

The City of Tomah's Watershed Adaptive Management Journey

Greg Droessler – Town and Country Engineering



Overview

- ▶ What is Watershed Adaptive Management (AM)?
- ▶ Overview of Tomah's WWTP
- ▶ How the City selected Watershed AM
- ▶ Implementation of Watershed AM
- ▶ Monroe County's role

Watershed Adaptive Management (AM)

Per the Wisconsin DNR, Watershed AM is:

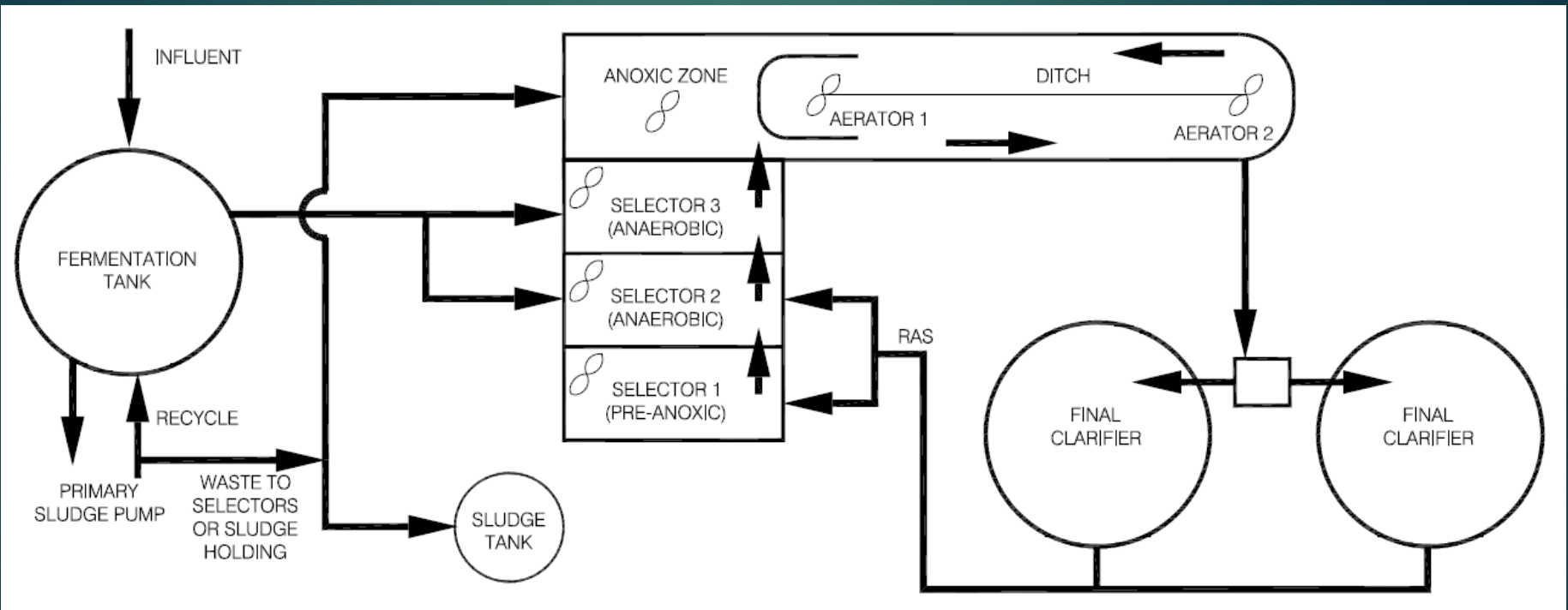
- ▶ A voluntary compliance option for point source facilities to comply with phosphorus limits in NR 217
- ▶ A watershed approach to control phosphorus (P), where a point source facility funds management measures at other point or nonpoint sources
- ▶ An adaptive process to work towards water quality improvements
- ▶ Based on achieving the applicable water quality criteria in the receiving water
- ▶ Often flexible for the permittee — many different approaches could achieve the desired result
- ▶ A strategy built on partnerships between point source facilities and other landowners, municipalities, private and public entities

