

## Report to Civic Works Committee

**To:** Chair and Members  
Civic Works Committee

**From:** Kelly Scherr, P.Eng., MBA, FEC  
Deputy City Manager, Environment & Infrastructure

**Subject:** Agreement – Thames River Experimental Stream Science  
Facility at Adelaide Pollution Control Plant

**Date:** September 13, 2022

## Recommendation

That the on the recommendation of the Deputy City Manager, Environment and Infrastructure, the following actions be taken with respect to the approval of a consent to enter agreement with the University of Waterloo:

- a. That the attached proposed by-law **BE INTRODUCED** at the Municipal Council meeting to be held on September 27, 2022 for the purpose of approving a consent to enter agreement with the University of Waterloo to conduct research at the Adelaide Pollution Control Plant, substantially in the form attached and satisfactory to the City Solicitor;
- b. That the Mayor and City Clerk **BE AUTHORIZED** to execute the Municipal Access Agreement on behalf of the municipality.

## Executive Summary

The purpose of this report is to approve a new agreement with Dr. Adam Yates (originally from Western University, now employed with the University of Waterloo) for his ongoing research facility at Adelaide Pollution Control Plant and to provide background information on the work performed at the Thames River Experimental Stream Science facility.

It should be noted that the facility exists at Adelaide PCP and has operated since 2015. A primary change from the original agreement other than the applicable dates, is that the primary researcher, Dr. Adam Yates has changed status at Western University to an adjunct professor and is now a full-time employee at University of Waterloo. Therefore the proposed agreement is now with the University of Waterloo as the primary partnering institution as opposed to Western University.

## Linkage to the Corporate Strategic Plan

Municipal Council's 2019-2023 Strategic Plan for the City of London continues to recognize the importance of environmental leadership, wise resource management and the need for a more sustainable, inclusive and resilient city, especially in light of climate change.

On April 23, 2019, the following was approved by Municipal Council with respect to climate change:

*Therefore, a climate emergency be declared by the City of London for the purposes of naming, framing, and deepening our commitment to protecting our economy, our eco systems, and our community from climate change.*

Aquatic research involving the Thames River and associated tributaries addresses three of the five Areas of Focus, at one level or another:

- Strengthening Our Community

- Building a Sustainable City
- Growing our Economy

## Analysis

### 1.0 Background Information

#### 1.1 Previous Reports Related to this Matter

Relevant reports that can be found at [www.london.ca](http://www.london.ca) under Government (City Council and Civic Administration) include:

- Thames River Experimental Stream Science Facility at Adelaide Pollution Control Plant (October 6, 2015 meeting of the Civic Works Committee, Agenda Item # 5)
- Agreement Renewal – Thames River Experimental Stream Science Facility at Adelaide Pollution Control Plant (September 26, 2017 meeting of Civic Works Committee, Agenda Item # 9)

#### 1.2 Background

The City of London originally partnered with Western University and Dr. Adam Yates in 2015 to establish an aquatic research facility at the Adelaide Pollution Control Plant given the available space in a fenced, secure compound and the services that could be provided. That original 3 year agreement was extended in 2017 to allow the continuation and expansion of the ongoing research.

### 2.0 Discussion and Considerations

#### 2.1 Context

The City of London supports co-operative research projects with University of Waterloo, Western University and other academic and industrial partners. The renewal of this agreement will allow the continued collaboration with Dr. Adam Yates from the Geography Department and the continuation of his mesocosm research within the Thames River Experimental Stream Science Facility.

A mesocosm is any outdoor experimental system that examines the natural environment under controlled conditions.<sup>a</sup> A mesocosm study provides a link between field surveys and highly controlled laboratory experiments.<sup>1</sup> The goal of this particular mesocosm research project is to mimic natural stream conditions using artificial streams to model chemical and physical changes to stream environments. The fenced compound at Adelaide Pollution Control Plant (PCP) provides a secure space with access to electrical power and water services. This work is especially relevant given the renewed provincial and federal interest in climate change and increasing phosphorus levels in Lake Erie and tributary waterways, including the Thames River.

#### 2.2 Discussion

The City of London has long recognized the benefits of collaborating on research with our local universities. The Thames River Experimental Stream Science Facility has operated for six years under the direction of Dr. Adam Yates, originally an Assistant Professor in Western University's Geography Department now employed as a full professor in the University of Waterloo Biology Department. Dr. Yates reports that during the years of the operation, the Thames River Experimental Stream Science Facility has satisfied its academic research goals and successfully met its intended and

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<sup>a</sup> Source: Mesocosm - <https://en.wikipedia.org>

anticipated results. A six-page project update prepared by Dr. Adam Yates is attached as Appendix 'B'.

