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# A Real Life Guide to Implementing Water Quality Trading

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# Outline of Today's Presentation

- Water Quality Trading (WQT) Overview
  - Background
  - WQT process
  - WQT opportunities/challenges
- Case studies
  - Agricultural best management practices
  - Detention ponds
  - Streambank restoration
- Discussion

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# New Phosphorus Regulations Became Effective December 1, 2010

- WWTPs have compliance schedules for stricter P limits
- Compliance options must be evaluated and included in annual reports to the WDNR
  - Treating to new limits often requires tertiary treatment (high capital cost)
  - Watershed options such as water quality trading
  - Multi-discharger variance

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# Water Quality Trading (WQT) May Provide a Long Term Compliance Option

- WWTP identifies projects or partners in the watershed that are willing to trade – work with county, ag, other municipalities, etc.
- To successfully implement WQT:
  - Identify a sufficient number of phosphorus credits in WQT plan
    - Modeling, calculate trade ratios, etc.
  - WWTP executes contracts and informs WDNR
  - WWTP and partners implement best management practices (BMPs) -- purchase easements, land, etc. if needed
  - WWTP/partners need to inspect and verify BMPs

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# WQT Can Include Urban Nonpoint Source Reduction

- Urban stormwater BMPs may generate phosphorus credits
  - Detention basins
  - Street sweeping
  - Leaf collection
  - Grass swales
  - Green roofs
- Municipalities may "trade with themselves"
- Cannot take credit for practices already installed

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# Water Quality Trading (WQT) Trade Ratio Calculations

| | |
|---|---|
| Delivery | •Accounts for the distance between the credit generator and the credit user, and the impact that this distance can have on fate and transport of the pollutant. |
| Downstream | •Accounts for local water quality impacts if the credit user is upstream of the credit generator. |
| Equivalency | •Accounts for situations where trading partners discharge different forms of the traded pollutant. (Example: Total Nitrogen vs. Nitrate-Nitrogen). |
| Uncertainty | •Accounts for modeling inaccuracies used to quantify load reductions. For trades with nonpoint source credit generators only (see Appendix A). |
| Habitat Adjustment | •Used to capture ancillary benefits from select practices that benefit habitat in addition to capturing the pollutant of concern. Only applies to wetland creation, wetland restoration, and stream habitat, improvement and management practices. |

Trade ratios are designed to account for the uncertainties specified in Table 2 using the equation below:

Trade Ratio = Delivery + Downstream + Equivalency + Uncertainty – Habitat Adjustment : 1

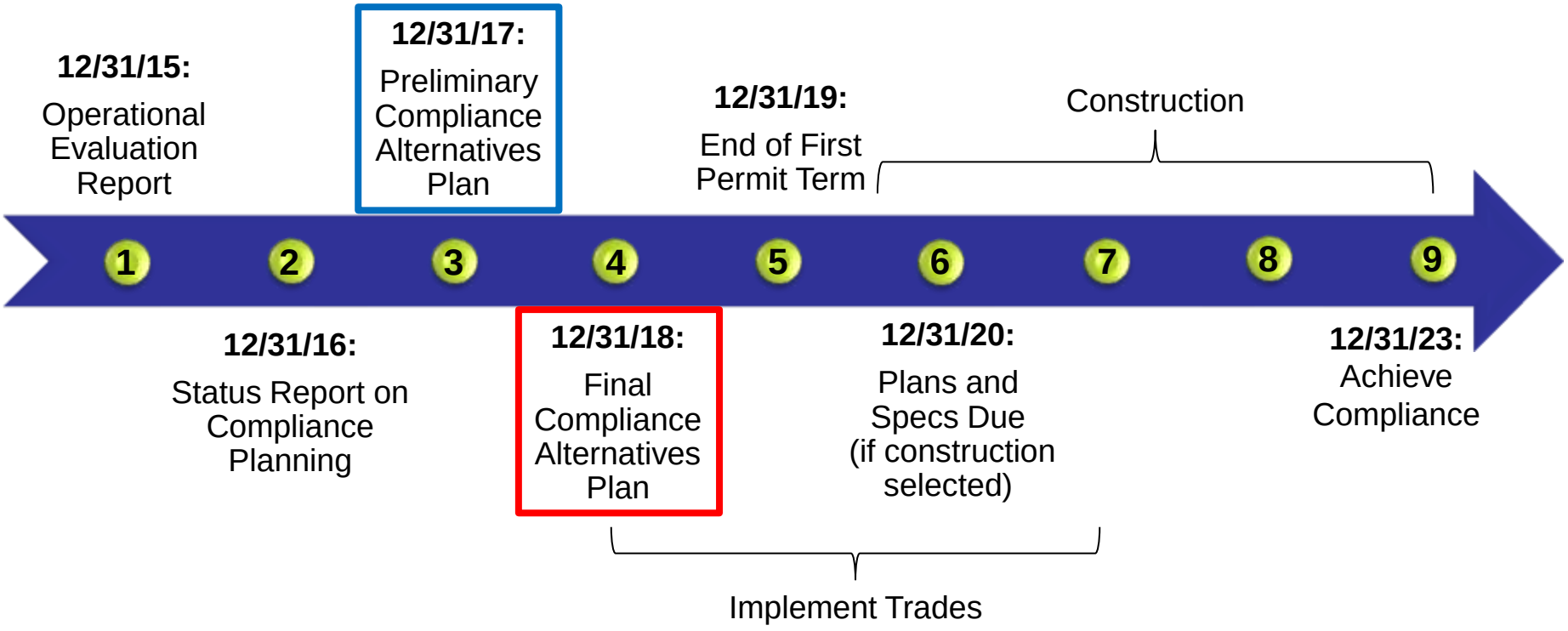
# Water Quality Trading (WQT) Best Management Practices

