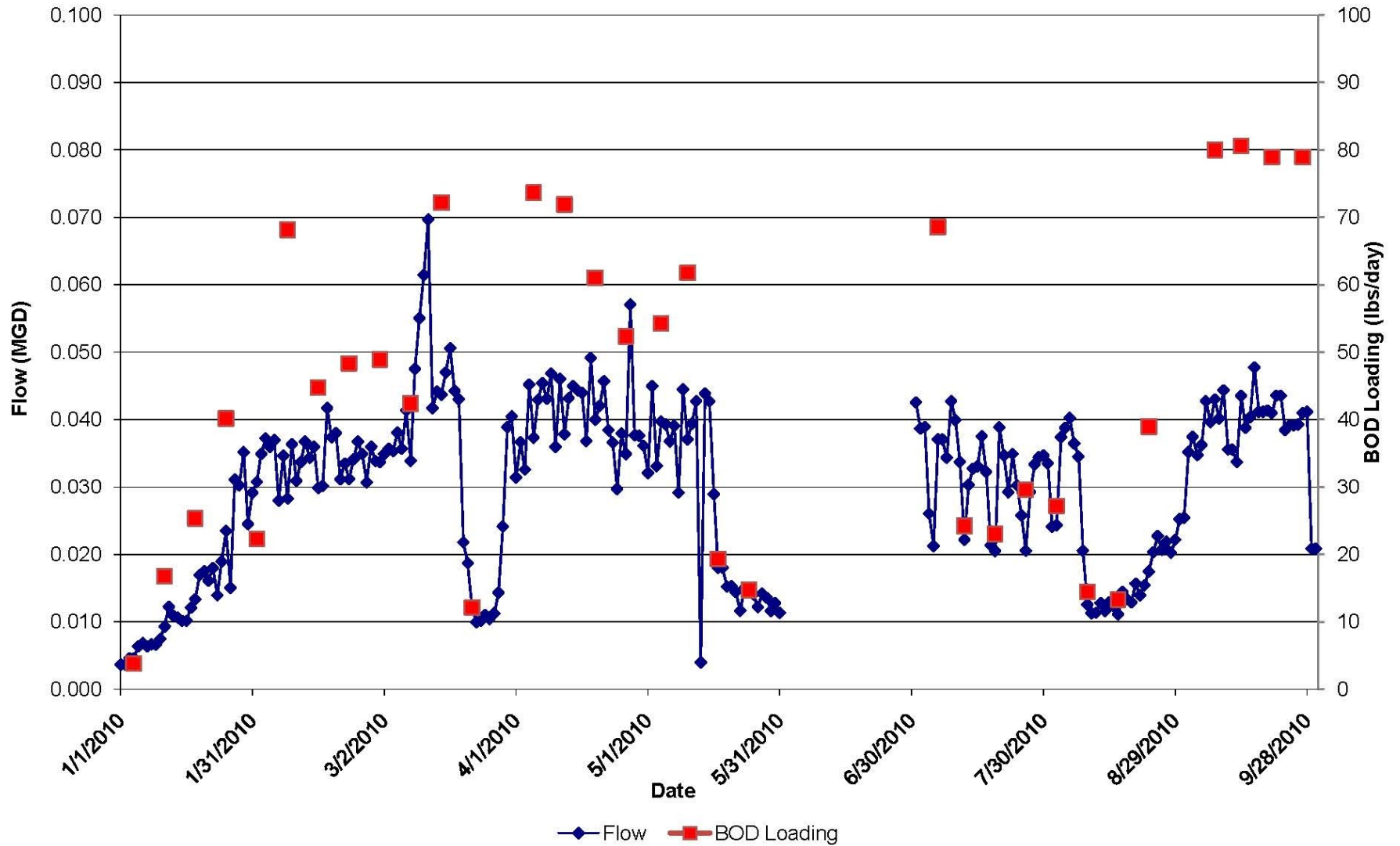
Low Loadings

- Student breaks during winter and spring cause extremely low flows and loadings

Flow and Loading - 2009



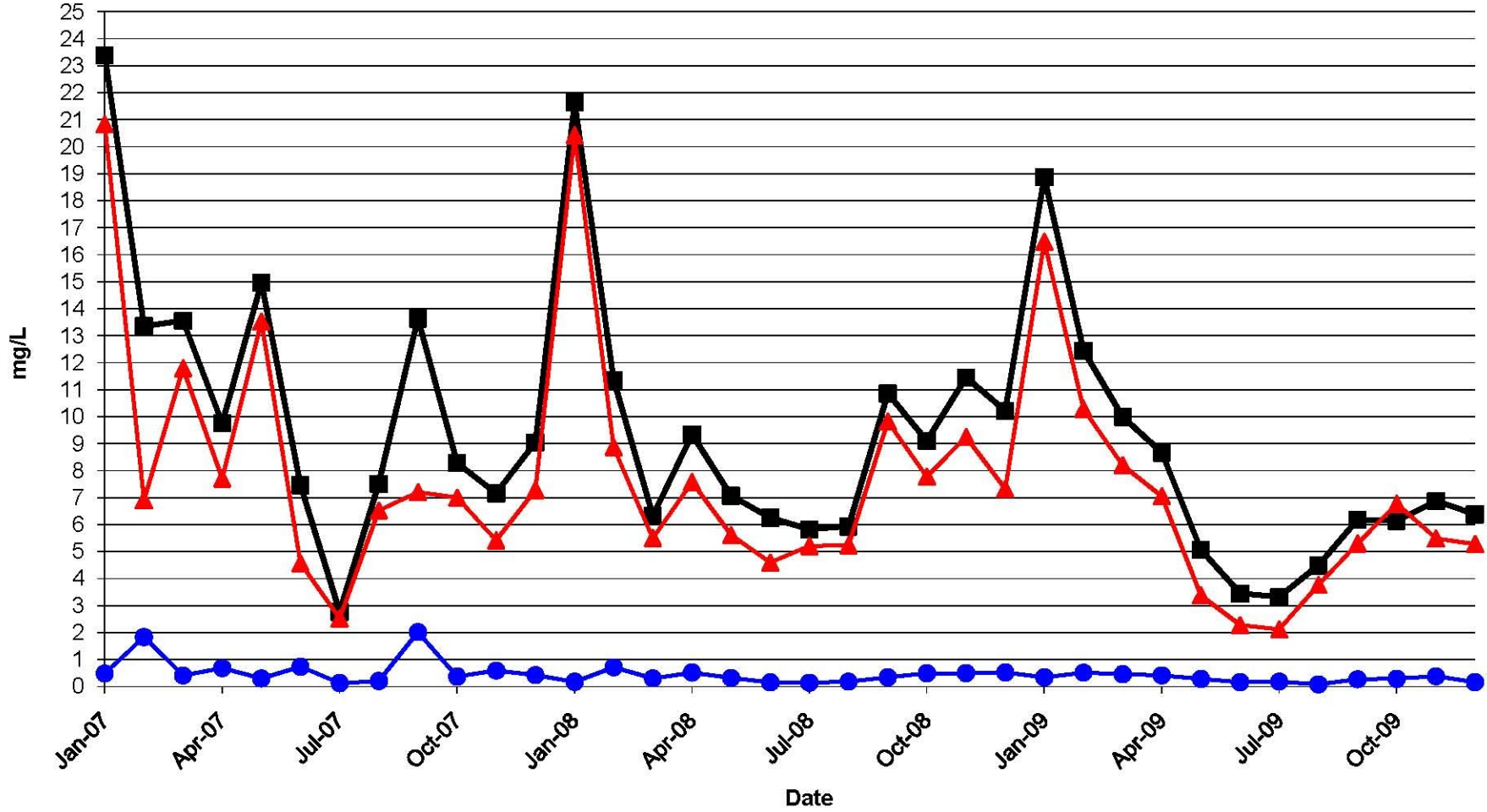
Flow and Loading - 2010



Loss of Denitrification

- Low loadings result in loss of denitrification and elevated effluent nitrate

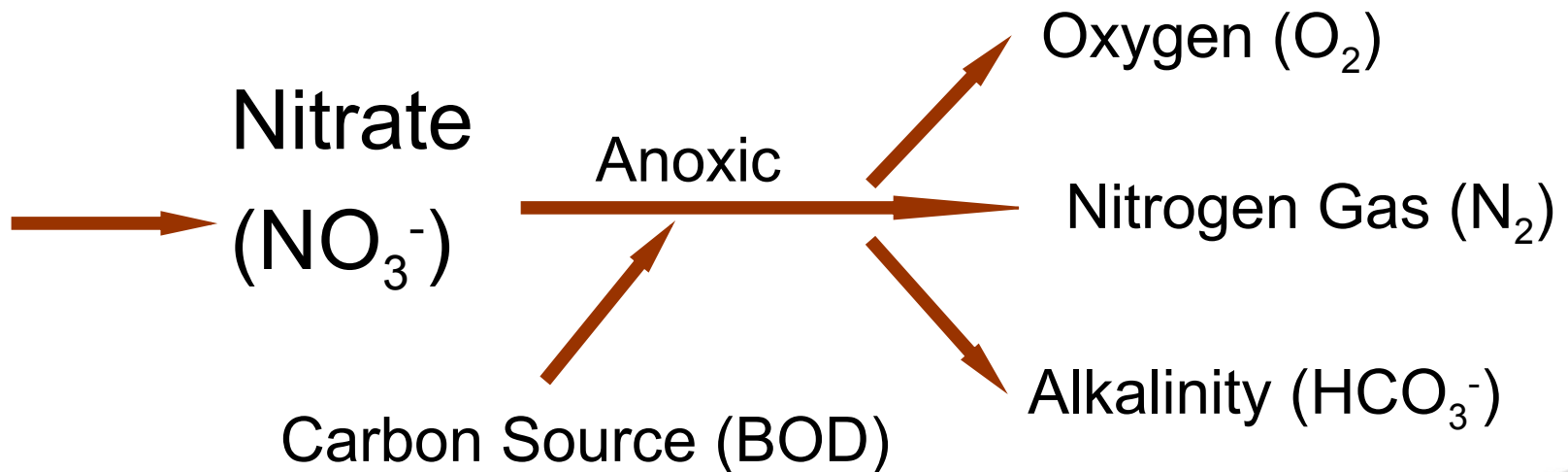
AVERAGE MONTHLY NITROGEN 2007-2009



■ Total Nitrogen ● TKN ▲ Nitrate

Denitrification

- Denitrification: Conversion of Nitrite/ Nitrate to Nitrogen Gas



Supplemental BOD