Locating the research facility at the Adelaide PCP, takes advantage of the close proximity of the north branch of the Thames River and several area streams, such as Medway, Stoney and Pottersburg Creeks. The Adelaide PCP site provides a central location for the calibration and validation of the artificial streams being constructed in the mesocosm. Currently, the facility has been constructed with six artificial streams, each with specific substrate and biological life. Research work will continue through 2022 and is expected to conclude in the fall of 2024.

The proposed by-law (Appendix 'A') would change the partnering university from Western to Waterloo, but effectively renew the current arrangement for the next three years, ending in November 2024. The by-law establishes the legal framework, using a Consent to Enter Agreement (Schedule "1" to the by-law) between the University and the City. The space designated in the agreement remains the same and is a relatively small (30 metres square) fenced area for exclusive use of the researchers.

### **3.0 Financial Impact/Considerations**

The City investment in the facility to date has been approximately \$10,000. Ongoing operating costs of the facility are minor in nature. The research space will not interfere with any future planned improvements at Adelaide PCP.

### **4.0 Key Issues and Considerations**

None

## **Conclusion**

The Thames River Experimental Stream Science Facility is expanding our understanding of natural stream systems. In addition, the City's participation in this initiative supports local scientific research at both universities. This partnership will continue to increase our understanding of the Thames River watershed and will aid in achieving future improvements to water quality and watershed health, especially given a changing climate.

**Prepared by:** Patrick Donnelly, M.Sc., RPP  
Manager, Watersheds & Climate Change

Kirby Oudekerk, P.Eng.  
Division Manager, Wastewater Treatment Operations

**Submitted by:** Ashley Rammeloo, MMSc, P.Eng.  
Director, Water, Wastewater, and Stormwater

**Recommended by:** Kelly Scherr, P.Eng., MBA, FEC  
Deputy City Manager, Environment & Infrastructure

Appendix 'A' – Proposed By-law  
Appendix 'B' – TRESS Project Summary, January 2022

c.c. Dr. Adam Yates, Biology Department, University of Waterloo  
Thiam Phouthonephackdy, Senior Manager, Research Partnerships, Office of Research, University of Waterloo  
Gary Burrows, Brian High, Aynsley Anderson, City of London

APPENDIX A

Bill No. 2022

By-law No. A.- 1

A by-law to authorize and approve an Agreement between The Corporation of the City of London and The University of Waterloo for the use of space at the Adelaide Pollution Control Plant for a research experiment (termed a Mesocosm) and to authorize the Mayor and the City Clerk to execute the Agreement.

WHEREAS section 5(3) of the *Municipal Act, 2001* S.O. 2001, c.25, as amended, provides that a municipal power shall be exercised by by-law;

AND WHEREAS section 9 of the *Municipal Act, 2001* S.O. 2001, c.25 as amended provides that a municipality has the capacity, rights, powers and privileges of a natural person for the purpose of exercising its authority under this or any other Act;

AND WHEREAS it is deemed expedient for The Corporation of the City of London to enter into an Agreement with University of Waterloo for the Mesocosm experiment;

AND WHEREAS it is appropriate to authorize the Mayor and the City Clerk to execute the Agreement on behalf of The Corporation of the City of London;

NOW THEREFORE the Municipal Council of The Corporation of the City of London enacts as follows:

1. The Agreement attached as Schedule "1" to this by-law, being an Agreement between The Corporation of the City of London and University of Waterloo is hereby authorized and approved.
2. The Mayor and the City Clerk are hereby authorized to execute the Agreement authorized and approved under Section 1 of this by-law.
3. This by-law shall come into force and effect on the day it is passed.

PASSED in Open Council on (date).

