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Muddy River Edge of Stream Phosphorus Capture

June 27, 2019

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Supervised by:

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Project Team



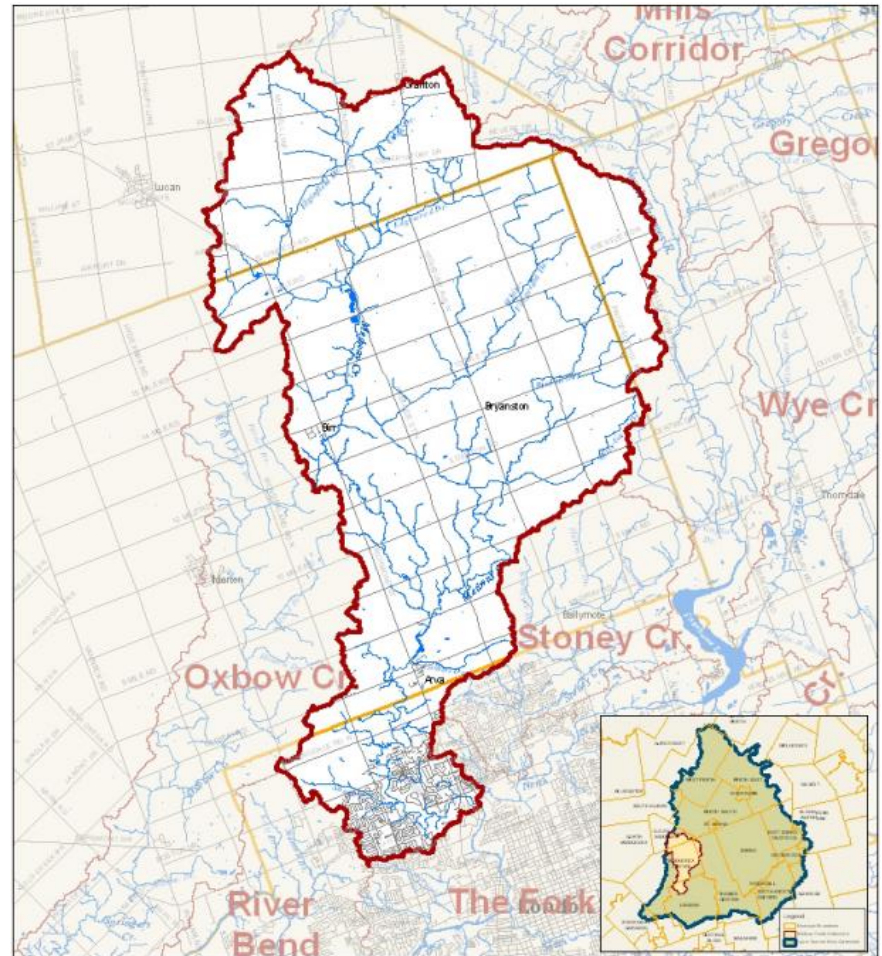
June 27, 2019

Today's Agenda

- Study Area
- Research Objectives
- Sampling Plan
- Monitored Parameters

Study Site (Monitoring Area)

- The Medway Creek watershed is in the Thames River watershed, which is part of the Lake Erie watershed.
- Water from Medway Creek enters the North Thames River in London and takes 4-10 days to flow through London and Chatham, and into Lake St. Clair.
- About 2 weeks later, it reaches Lake Erie via the Detroit River.
- More than 80% of the land is used for agriculture.