Tomah, WI WWTP



▶ Design Conditions	<u>Design</u>	<u>Current</u>
▶ Design Flow (MGD)	2.28	1.18
▶ BOD (lbs./day)	4,500	3,423
▶ TSS (lbs./day)	4,750	3,623
▶ TKN (lbs./day)	540	220
▶ Phosphorus (lbs./day)	190	60
▶ Effluent Phosphorus:	755 lbs. / year (0.21 mg/L)	

Tomah, WI WWTP



Tomah Plant Operating Results

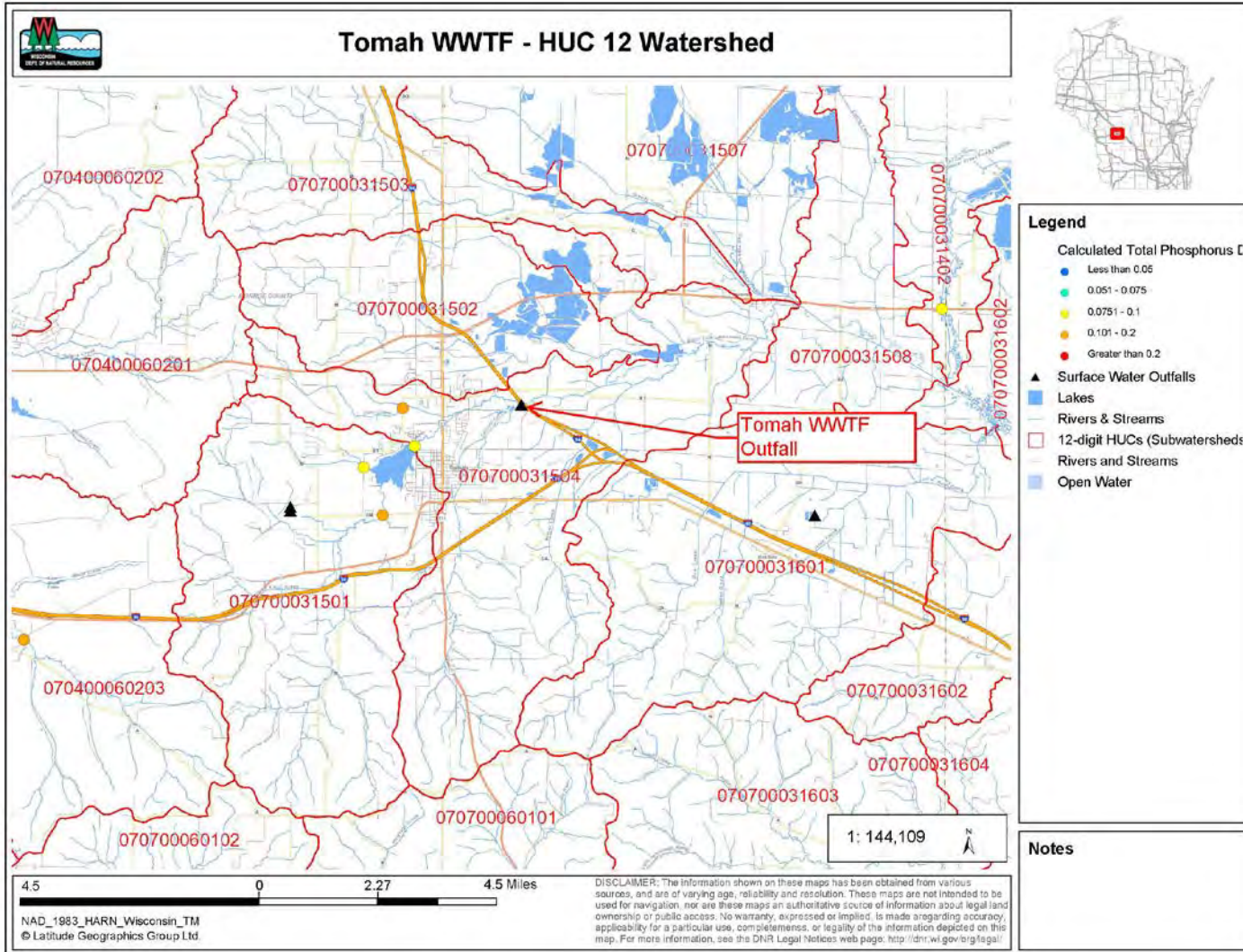
- ▶ Effluent Results
 - ▶ BOD/SS < 5 mg/L
 - ▶ Ammonia < 0.5 mg/L
 - ▶ Phosphorus < 0.3 mg/L
- ▶ Limited chemical usage for "P" removal
- ▶ No control on recycle streaming