Ed Holder  
Mayor

Michael Schulthess  
City Clerk

First Reading – September 27, 2022  
Second Reading – [date]  
Third Reading – [date]

## SCHEDULE 1

### CONSENT TO ENTER AGREEMENT

#### BETWEEN:

#### THE CORPORATION OF THE CITY OF LONDON

(hereinafter called the "City")

and

#### UNIVERSITY OF WATERLOO

(hereinafter called the "University")

**WHEREAS** the City operates the Adelaide Wastewater Treatment Plant located at 1159 Adelaide Street North (the "Facility");

**AND WHEREAS** University of Waterloo has requested permission to use a portion of the Facility for the purpose of **continuing ongoing research that began in 2015;**

**AND WHEREAS** the City has agreed to permit the University to use a portion of the Facility as more particularly described herein for the purpose of conducting research;

**FOR VALUABLE CONSIDERATION**, the receipt and sufficiency of which is hereby acknowledged, the City hereby consents to the entry into the Adelaide Wastewater Treatment Plant pollution control plant by the University and its employees, authorized representatives and consultants with all necessary machinery and equipment, for the purpose of conducting research.

University of Waterloo shall have, during the term of this Agreement, the exclusive right to occupy and use that portion of the Facility as shown in the Schedule B attached (the "Designated Space").

The University's use of the Designated Space shall be for the purposes of the Mesocosm Project as detailed in Schedule A (the "Project"). In connection with the Project, the University shall have the right to:

- a) connect to the electrical system of the Facility;
- b) connect to the water system of the Facility through connection provided.

The Agreement shall be effective from **May 1, 2021** to **November 30, 2024**.

Any alterations to the Designated Space shall be at the University's expense and approved by the City's Site Manager, who shall also approve any contractors that will make alterations to the Designated Space. University of Waterloo shall prepare a Health and Safety Plan (the "Plan") with respect to the Designated Space for its employees, authorized representatives and consultants. The Plan will be reviewed by the City's Site Manager.

University of Waterloo and its employees, authorized representatives and consultants shall comply with the Facility Fire Safety Plan and other policies and procedures applicable to the Facility provided to the University by the City.

To the best of its knowledge, the University agrees that its activities in the Designated Space and the Facility will not interfere with the ongoing operation by the City of the Facility as a wastewater treatment plant. University of Waterloo shall maintain comprehensive general liability insurance on an occurrence basis for an amount of not less than Five Million (\$5,000,000.00) Dollars and shall include the City as an additional insured with respect to Waterloo's occupancy and use of the Designated Space and the Facility. In addition, the University shall maintain automobile liability insurance for an amount of not less than Two Million (\$2,000,000.00) Dollars on forms meeting statutory requirements covering all owned or leased vehicles. University of Waterloo agrees to provide evidence of continued insurance coverage from insurer(s) licensed to operate in Canada annually to the City at each policy renewal date during the term of this Agreement.

University of Waterloo shall indemnify and save harmless the City and its council members, officers, employees and agents from any and all liability, loss, claims, demands damages and costs caused in whole or in part by the negligent acts, errors or omissions of the University or anyone for whose acts it is responsible in law.

The City shall indemnify and save harmless University of Waterloo and its officers, employees and agents from any and all liability, loss, claims, demands damages and costs caused in whole or in part by the negligent acts, errors or omissions of the City or anyone for whose acts it is responsible in law.

The City reserves the right to enter the Designated Space for the purpose of determining compliance with this Agreement provided the City's Site Manager gives the University reasonable notice of such entry.

The City reserves the right to terminate the right of entry and occupancy hereby granted by giving University of Waterloo thirty (30) days' written notice. Upon receipt of such notice, the University shall immediately vacate the Designated Space and remove all its equipment and material.

Any approvals required by this Agreement may take any form, provided such approval is confirmed in writing as soon as possible.

University of Waterloo shall not assign this Agreement without the consent of the City, which consent may be unreasonably withheld.

This Agreement shall ensure to the benefit of and be binding upon the parties and their respective successors and approved assigns.

**DATED** at London this \_\_\_\_\_ day of March, 2022.

**THE CORPORATION OF THE CITY OF LONDON**

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Ed Holder, Mayor

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Michael Schulthess, City Clerk

**UNIVERSITY OF WATERLOO**

**Thiam Phouthonephackdy** UNIVERSITY OF WATERLOO  
Signed with ConsignO Cloud (2022/04/01)  
Verify with verifio.com or Adobe Reader.



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Title: Senior Manager

I have the authority to bind the University

## **Schedule A Statement of Work:**

The goal of the project is to continue the ongoing research started in 2015 to establish thresholds of key indicators of riverine ecological health to nutrient exposure for the Thames River and other Great Lakes tributaries using artificial mesocosm experiments.

The establishment of ecological thresholds will be achieved through a series of exposure experiments over the three year period, beginning on **May 1, 2021** and ending on **November 30, 2024**. There may be opportunities for additional studies in following years), in which case, this Agreement will be amended if agreed to by both parties.