- Examples from WDNR guidance – many options available

| Management Practice | Uncertainty Factor[1] | Applicable Technical Standard | Method for Calculating Pollutant Load Reductions |
|---|---|---|---|
| Nutrient Management and supporting practices: | 2 (3) | NRCS 590 | SNAP-Plus or equivalent model results compared to baseline |
| Tillage Options | | | |
| Mulch Till | 2 (3) | NRCS 345 | |
| No Till | 2 (3) | NRCS 329 | |
| Riparian Filter Strip (edge of field) | 2 (3) | NRCS 393 | |
| Grassed Waterway | See Notes | NRCS 412 | |
| Cover Crop | 2 (3) | NRCS 340 | |
| Other practices simulated in SNAP-Plus | 2 (3) | | |

# WPDES Permits Set Timeline for Various Phosphorus Compliance Steps

- Example permit timeline (varies depending on WWTP)

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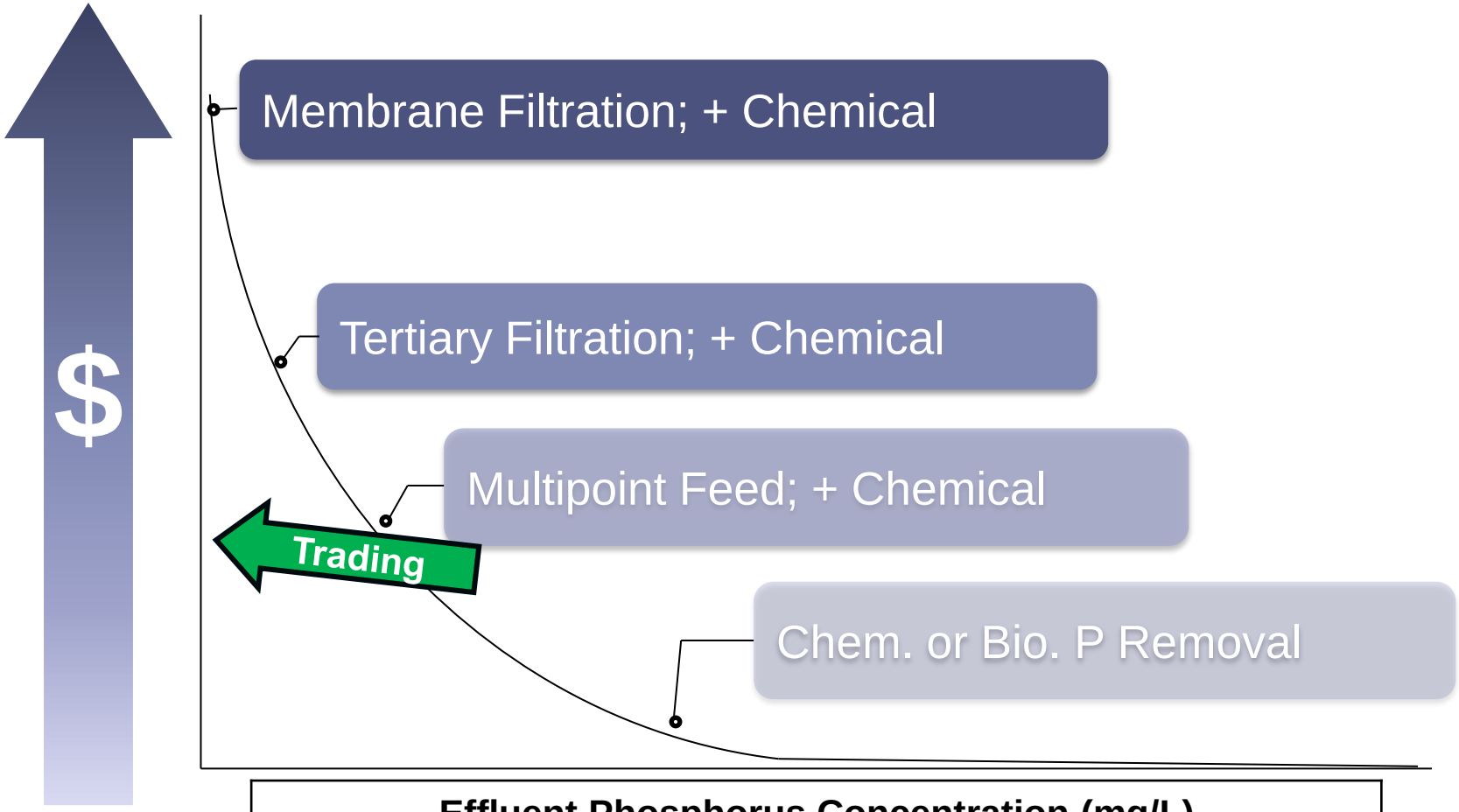
# Combination of Phosphorus Compliance Options May Ultimately Provide the Best Value