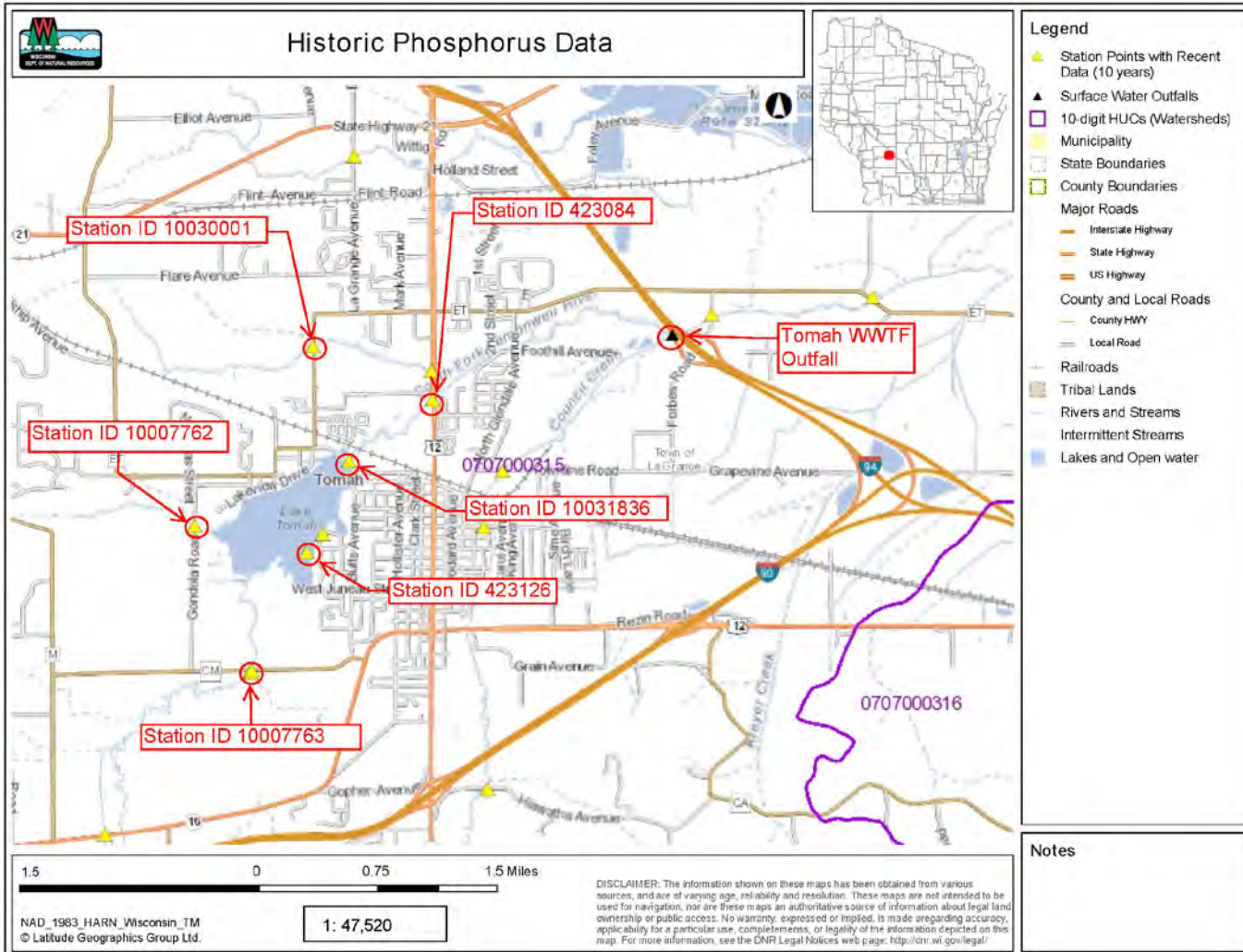
Receiving Stream

- ▶ WWTP discharges to the South Fork of the Lemonweir River, east of the City of Tomah
- ▶ The Lemonweir River is in the Wisconsin River basin; thus we knew that TMDLs were to be anticipated
- ▶ The City had access to 10 years of monitoring data for the river at various locations.
- ▶ Data was collected as part of a Lake Tomah study
 - ▶ Median P = 0.12 mg/L to 0.22 mg/L at various locations monitored

Watershed Map



Phosphorus Sampling



Timeline

- 12/2012 WPDES Permit received
- 11/2013 Year 1 - Optimization Plan
- 11/2014 Year 2 – Optimization Plan update
- 11/2015 Year 3 – Phosphorus Compliance Alternatives Plan
(tentatively selected disk filters)
- 11/2016 Year 4 – Phosphorus Compliance Plan (switched to WAM)
- 1/2017 WAM Plan submitted to the DNR
- 3/2017 DNR Approval of the Plan
- 8/2017 1st Watershed Project began
- 11/2017 2nd Watershed Project began
- 7/2018 3rd Watershed Project identified

Phosphorus Compliance Plan

City of Tomah WWTP
Phosphorus Compliance Alternatives
Summary of Alternatives

Assumptions:

1. Design capacity is being maintained.
2. O&M costs for treatment assume a flow of 1.705 MGD, which is a 10 year linear projection between current (1.14 MGD) and the 20 year design (2.27 MGD). WAM and the Statewide Variance assume linear growth each 5 years.

Rate of Return	4.625%
Loan Interest	3.00%
Loan Term	19
Evaluation Year	2036
Users (only residential)	4,963
Median Household Income (MHI)	\$40,188