We will use a set of mobile artificial stream mesocosm units (approximately 8) which will be temporarily located at the City of London's Adelaide Pollution Control Plant. Mesocosms consist of a flume with a partial recirculation system supplied by a series of pumps connected to reservoir tanks. Mesocosms will use City of London drinking water with controlled additions of nitrogen and phosphorus forms to generate exposure conditions.

Stream biotic communities will be seeded into the mesocosms through the transfer of gravel substrate from nearby streams.

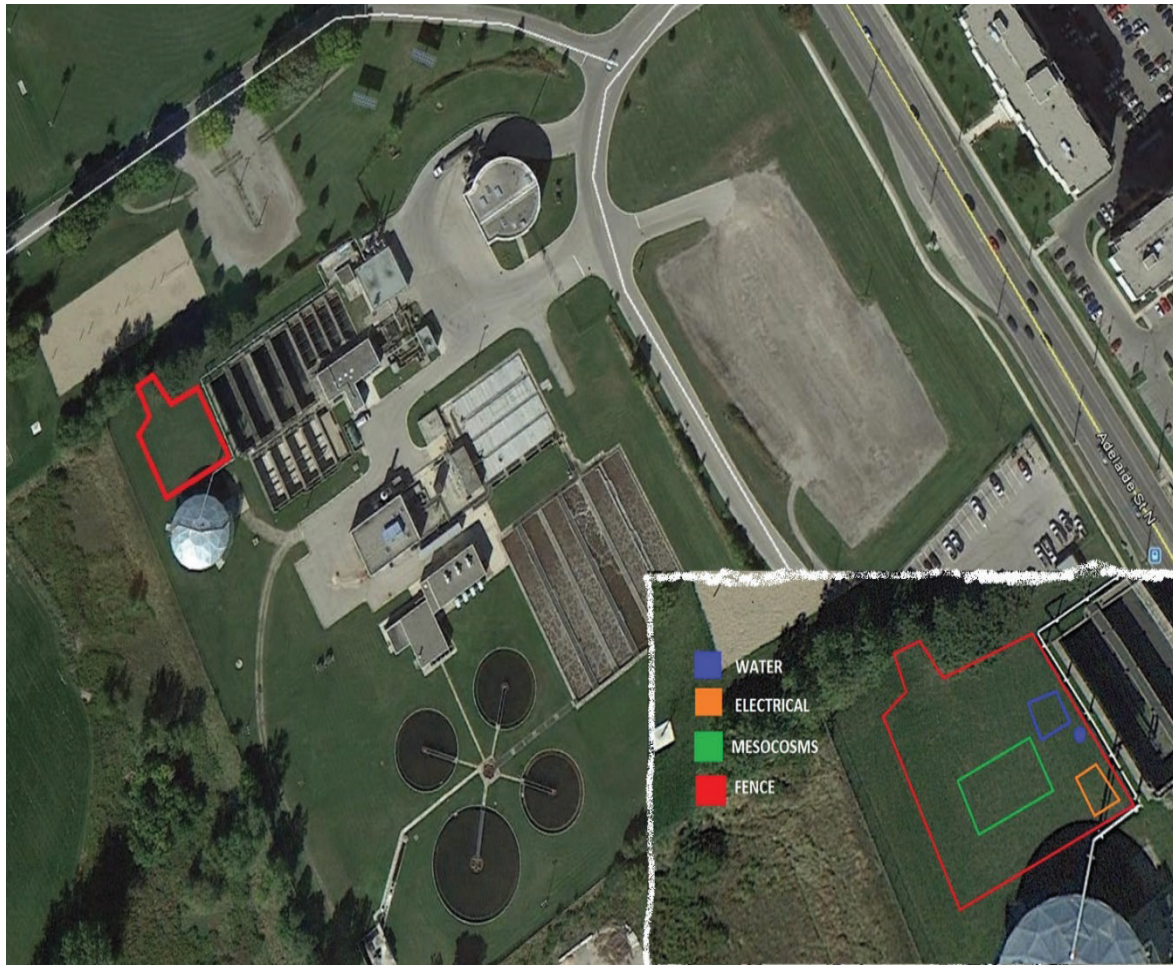
Experiments will occur over 3 - 4 four week periods throughout the summer months (**June through September**).

During the experiments biological and chemical measurements will be made over daily to weekly intervals. Mesocosm units will be partially dismantled and disconnected from water and electrical connections during the non-operational months (November through April). All units and supporting equipment will be removed from City of London property following the completion of the 2020 experimental season.