- Need to supplement BOD during low loading periods
 - Dog Food
 - Molasses
 - Methanol
 - Internet Research...

MicroCm™

- Methly alcohol solution designed for use as a carbon source for denitrification
- 3.6 lbs BOD per gallon
- Low methanol content (5%)
 - Non-flammable
 - Non-hazardous
- Low freezing point (-4 F)

Product Description

MicroCm™ is a proprietary wastewater treatment chemical developed by Environmental Operating Solutions, Inc. MicroCm™ was designed specifically for use as an electron donor/carbon source for wastewater denitrification applications.

Physical Properties / Specifications

Physical State	Liquid
Color	Clear / Yellow Liquid
Odor	Mild Alcohol Odor
Specific Gravity @ 25°C	1.18
Density (lbs/gal)	9.84
pH	5.3-5.8
Viscosity (centipoises)	16.4
Solubility in water	100%
VOC Concentration	0% (EPA 8260B)
Freezing Point	-4°F (-20°C)
COD Value	670,000mg/L

Pilot Testing

- Start feeding MicroCm on December 16, 2009 through Christmas Holiday
- To increase BOD loading by 20 lbs/day, we would need a feed rate of approximately 5.5 gpd ($20/3.6$)
- Initial feed rate was set at 3 gpd
- Take outer ditch channel offline...