Ex Average User Rate (\$/month)	\$34.60
Ex Average User Rate as % MHI	1.03%

	Advanced Treatment				WQT	Non-Point Source		
	SorbX	Disk Filters	Membrane Filtration	Cont. BW Sand Filter		WAM 0-5, WQT 6 - 20	WAM 0-10, WQT 11 - 20	WAM 0-15, WQT 16 - 20
Capital Cost	\$325,600	\$3,303,868	\$6,056,915	\$8,022,257	\$731,500	\$758,240	\$1,128,960	\$1,559,040
P&I Payment	\$22,731	\$230,656	\$422,996	\$560,065	\$51,069	\$52,936	\$78,817	\$108,843
Average O&M Costs	\$688,000	\$121,458	\$154,666	\$143,784	\$0	\$0	\$0	\$0
Annual Replacement Costs	\$4,219	\$55,121	\$120,651	\$98,025	\$0	\$0	\$0	\$0
Annual NPS Cost	\$0	\$0	\$0	\$0	\$169,920	\$245,108	\$338,605	\$392,926
Annual County Pmt	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Present Worth Cost	\$7,706,622	\$4,888,909	\$8,451,788	\$10,132,835	\$2,654,525	\$3,098,586	\$4,724,829	\$5,419,826
Variation	190.32%	84.17%	218.39%	281.72%	0.00%	16.73%	77.99%	104.17%
Average Annual Cost	\$614,950	\$407,235	\$698,313	\$801,873	\$220,989	\$298,044	\$417,422	\$501,768
Average Annual Cost per household	\$123.91	\$82.05	\$140.70	\$161.57	\$44.53	\$60.05	\$84.11	\$101.10
Average Monthly Cost	\$10.33	\$6.84	\$11.73	\$13.46	\$3.71	\$5.00	\$7.01	\$8.43
% MHI	0.31%	0.20%	0.35%	0.40%	0.11%	0.15%	0.21%	0.25%
Cost Per Pound of Phosphorus								
Permit Term 1 (Year 0-5)						\$193.64	\$193.64	\$193.64
Permit Term 2 (Year 6-10)	\$338.52	\$224.18	\$384.41	\$441.42	\$121.65	\$65.65	\$217.60	\$217.60
Permit Term 3 (Year 11-15)							\$84.15	\$221.54
Permit Term 4 (Year 16-20)								\$100.33