**Schedule B  
Designated Space:  
at  
Adelaide Pollution Control Plant**

Photo below shows the Designated Space (see red outline) and the location of Mesocosm and related services (see inset photo).



## Thames River Experimental Stream Sciences (TRESS) Centre

### 2021 Summary

#### Background

Human development of landscapes is a global threat to aquatic ecosystem health. Our ability to protect these important ecosystems is hindered by limited understanding of catchment scale effects of land use on aquatic conditions. As a group though, observational field studies are limited by the impracticality of manipulating landscape conditions at large scales. Innovative approaches are thus needed to test hypotheses regarding the influence of land use patterns on aquatic ecosystem conditions, such as water quality and ecological health. This need is particularly strong in regions where contemporary landscapes present a limited snapshot of possible landscape patterns due to widespread development. As a solution, the Thames River Experimental Stream Sciences (TRESS) Centre was constructed in 2015 by Dr. Adam Yates (University of Waterloo, formerly of Western University)) in partnership with the City of London and the Upper Thames River Conservation Authority to house medium scaled, artificial streams (referred to as mesocosms) where controlled ecosystem experiments can be completed to fill key knowledge gaps inhibiting informed land use and watershed management decisions.

#### The TRESS Centre in London

The TRESS centre is an outdoor mesocosm facility with strictly controlled biological assemblages and physio-chemical conditions. Stated advantages of the stream mesocosm approach include increased experimental control and replication, elucidation of mechanism of stressor effects, and the ability to investigate effects of toxic compounds on food webs without harming natural systems because of experimental manipulation. The TRESS Centre consists of a system of nine artificial streams made of fabricated tanks with partial recirculation of water flow (Figure 1). TRESS is situated in London at the Adelaide Pollution Control Plant, which provides a secure environment with ready access to a reliable supply of low contaminant (e.g., nutrients, pesticides, sediment) water through the City of London drinking water supply. The site is also closely located to the

Thames River and two of its tributaries, Medway Creek and Stoney Creek which provide biological communities which can be tested at the TRESS Centre. Most importantly, the current location of TRESS provides a visual as well as information connections between the research and examples of how that knowledge can be applied. Thus, the location near the Thames and the Adelaide PCP provides excellent opportunities to develop educational and outreach programming in the future.



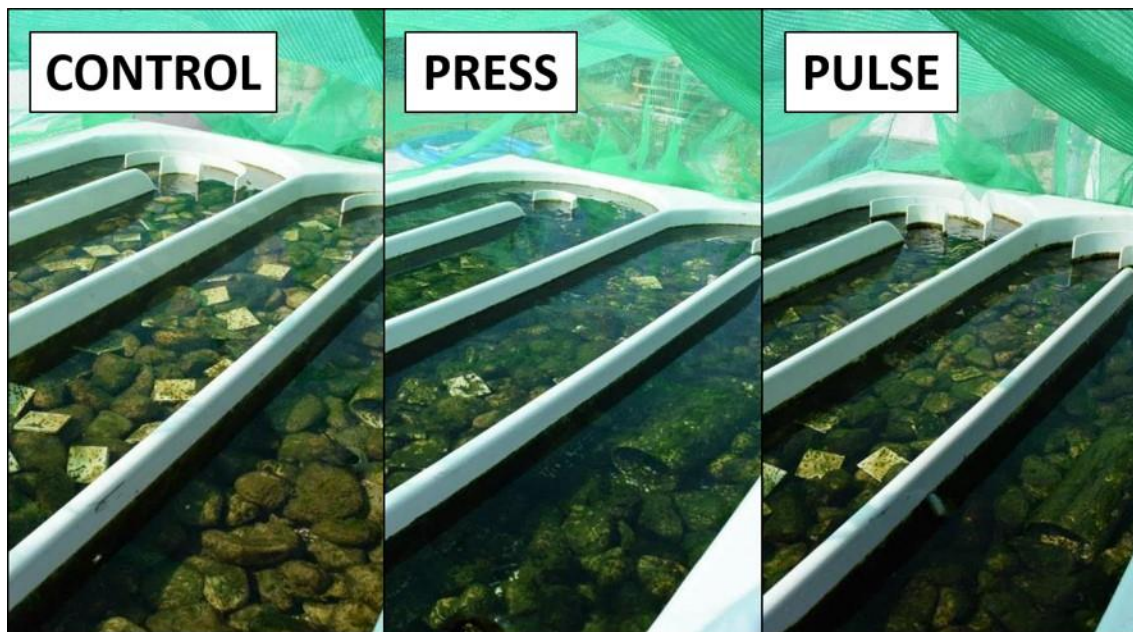
Figure 1. Schematic of the TRESS centre (left) indicating location of TRESS Centre (in red outline) within the Adelaide PCP site. Photographs of the facility in 2015 (Top right) and of an individual stream mesocosm (bottom right).