| Effluent Phosphorus Concentration (mg/L) | | | |
|---|---|---|---|
| 0.05 | 0.25 | 0.5 | 1.0 |

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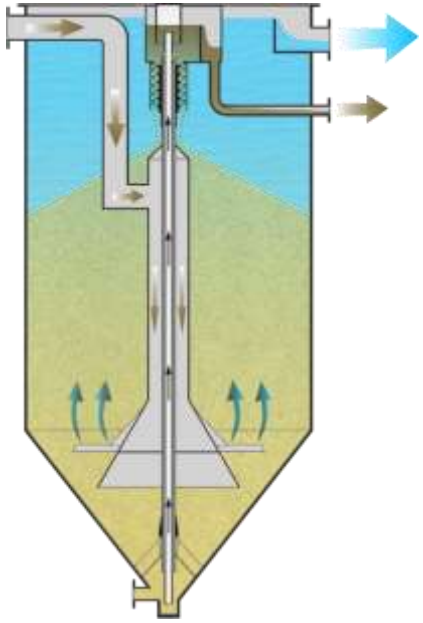
# Upgrading WWTPs to Meet Phosphorus Limits is a Costly Compliance Option

| | Capital Cost | 20-Year Total Present Worth |
|---|---|---|
| Phosphorus Treatment Costs Example (0.2 mgd facility) | $3.8 million | $4.9 million |

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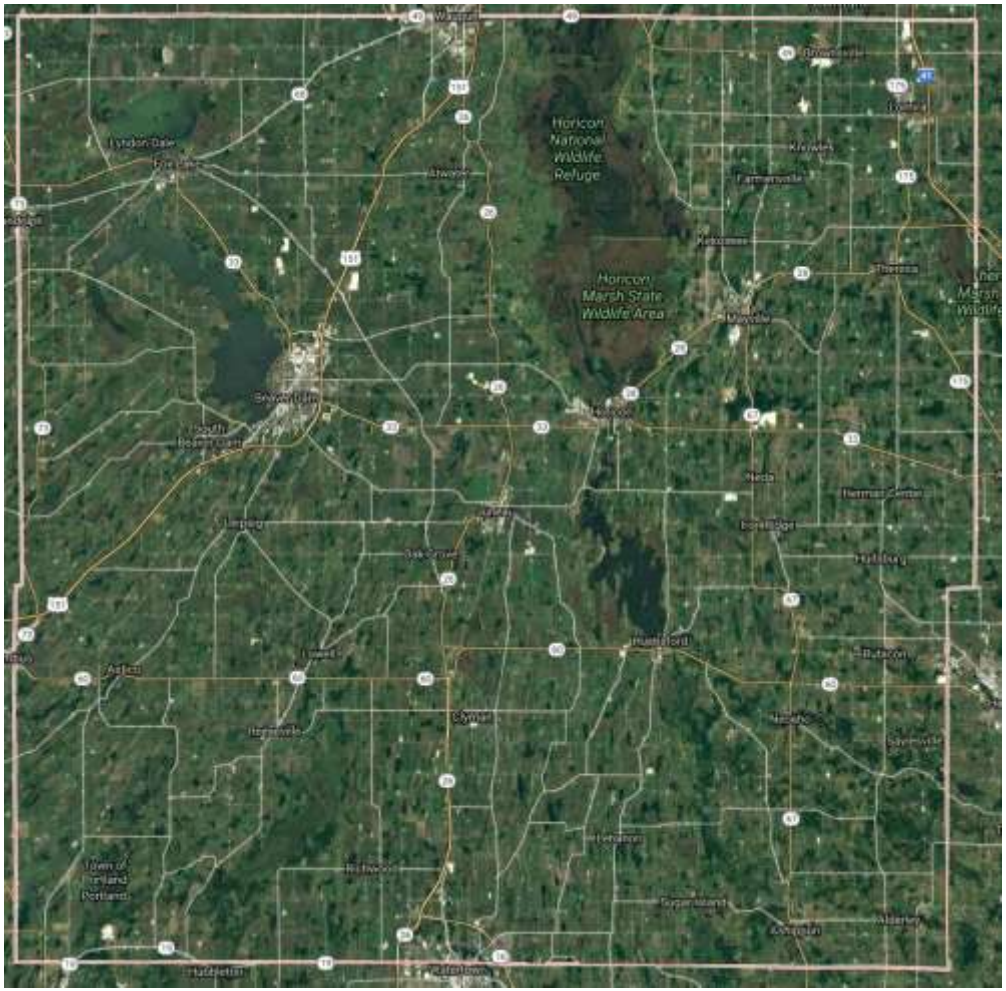
# Water Quality Trading (WQT) May Be Challenging and Take Time to Implement