Notes:

1. The capital cost estimates are based on 2015 prices.
2. The City's Clean Water Fund Loan #1 with an annual payment of \$826,256 is paid off in 2017.
3. The SorbX average O&M costs use a conservative dosing value based on the 6.1 ppm influent phosphorus levels at the WWTF.
4. The WQT alternative includes 100% watershed based BMP costs. These costs are highly variable by region.

Phosphorus Compliance Plan

- ▶ Initial Findings:
 - ▶ SorbX – Unknown effectiveness at WWTPs with bio-P
 - ▶ Filters and Membranes – high capital and O&M costs
 - ▶ WAM and WQT – City would have to work with people outside the City
 - ▶ WQT was projected to have the lowest rate impact for the City, but the City had a very narrow window to get the necessary trades in place

City was leaning towards adding disk filters at the WWTP and just being done with it....

Phosphorus Compliance Plan

- ▶ Challenges:
 - ▶ Implement a plan to “buy time” to keep a 0.075 mg/L limit out of the City’s permit in hopes that TMDLs would be a more lenient limit (0.20 - 0.25 mg/L)
 - ▶ Needed to convince the City to try WAM
 - ▶ Spend \$\$ outside the City limits
 - ▶ Spend \$\$ on a rather abstract idea vs. a brick and mortar addition at the WWTP
 - ▶ Potential impact of WQT with TMDLs

WAM Implementation

- ▶ Meeting #1 - with Monroe County Land Conservation Department (LCD)
 - ▶ Discussed big picture options
 - ▶ Clean Lake Tomah forebay
 - ▶ Streambank restoration work within the City
 - ▶ Potential barnyard projects
 - ▶ Potential nutrient management programs
 - ▶ **Most Importantly: We asked the LCD for a FARM PRIORITY LIST**

WAM Implementation

- ▶ Meeting #2: City and Consultant
 - ▶ Met to discuss the potential project locations identified by the County LCD
 - ▶ Went for a drive to see for ourselves what these farms look like
 - ▶ Confirmed that the farms were viable projects

Land Conservation Department's Role in the Tomah Adaptive Management Project



LCD (Broker) Role:

- ▶ ID Non-Point Sources
- ▶ Landowner Contacts
- ▶ Soil Sampling/Erosion Calculations
- ▶ Design
- ▶ Permits
- ▶ Construction & Certification
- ▶ Easements & Maintenance Agreements

