Wisconsin Wastewater Operators’ Association 47th Annual Meeting
October 22nd to 25th 2013

Dave Arnott – Ruekert & Mielke, Inc.

Paul Sebo – Washington County Land and Water Conservation Division

October 24, 2013
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BACKGROUND: CITY OF HARTFORD

Washington County
Population: 14,258

Large Industrial Base
Dairy
Tannery
Metal Finishing

Hartford Wastewater Treatment
Water Pollution Control Facility

- Activated Sludge
- Extended Aeration
- Advanced Treatment
  - Nitrification/Denit.
  - Tertiary Filters
- Design ADF: 3.4 MGD

- New Permit July 2012
  - Interim P Limit: 0.6 mg/L
  - Final P Limit: 0.075 mg/L
**PHOSPHORUS MASS BALANCE**

- **Total Load**: 5,261 lb/year
- **Allowable Load**: 1,014 lb/year
- **Needed Reduction**: 4,248 lb/year

- **Existing Load**: 330 lb/year (7Q2)
- **Hartford WPCF**: 4,931 lb/year (Design Flow)
Adaptive Mgt.
Work to Reduce Runoff in Watershed

Nutrient Trading
Buy/Sell Credits
Three Criteria:
1. Surface water not meeting WQ Standards
2. Filtration or equivalent technology needed
3. Non-point source dominated

Presto:
- 80% C.I., 70% point source
- 30% non-point source
  - Not eligible
ADAPTIVE MANAGEMENT ELIGIBILITY

WDNR:
- Need for Non-Point Source Reduction
- Unit Area Method
- Phosphorus Export Method

Shows NP dominated
- Eligible
<table>
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<tr>
<th>Adaptive Management vs. Trading</th>
<th><strong>Adaptive Management</strong></th>
<th><strong>Trading</strong></th>
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<tr>
<td>Pollutants Covered</td>
<td>TP (and possibly TSS)</td>
<td>Numerous Pollutants</td>
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<tr>
<td>End Goals</td>
<td>Attaining the Water Quality Criteria</td>
<td>Offsetting the Limit</td>
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<tr>
<td>Offsets</td>
<td>No Trade Ratios</td>
<td>Trade Ratios Apply</td>
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<tr>
<td>Timing</td>
<td>Implemented Throughout the Permit Term</td>
<td>Generating Credits Before They Can Be Used</td>
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<tr>
<td>In-Stream Monitoring</td>
<td>Required</td>
<td>Not Required</td>
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<tr>
<td>Level of Documentation Needed</td>
<td>General Watershed Information</td>
<td>Field-by-Field Documentation</td>
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WATERSHED-BASED SOLUTIONS

Study Area: Dairy Farm
WATERSHED-BASED SOLUTIONS

Cropland and nutrient application data dating back to 2008
Six years of history

Heifer Farm
Dairy Expansion
Original Homestead
WATERSHED-BASED SOLUTIONS

Riparian Buffers
WATERSHED-BASED SOLUTIONS

Filter Strips Definition

1. How Located?
Filter Strips Definition

1. How Located?
2. Sizing

Washington County
Goal is 75 feet

Encourage buffer widths of 30 feet minimum
WATERSHED-BASED SOLUTIONS

Filter Strips Definition

1. How Located?
2. Sizing
3. NRCS Standard
WATERSHED-BASED SOLUTIONS

Filter Strips Definition

1. How Located?
2. Sizing
3. NRCS Standard
4. Load
   Reduction Methodology - Snap Plus
WATERSHED-BASED SOLUTIONS

Snap-Plus program developed by the University of Wisconsin

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<table>
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<tr>
<th>Year</th>
<th>Crop</th>
<th>Yield Goal</th>
<th>Tillage</th>
<th>Soil Test Date</th>
<th>Lime Rec</th>
<th>Irrigation/MRTN info</th>
<th>Rotation Settings</th>
<th>Rotation Summary Results 2008-2013</th>
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<tr>
<td>2009</td>
<td></td>
<td>Wheat 85</td>
<td>Fall Chisel</td>
<td>10/31/2008</td>
<td>NA</td>
<td>Irrigated</td>
<td></td>
<td>Avg soil loss and seed drill</td>
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<tr>
<td>2010</td>
<td></td>
<td>Corn 175</td>
<td>Fall Chisel</td>
<td>10/31/2009</td>
<td>NA</td>
<td>Irrigated 0.5A/MRTN</td>
<td></td>
<td>Avg P Index</td>
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<tr>
<td>2011</td>
<td></td>
<td>Corn 175</td>
<td>Fall Chisel</td>
<td>10/31/2010</td>
<td>NA</td>
<td>Irrigated 0.5A/MRTN</td>
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<td></td>
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<tr>
<td>2012</td>
<td></td>
<td>Corn 175</td>
<td>Fall Chisel</td>
<td>10/31/2011</td>
<td>NA</td>
<td>Irrigated 0.5A/MRTN</td>
<td></td>
<td></td>
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<tr>
<td>2013</td>
<td></td>
<td>Corn 175</td>
<td>Spring Chisel</td>
<td>10/31/2012</td>
<td>0</td>
<td>Irrigated</td>
<td></td>
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Field notes:
- Contouring: None
- Strip cropping: None
- Soil test P index: 5
- P2O5 removal: 125 lb/acre
- K2O removal: 100 lb/acre
- P2O5 balance: 0 lb/acre
- K2O balance: 0 lb/acre