- May require 1,000's of acres necessary for compliance
- Forest, wetland, and pasture (minimal to no value for WQT)
- Minimal urban acreage = reduced opportunity for stormwater credits
- Can be difficult to identify trading partners
- Requires contracts
- Plan must be approved by WDNR (modeling, soil sampling, nutrient management plans, etc…)

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# Brooklyn Overview

- Design average flow 0.2 mgd, currently 0.065 mgd
- Not eligible for the multi-discharger variance
- Cost of upgrades ~$4 million to meet 0.075 mg/L P limit
- Uncertainty with adaptive management

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# Brooklyn WWTF – The Search for Trades…

- Best opportunities
  - Steep slopes
  - Funnel points
  - Corn

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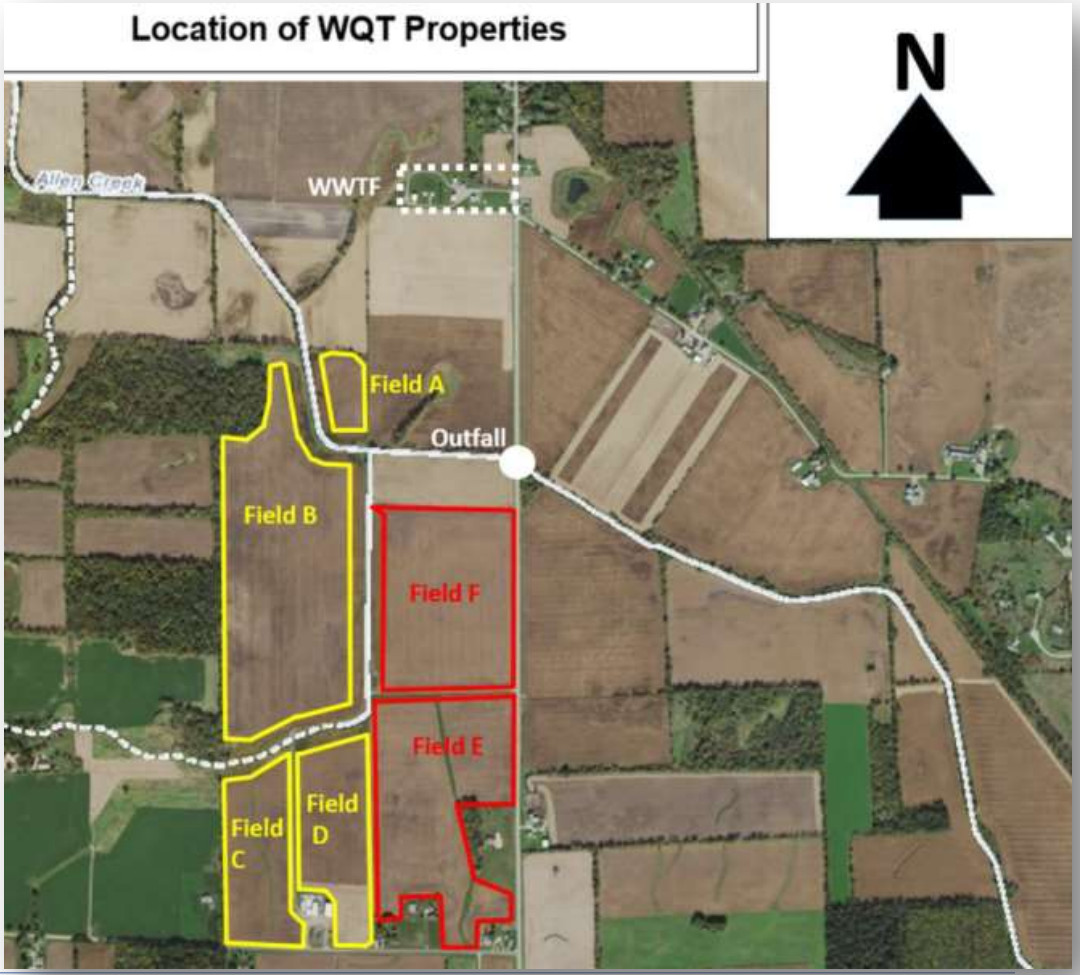
# Brooklyn Trade Overview