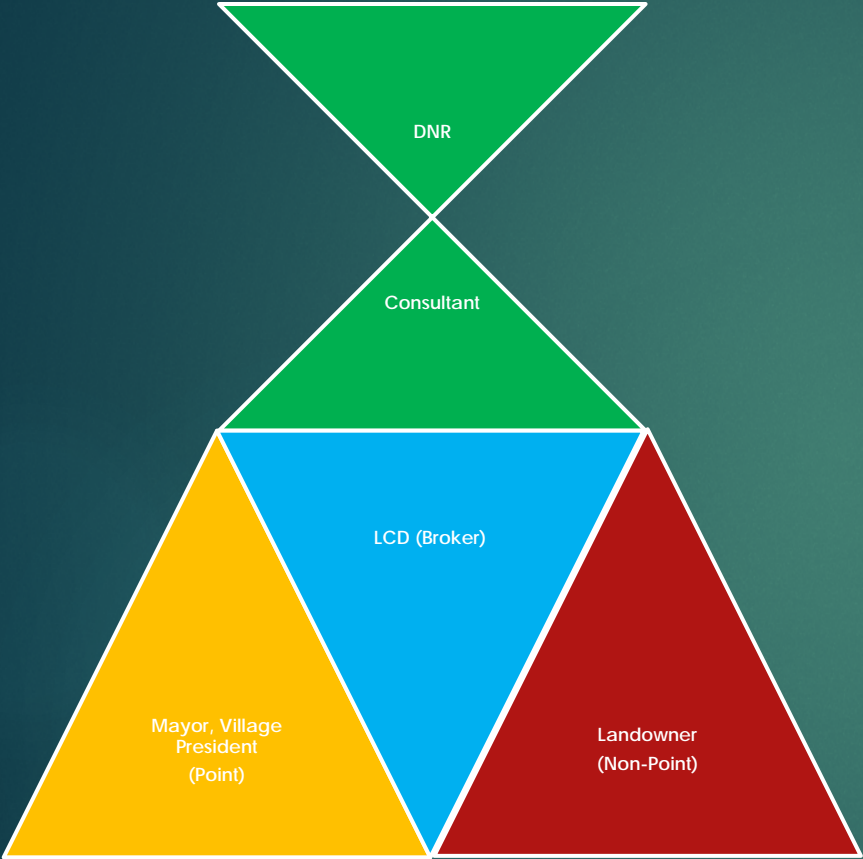


Farmer Flood



Conservation Staff?

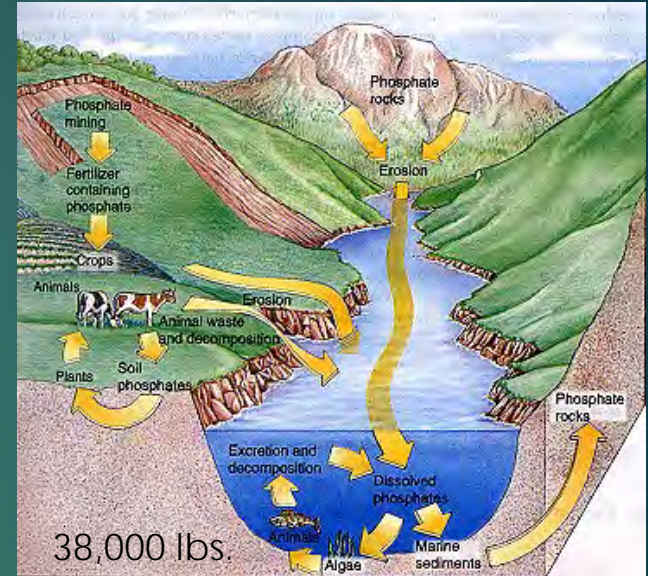
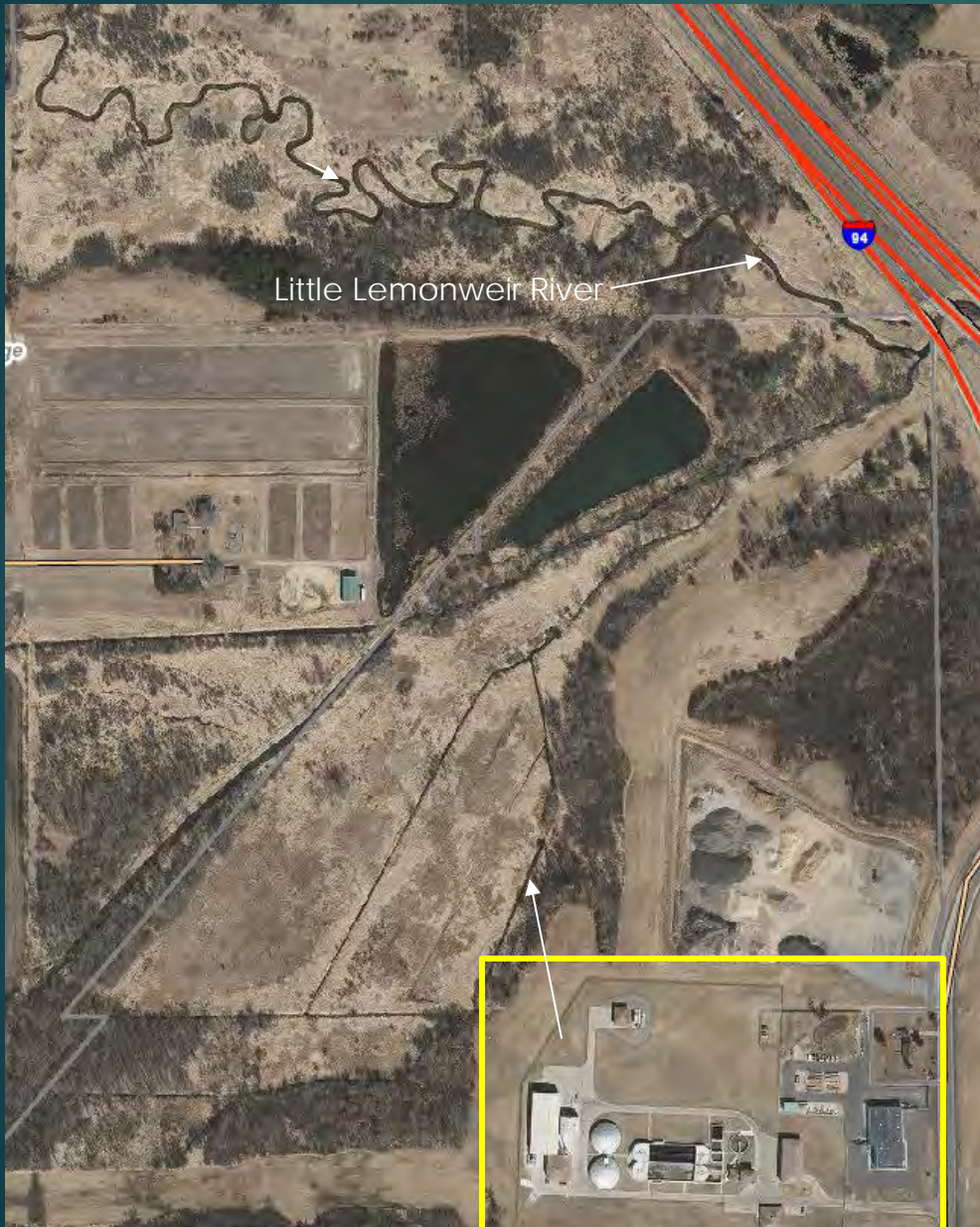
Relationships/Expectations