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Ruekert • Mielke
WATERSHED-BASED SOLUTIONS

Filter Strips Definition

1. How Located?
2. Sizing
3. NRCS Standard
4. Load Reduction Methodology – Snap Plus
5. Harvestable

Harvesting is “HIGHLY” Promoted
Cover Crops

• Definition
• Load Reduction
• Methodology

– SNAP PLUS

Cover Crop: A close-growing crop that temporarily protects the soil during the period before the next crop is established.
Sample Farm
• 730 Acres (400 Acres owned)
• Rotational Average PI’s from range from 10 to 0.
• Weighted Average P Index for entire farm = 2.4 lb/ac/yr P
• This should mean that our sample farm has a phosphorus load of 1,752 lbs/yr

Snap-Plus modeled reductions:
• Total Farm average PI’s were reduced to 1.6 with just filter strip.
• Average PI’s reduced to 1.44 with buffers and cover crops.

Total Phosphorus reduction = 688 lbs/yr
UNIT REDUCTIONS & EXTRAPOLATION

With improvements to sample farm
- Reduction of 688 lb P/year = 1.9 lb P/day
- DNR required reduction of 4,248 lb P/year = 11.6 lb P/year

Extrapolate to entire watershed
- Sample farm, 19% of all filter strip area
- Consider only filter strips and minor barnyard improvements
- 3,139 lb P/year = 8.6 lb P/day
- 74% of problem could be addressed through filter strips (w/o trade ratios)
UNIT COST COMPARISONS

Watershed:
- Filter strips = $39/lb P

Plant Upgrade:
- No New Building
- Reuse deep bed filter
- Concrete superstructure
- Capital Cost = $2.7 million
- 20-year 4% i-rate annualized cost = $175,370
- Incremental cost (0.45 mg/L to 0.06 mg/L) = $109/lb P
DISADVANTAGES

General Watershed
- Lack of Control
- Uncertainty
- Liability
- Drain Tile

Filter Strips
- Less Cropland Available

Cover Crops
- Harder to Verify
- Timing Dependent
The Washington County Land & Water Conservation Division (LWCD) relies on partnerships with local farmers and landowners by offering:

- Technical Assistance
- Financial Assistance
- Education
Since many conservation practices can be costly and clean water and sustained soil productivity benefit everyone, public financial assistance is often available and in many cases required.

Funding assistance comes from:
- Federal Grant Programs
- State Grant Programs
- County / Local Programs
CONSERVATION AND WI RUNOFF RULE

In 2002, Wisconsin adopted administrative rules (NR 151/ATCP 50), with revisions effective in 2011 that set statewide performance standards and prohibitions for all Wisconsin farms.

All farmers must comply. However, under these rules, a landowner is entitled to cost sharing if required to implement Best Management Practices (BMP) on “existing cropland” or on “existing” livestock operations.
FEDERAL AND STATE GRANT PROGRAMS

Natural Resource Conservation Service

- Environmental Quality Insurance Program
  - Offers financial assistance to agricultural producers for BMP installation.

Wisconsin Department of Agriculture Trade and Consumer Protection

- Soil and Water Resource Management Program
  - Provides limited funding to counties for staff and for BMP installation.
  - Geared towards State priorities.

Wisconsin Department of Natural Resources

- Targeted Runoff Management Program
  - Competitive grant targets high priority resource problems.
  - Funding up to $150,000 per site.
  - Not available for Adaptive Management or Pollutant Trading programs.
“Federal and state natural resource agencies have long recognized the need to apply a wide range of Best Management Practices on agricultural lands to improve stream water quality. Although there are many tools available in the toolbox to reduce pollutant runoff from agricultural lands, such as crop rotations, nutrient and manure management, conservation tillage, and contour plowing, riparian buffers are one of the most effective tools to accomplish this task.” (SEWRPC, Managing the Waters Edge, April 2010)
CONCLUSIONS

1. Uncertainty and Liability Significant Factors for City
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2. Unit Cost of Phosphorus Reduction Relatively Low with Plant Upgrade
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2. Unit Cost of Phosphorus Reduction Relatively Low with Plant Upgrade
3. Watershed Used as Secondary Solution - Reduce Extent of Plant Upgrade
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2. Unit Cost of Phosphorus Reduction Relatively Low with Plant Upgrade

3. Watershed Used as Secondary Solution-Reduce Extent of Plant Upgrade

4. Watershed Used as Insurance
CONCLUSIONS

1. Uncertainty and Liability Significant Factors for City

2. Unit Cost of Phosphorus Reduction Relatively Low with Plant Upgrade

3. Watershed Used as Secondary Solution-Reduce Extent of Plant Upgrade

4. Watershed Used as Insurance

5. Watershed Used for Public Relations
City Implement Optimization Plan
- Greater Degree of Bio-Phosphorus from Oxidation Basin

Progress Report
Due:
June 30, 2014
- Identify Compliance Strategy