- Identified willing two farmers with land upstream from outfall
- Filter strips used to reduce phosphorus runoff to Allen Creek
- Modeled P reduction
- Negotiated payment
- Executed contract
- Developed WQT plan
  - Soil sampling
  - Nutrient Management Plans
  - Model NR 151 requirements
  - Calculate trade ratios

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# Brooklyn Trade Cost Savings Versus Upgrades

- Village will construct CPR/BPR improvements in 2019

| | Capital Cost | Total Present Worth |
|---|---|---|
| CPR/BPR with WQT | $600,000 | $870,000 |
| CPR with Filtration | $3,800,000 | $4,900,000 |

| | **2019** | **2020** | **2021** | **2022** | **2023** |
|---|---|---|---|---|---|
| Property 1 | Soybean | Corn | Soybean | Corn | Soybean |
| Property 2 | Corn | Soybean | Corn | Soybean | Corn |
| Acres Modeled | 210 | 210 | 210 | 210 | 210 |
| Baseline Load (lb/acre) | 4.2 | 7.0 | 5.8 | 7.1 | 5.9 |
| Predicted Load (lb/acre) | 1.4 | 2.1 | 1.9 | 2.2 | 1.9 |
| Reduction (lb/acre) | 2.8 | 4.9 | 3.9 | 4.9 | 4.0 |
| Reduction (lb/yr) | 586 | 1031 | 827 | 1026 | 835 |
| Trade Ratio | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| **Credits Generated** | **391** | **687** | **551** | **684** | **557** |
| WQBEL (mg/L) | 0.075 | 0.075 | 0.075 | 0.075 | 0.075 |
| Design Average Flow (mgd) | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| **Effluent P Target (mg/L)** | **0.72** | **1.20** | **0.98** | **1.20** | **0.99** |
| Current Average Flow (mgd) | 0.065 | 0.065 | 0.065 | 0.065 | 0.065 |
| **Effluent P Target (mg/L)** | **2.05** | **3.55** | **2.86** | **3.53** | **2.89** |

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# Fontana-Walworth Water Pollution Control Facilities Overview

- Design average flow of 1.77 mgd
- Future effluent limit of 0.075 mg/L
- Capital cost to meet new limit = $7.1 million

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# Fontana-Walworth Trade Overview

- Remove phosphorus from agricultural runoff using wet detention ponds with chemical phosphorus removal


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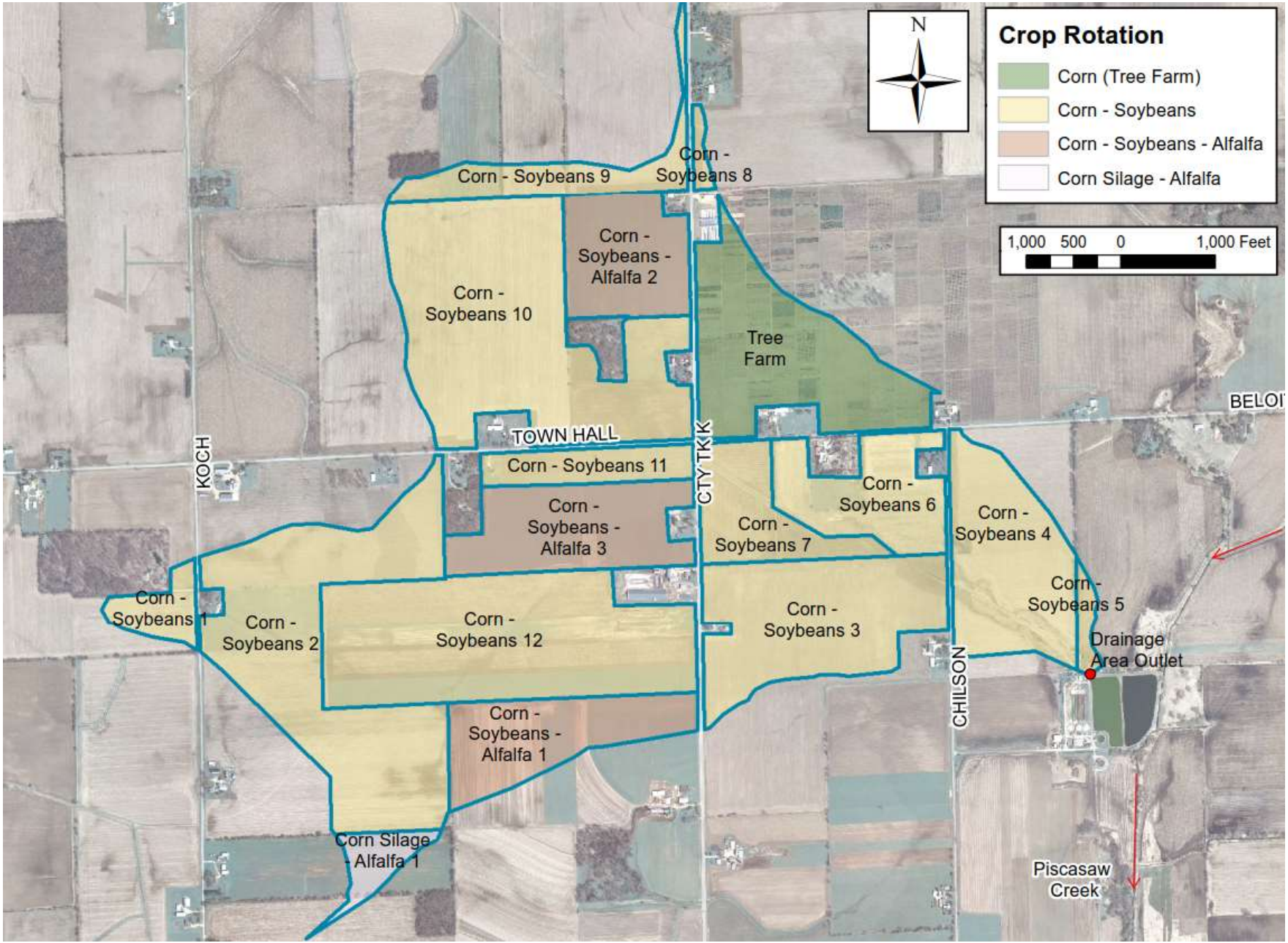
# Fontana-Walworth North Drainage Basin