2016 Trial – Streambank Protection in Tomah

Connecting Point to Non-Point

3.5-8 million vs. 1/2-1 million



20% Point Source = 2%
80% Non-point = 98%

Tomah WTF Land use – (24,000 ac.)

- 55% Farmland
- 23% Forest
- 22% Urban/Developed

Meeting #1 -Target Non-Point Sources for Phosphorous



Sediment Basin



No Soft Practices



Nutrient Mgt.



Cover Crops

Focus on Hard Practices



Farmer "A" (Target)

- 1.) Feedlot/Barnyard – 200 Head
- 2.) Streambank Stabilization
- 3.) Stream Buffers - CREP



- Cattle: A reduction in the total number of cattle from 200 to 20.
- Barnyard: The cattle will be contained on the concrete lot area (20,108 sq. ft.) instead of in the earthen area along the river. This practice will allow a buffer to be created along the river.
- Existing Buffer: A 150' wide buffer strip is proposed along the river along the entire pasture. For this model of the proposed design conditions, the buffer strip is shown to be an average of 260' long and 160' wide. The proposed buffer is 41,600 sq. ft.
- Buffer "C" value: The proposed buffer will be a grassy meadow at an approximate slope of 3% from the barnyard to the river. The grassy meadow C-value is 0.59 per the model's accompanying table.

The BARNY model calculates 3.1 pounds of phosphorus a year coming off the barnyard under these revised conditions. The City would look to claim a total reduction of phosphorus to the creek of 293 pounds for this barnyard project.

Figure 1 [redacted] Farm – Barnyard Buffer



Address the barnyard & stream corridor





2.) Streambank Protection – 3:1



Meet NRCS Standards



DNR Approved?





Habitat - Credit 2:1





Farmer "A"
Phosphorous Credit?