## Research Findings and Collaborations

To date over a dozen experiments have been conducted at TRESS. Experiments at TRESS have focused on the effects of phosphorus as a cause of stream eutrophication. In particular, the experiments have emphasized the role of short-term phosphorus loadings that mimic stream conditions following storm events that can introduce large quantities of phosphorus to streams from agricultural and urban lands.

**Algae and Phosphorus:** Results of experiments at TRESS have definitively established those short-term loadings of phosphorus can result in significant biological effects including increased algal biomass and greater abundance of “nuisance” filamentous

green algae species. Indeed, these experiments have shown that short-term loadings of phosphorus can result in stream conditions that resembles streams receiving more continuous inputs of phosphorus such as those experienced in river systems with municipal wastewater outlets (Figure 2). Moreover, examination of algal uptake of phosphorus has demonstrated that stream algal communities can remove significant amounts of phosphorus from stream water during the simulated storm events. Although more investigation is needed into phosphorus removal by stream algae these preliminary results suggest a significant role of algae in purifying stream water and potentially protecting downstream ecosystems from eutrophication.



*Figure 2. Comparison of algal growth from an experiment testing effects of pulse and press additions of nutrients relative to a low nutrient control. Photos show relative coverage of algae by treatment.*

**Collaborations:** TRESS has also become an important research hub with collaborators from multiple universities (e.g., Trent University and Institut National de la Recherche Scientifique (INRS)) and government agencies (e.g., Environment and Climate Change Canada) conducting research at TRESS. These collaborations have led to the completion of several successful experiments generating knowledge that has been presented at

international conferences and in peer-reviewed publications including in the prestigious peer-review journal “Water Research” (Pearce et al. 2020, vol. 185).

## **Future of TRESS**

The next phases of TRESS will seek to further enhance the facility infrastructure and equipment through construction within the existing envelope on the Adelaide Pollution Control property to enable expansion of the research program at TRESS.

***Climate Change:*** The expansion will ultimately result in the facility containing 24 streams and associated support equipment, including heating systems that will enable experiments incorporating climate change scenarios of stream warming. The facility expansion is modularly designed to allow phases of construction base on funding availability. The first planned phase of enhancement has recently been completed with the addition of a secure and muliti-season pump house that allows the facility to be more easily maintained. Future additions will focus on expansion to 12 streams from the current nine and the construction of a stable decking. The additions will help to maintain TRESS’ status as a unique, leading edge, research facility where user-driven research provides the knowledge needed to address the most important environmental problems of the next 15 years.

***Education / Outreach:*** Upgrades through construction would also generate the potential for collaboratively organized outreach programs. Such programs could provide participants with a greater appreciation of how people and neighbourhoods impact and are impacted by neighbourhood streams and rivers by enabling visual linkages between water management actions and potential river health consequences illustrated by healthy and unhealthy stream conditions in TRESS’ artificial streams.

Future research will continue to focus on critical problems facing the Thames River and the citizens in its watershed. Specifically, research over the next 3 year will continue to generate improved understanding of phosphorus affects on river health and to identify the capacity of rivers to assimilate phosphorus without unacceptable harm to ecological function and diversity. The results of this research will provide knowledge that City of London and UTRCA staff can use to meet phosphorus targets for the Thames River. In

addition, future research will align with the City of London's focus on responding to the climate emergency by interrogating the links between Phosphorus and river health in the context of a changing climate. As such, near term research projects will centre on the effects of nutrient pulse concentration and duration, as well as interactive effects of additional stressors commonly associated with pulse events (e.g., sediments and pesticides) under the overarching umbrella of stream warming expected under future climate change scenarios. In addition, to projects on nutrients and climate warming the TRESS centre is planning to further expand collaborative research projects with governments, industries, and universities across North America. These projects would raise the profile of the TRESS centre and London's collaborative approach to aquatic research and concern with wise management of the Thames River. All research directly associated with TRESS' original partners (City of London and UTRCA) would continue to take precedence over any proposed external research.