# Fontana-Walworth Wet Detention Basin Improvements

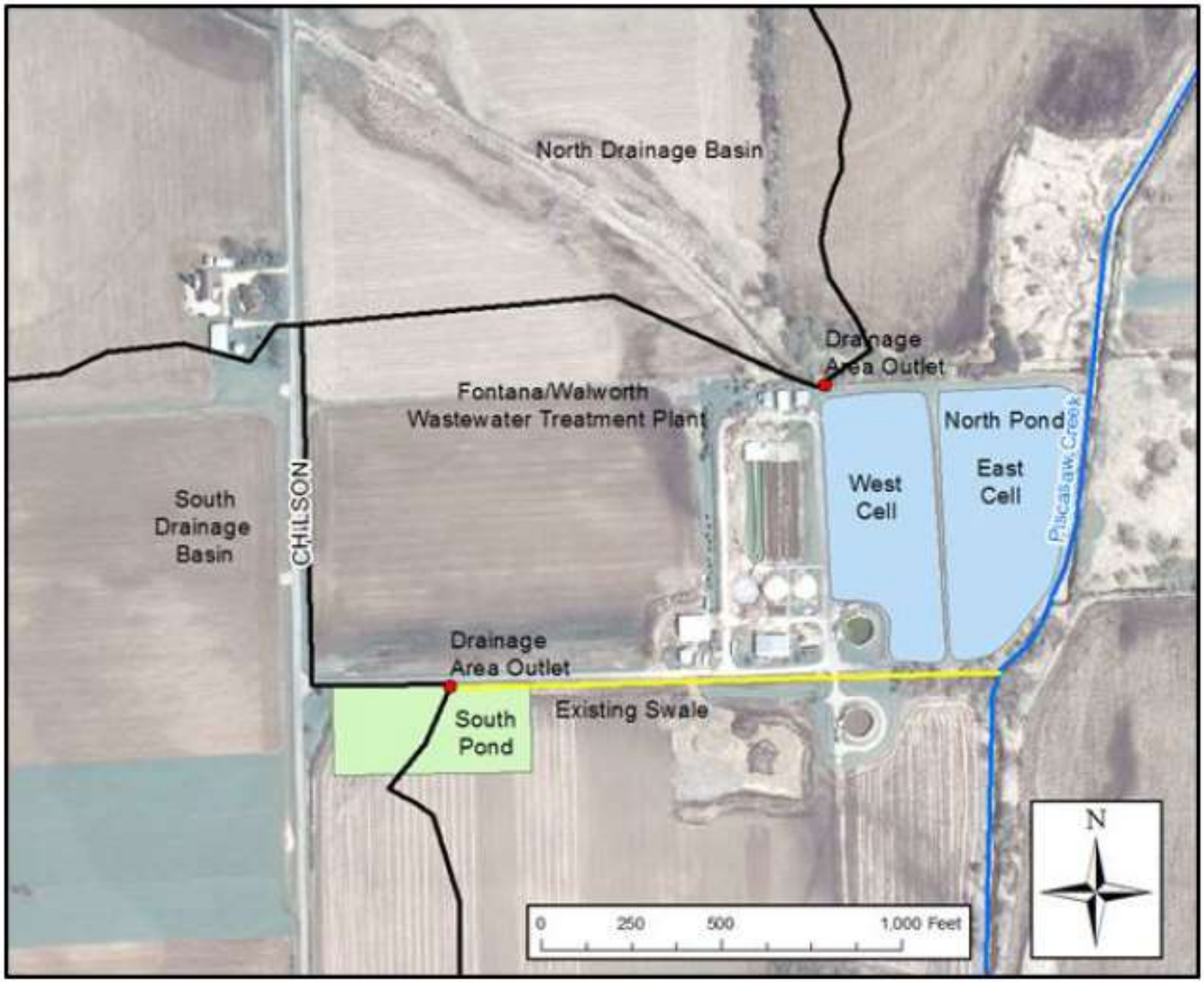



Figure 5 Location Map

# Fond du Lac, WI Water Pollution Control Plant

- 9.8 mgd design average flow
- Discharge to Lake Winnebago
- Very stringent 0.04 mg/L P limit

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# Water Quality Trading Preliminary Costs

| BMP | Average TP Removed (lb/acre/yr) | Total TP Removed in Watershed (lb/yr)[1] | 20-Year Present Worth Cost[2] | Present Worth Cost per Total Pounds TP Removed ($/lb)[3] |
|---|---|---|---|---|
| **Buffer Strips** | 2 | 1,150 | $1,100,000 | $48 |
| **Cover Crops** | 0.5 | 5,920 | $9,900,000 | $84 |
| **Cropping, Tillage, and In-Field Conservation Practices** | 0.83 | 9,820 | $6,200,000 | $32 |
| **Total** | --- | 16,890 | $17,200,000 | $51 |
| **Total with Additional CPR at WPCP** | | | $18,000,000 | |

*Note: Trade ratios applied to Total TP Removed in Watershed (lb/yr). Weighted Trade Ratio = 1.5:1*

[1]TP removed after full implementation of this practice (implementation ramps up over 3 years).