Streambank Protection – 2,655'

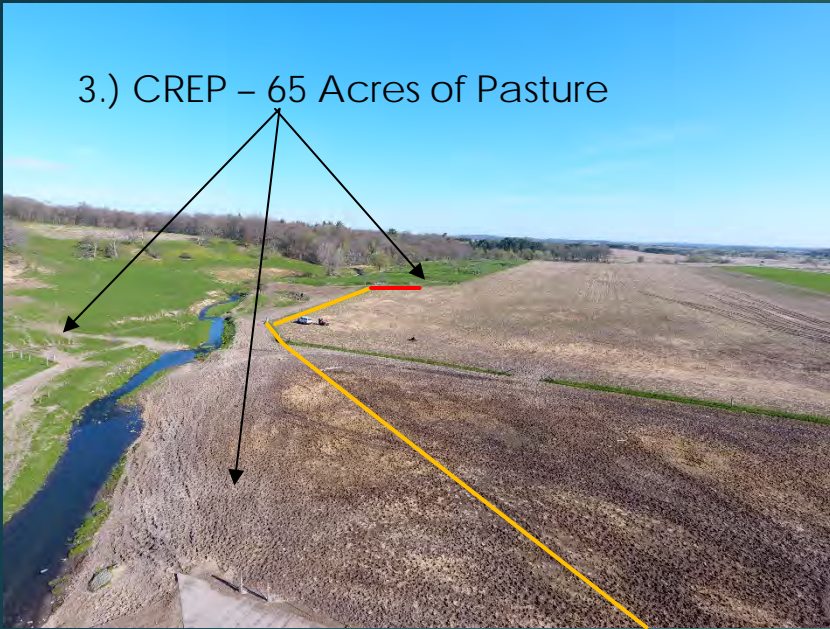


Streambank Erosion - Using estimated soil loss of 12tons/100LF of stream-bank with an average phosphorous content of 0.04%. The calculated phosphorous credit is 8.6 lbs. per 100LF.

Lateral Recession
Rate ___ft./yr.?



3.) CREP – 65 Acres of Pasture



CREP Requirements:

- ▶ Permanent grass buffer strip a min. of 30' wide along the stream.
- ▶ Soil testing required to quantify the reductions (SNAP+)
- ▶ Pays \$35 / acre / year for pasture and \$160 / acre / year for cropland for farmer "A"
 - ▶ Determined soil rental rate for cropland at \$160 / acre would be required to secure the 65+ acres of pasture
 - ▶ City agreed to pay the difference of \$125 / acre / year to incentivize the project
 - ▶ Signing Incentive Payment (federal / state / City)
 - ▶ Cost Share Payment (federal / state)

The project cost to the City < \$20,000 / year over 15 years

Operation & Maintenance Easement – (Perpetual)



Mowing



Farmer "B" - Streambank



- 120' of streambank work resulted in about 10 lbs. / year phosphorus reduction
- City's Cost: \$2,500



▶ Total Phosphorus Credits:

- ▶ Barnyard Project: 293 lbs.
- ▶ Streambank Project #1: 250 lbs.
- ▶ Streambank Project #2: 208 lbs. (est.)
- ▶ Streambank Project – FB 10
- ▶ Pasture Change to Permanent Grass: TBD (65 lbs.?)



- ▶ *Total Credits = 761 lbs. with a Trade Potential = 380 lbs. of P*
- ▶ *Cost \$250/lb.*



Conclusion

Municipality:

- Reach out to the LCD early in the process to identify “low hanging fruit”.
- The LCD staff will often know the farmers well and may be willing to initiate the conversation
- City / County should work together to incentivize projects so as to maximize the return on investment
- Need to identify program \$\$ early in the process to offset the project costs
- No project is too big or too small to consider
- 380#s of credit (trade value) is about half the 755#s the City currently discharges



Land Conservation Department:

- Meets our soil conservation and water quality objectives (Land & Water Plan)
- Another revenue source to address non-point source pollution.
- Relationship bridge between county and point source managers.
- Sustainable projects with a perpetual easement.

Questions?

Greg Droessler – Town and Country Engineering

(608) 273-3350

gdroessler@tcengineers.net