Map 1
Medway Creek Watershed

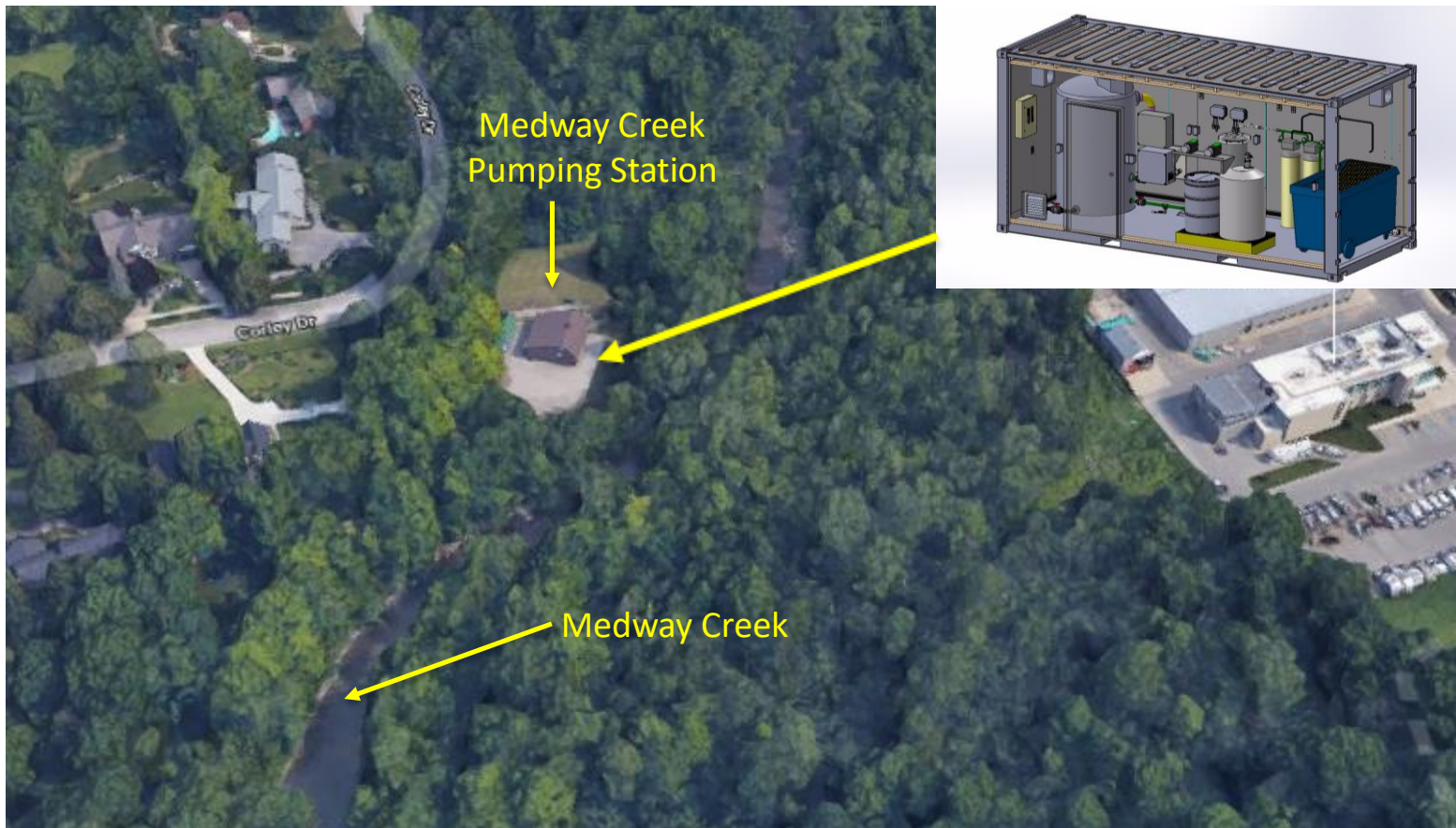
3,000 1,500 0 3,000 m

Legend

- Medway Creek Watershed
- Municipal Boundary
- Subwatershed Boundaries

<https://thamesriver.on.ca/wp-content/uploads//MedwayCreek/MedwayCBES-report.pdf>

Study Site



Google Maps, 2019

Study Site



Google Maps, 2019

Research Questions to Answer

- Impact of flow rate, electrical current, voltage, turbidity, water conductivity, initial pH on treated water pH, P removal?
- Lava rock: impact of type and particle size on P removal, pH? Dissolution rate, metals in treated water?
- Ti electrodes: durability?
- Minimum effective polymer dose?
- Silt sock solids: dewaterability, fertilizer value?
- Operating cost: electricity, polymer, lava rock, electrodes

Research Objectives

- As no unique set of configurations exists, many parameters will be tested and optimized including flow rate, electrical current, voltage, conductivity, and phosphorus removal efficiency.
- Also, different types of lava rocks will be used, and the impact of composition and particle size on phosphorus removal will be studied.
- Moreover, recovering phosphorus and estimating its fertilizer value will be examined.

Time Sequence Plan

Task	2019				2020				2021	
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
Approval to Proceed	▶									
Amprey Design, Build, Commissioning	▶	▶								
Amprey Transport & Installation		▶								
Phase 2 Operations & Monitoring			▶	▶	▶	▶				
Phase 3 Operations & Monitoring							▶	▶	▶	▶

Proposed Sampling Plan

- Number of Sampling Locations: 4
 1. Medway Creek (Influent)
 2. Amprey Cell Effluent
 3. Pilot effluent (The final effluent)
 4. Silt Sock Solids and Filtrates

- Time Intervals: Weekly, except during flood events, when samples will be collected every two hours.

Amprey operations monitoring plan

Parameter	Sample Location	Frequency	Responsible Party
System Operations:			
Water Flow Rate	Influent	Continuous	Muddy River
Water Temperature	Amprey Cell Effluent	“	Muddy River
pH	Feed tank, Effluent	“	Muddy River
Electric Current	Meter	~ Daily	Western U
Voltage	“	“	Western U
Polymer Flow Rate	“	“	Muddy River

Water quality monitoring plan

Parameter	Sample Location	Frequency	Responsible Party
pH, ORP, DO	Influent, Effluent	grab sample ea week	Western U
Water Conductivity	“	“	Western U
Total P	“	“	Western U
Soluble P	“	“	Western U
Total Suspended Solids (TSS)	“	“	Western U
Water Turbidity	“	“	Western U
Alkalinity	“	“	Western U
Ammonia Nitrogen	“	grab sample ea 2 weeks	Western U
Total TKN, Nitrate	“	“	Western U
TOC	“	“	Western U
Total Metals Scan	“	“	Western U

Solid residuals management and monitoring plan

Parameter	Sample Location	Frequency	Responsible Party
Filter Sock Filtrate:			
Total PO₄	Filtrate Return to Sanitary Sewer	grab sample ea month	Western U
Total TKN	Filtrate Return to Sanitary Sewer	“	Western U
Silt Sock Solids:			
Wet Mass or Volume	Silt Sock	estimate with ea new silt sock	Silt Sock
Total Dry Solids	Silt Sock	grab sample with ea new silt sock	Western U
Total TKN	Silt Sock	“	Western U
Total P	Silt Sock	“	Western U
“Fertilizer Value”	Silt Sock	“	TRPRC via Silt Sock
Total Metals Scan	Silt Sock	“	Western U

Variables of bench scale lava rock test plan

Lava Rock Type	Nominal Particle Size ["dia]	Current [amps]	Conductivity [mS/cm]	Operating Variable Measurements	Water Quality Measurements
As many as practical	1/8", 1/4", 1/2"	Low, medium, high	Low, medium, high	Voltage, Influent and Effluent temperature	Influent and Effluent: pH, total and soluble P, total metals

*Continuous constant flow rate, constant electrode density and spacing



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