[2]Includes installation costs, replacement/renewal costs, and annual maintenance costs. 2015 dollars, discount rate = 4.625%.

[3]PW $/lb is based on the total pounds removed over 20 years.

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- City is using MDV at an estimated total present worth of $8 million

# City of Horicon Water Quality Trading (WQT) Evaluation – Streambank Restoration

- Potential for 600 ft of streambank restoration
- Results in annual phosphorus reduction of 48 lb/yr to 90 lb/yr (depends on soil %P)
  - A 3:1 trade ratio is applied to calculate phosphorus credits available for WWTP (accounts for uncertainty)
  - Approximate credits = 16 lb/yr to 30 lb/yr
  - 660 lb/yr must be addressed to meet the TMDL based limits (without filtration upgrades)
  - 64 lb/yr must be addressed (assuming cloth disk filtration or similar technology)
- City will likely apply for MDV and implement trades over time


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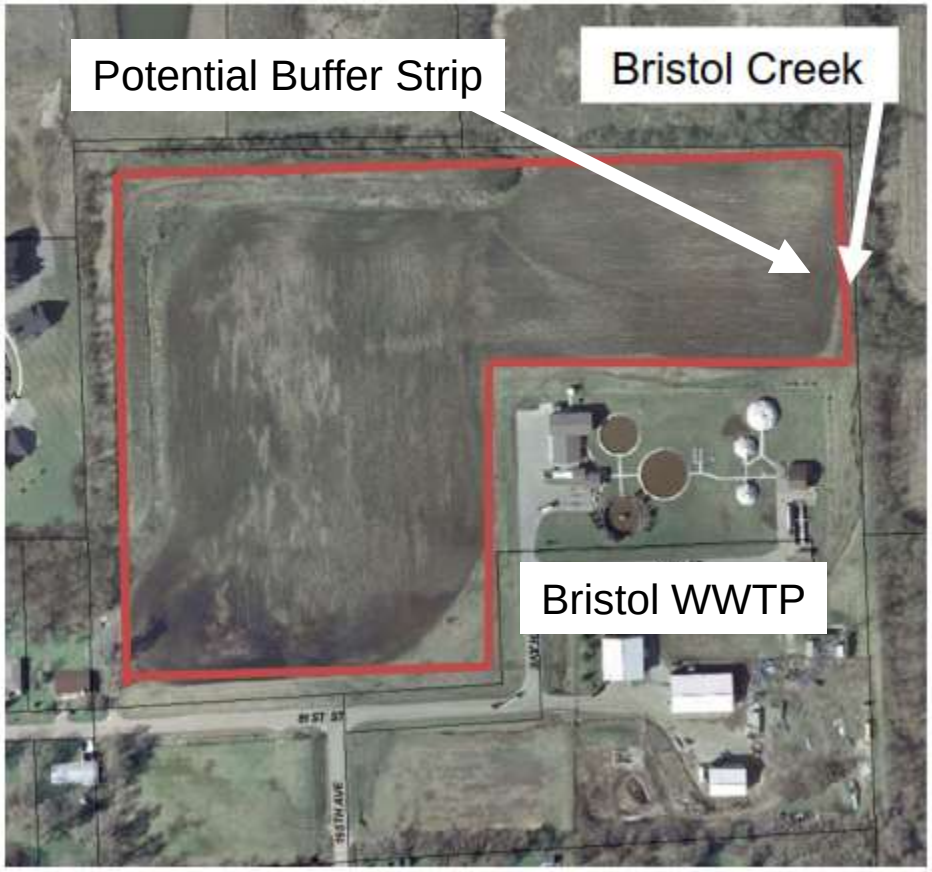
# Evaluating Village Owned Land at Bristol WWTP