Micro Cam

11A 3-200

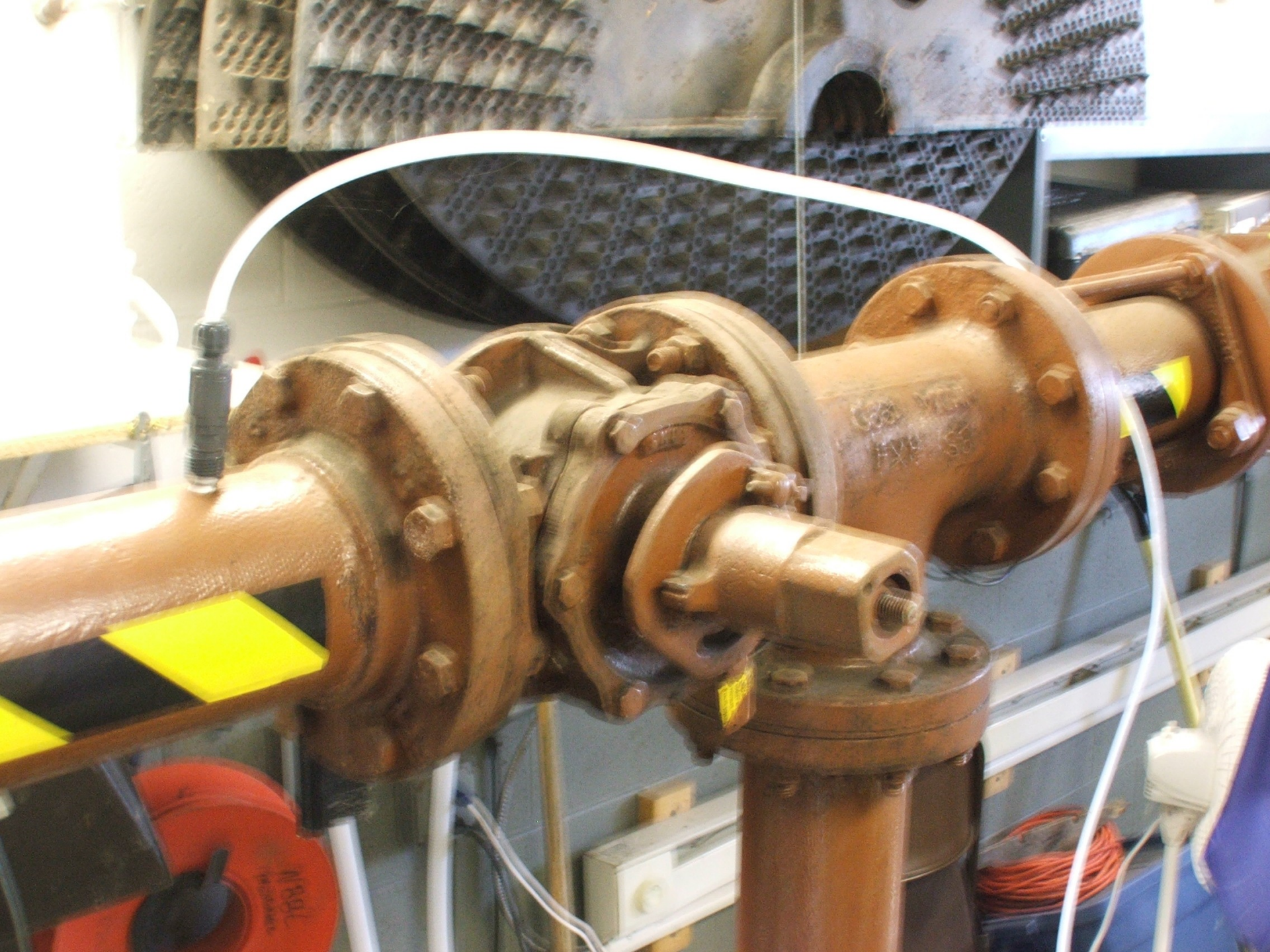
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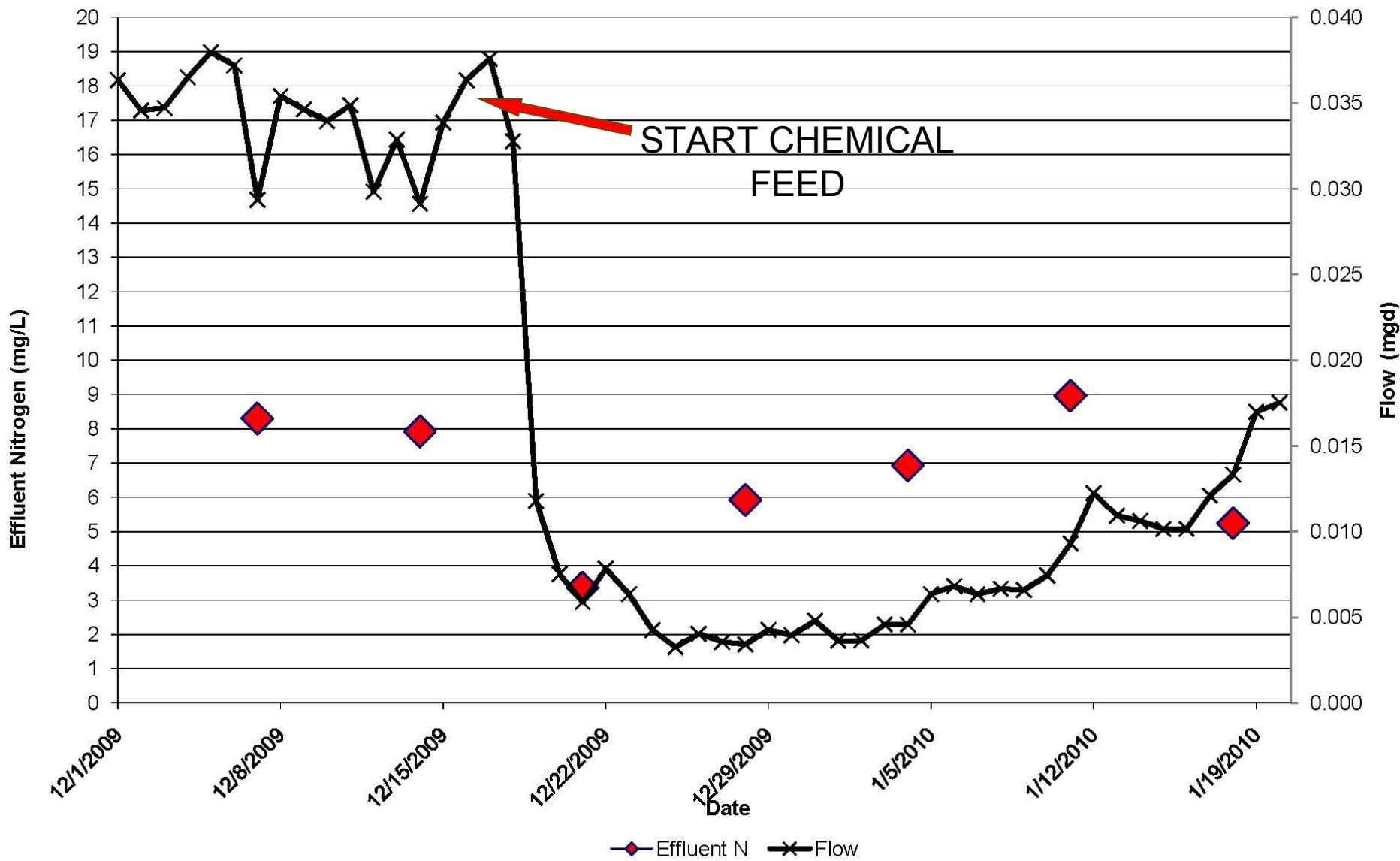
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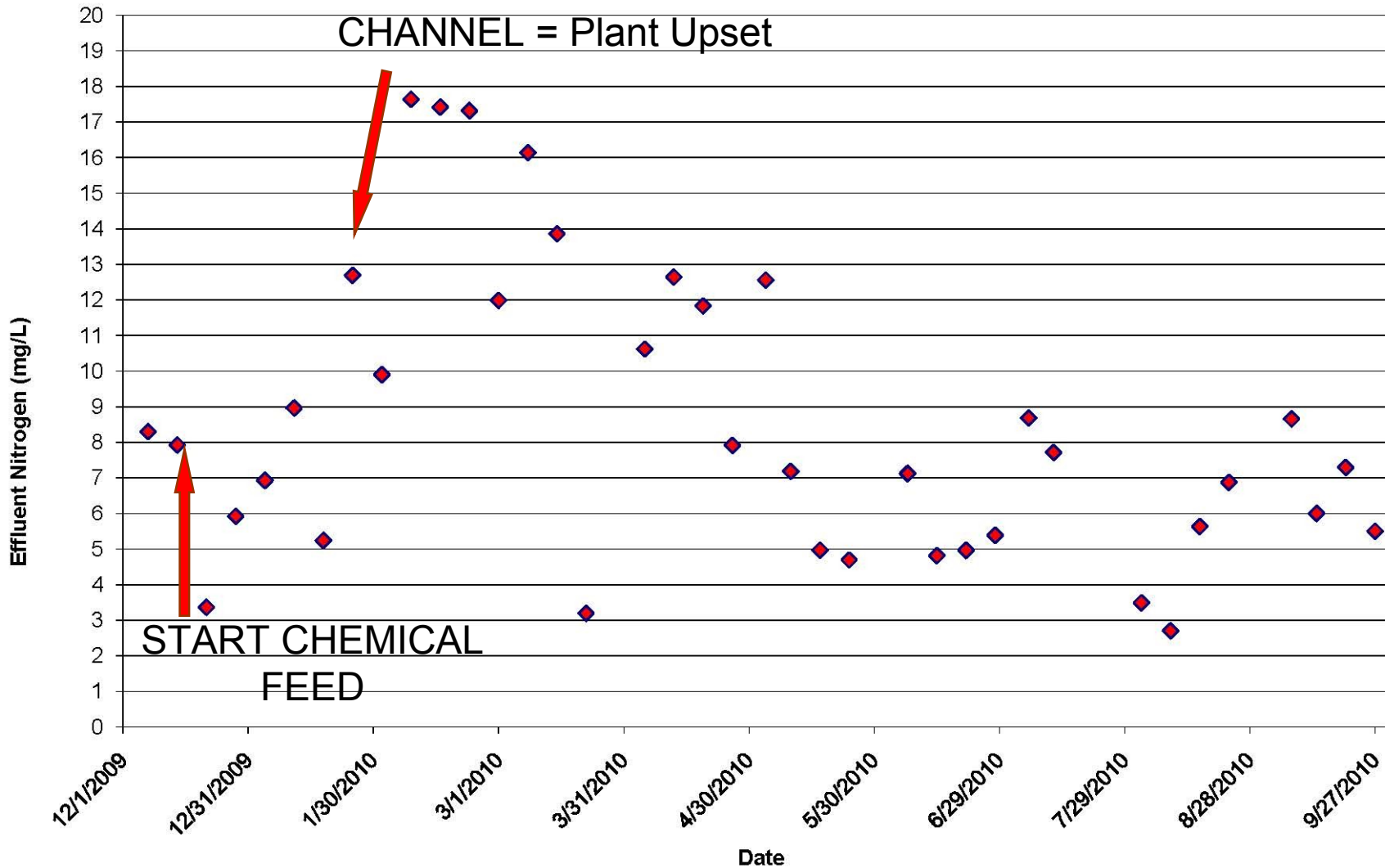
Effluent Nitrogen - December 2009/January 2010



Effluent Nitrogen - 2010

START OUTER

CHANNEL = Plant Upset



Operating Cost

- 237 gallon tote = \$1,200 (\$5.05/gallon)
- Used approximately 3 gpd = \$15 per day
- Total cost for 2010 = \$2,400

Lessons Learned

- MicroCm is a good supplemental source of BOD. It works!
- Increase dosage to 5 gpd this winter
- Do not change more than one process parameter
- Leave all three channels on line
- Do not make drastic process changes during winter months

Questions

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