- Village owns 15 acres adjacent to WWTP
- Installing buffer strips could result in 63 lb/year P credits
- Village requires 770 lb/yr for compliance at design flow
- Village will likely apply for MDV and implement trades such as this over time

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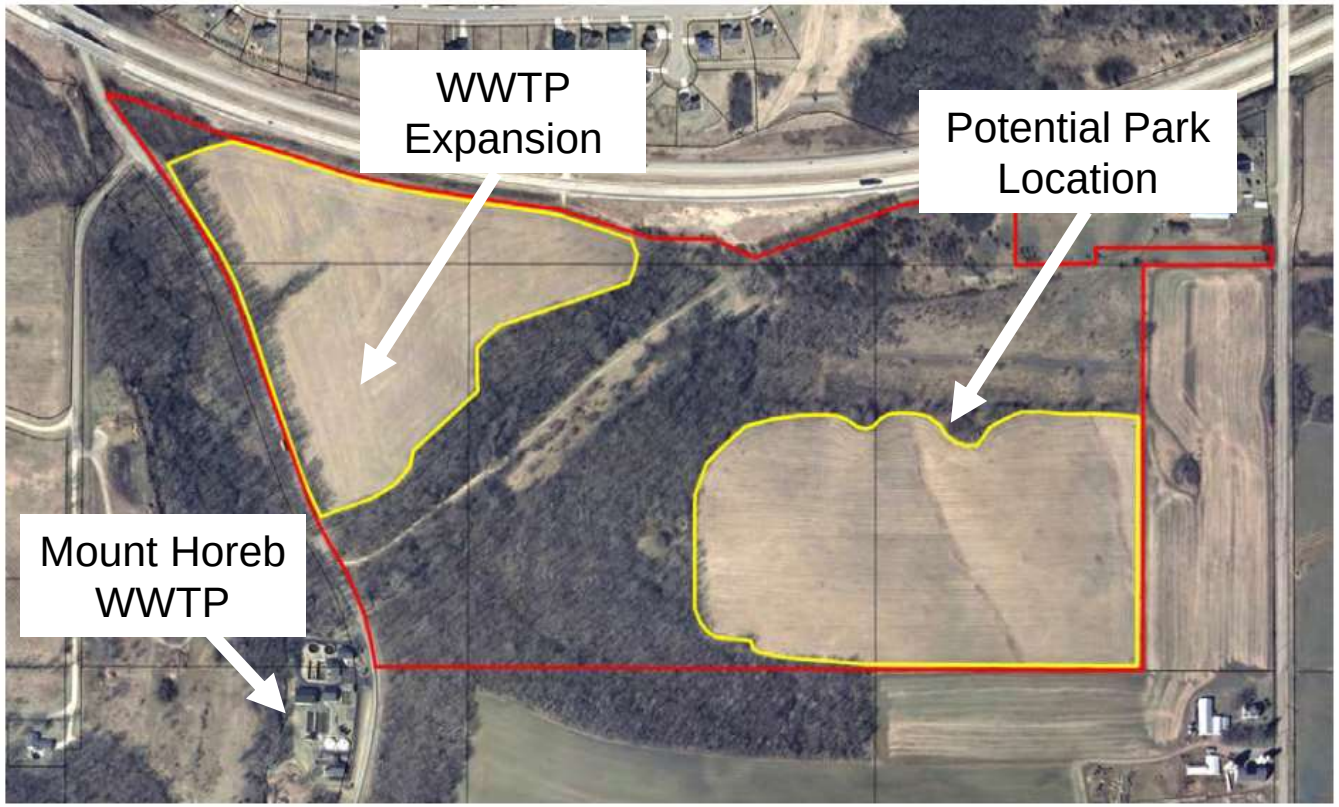
# Creative Use of Village Owned Land at Mount Horeb

- Converting Village owned cropland to perennial vegetation may result in up to 211 lb/yr of P credits

- Village will likely use trading in combination with cloth disk filters

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# WQT Conclusions

- WQT can be a low cost option compared to WWTP upgrades
- Compliance will likely require multiple trades
- Trades can be developed over time as part of the MDV
- Focus on trades with the greatest potential
- Work with resources such as County agencies
- Think “outside the box” and be persistent

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# Questions, Answers, Discussion

Thank you!

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