

Dear Leaders of the City of London,

The Western Ontario's International Genetically Engineered Machine (iGEM) team is writing to you to express our concern regarding the allocation of resources used to regulate emerging contaminants (ECs) in the City of London's wastewater. We would also like to address the City of London's duty to consult, be transparent and inform the public about issues that have the potential to be harmful at the individual level under the Accountability and Transparency to the Public Policy (By-law No. A.-6151(v)-420). It has come to our attention through our research aimed towards removing pharmaceuticals and microplastics from wastewater, the public's perception and engagement on this topic is inconsequential to the City of London. We are aware and appreciate the City of London's online information on how to reduce individual's wastewater contamination, but feel much more could be done to solve the issue. We hope the enclosed information is valuable in bringing further recognition to these matters.

In 2018, the Canadian Water Network (CWN) published a national review of known and emerging contaminants in municipal wastewater titled "Canada's Challenges and Opportunities to Address Contaminants in Wastewater". The known contaminants identified included oxygen-demanding substances, suspended solids and nutrients. Emerging contaminants include compounds such as endocrine-disruptors, pharmaceuticals and personal care products (PPCPs) and microplastics. PPCPs were identified as being of particular concern in North American bodies of water and have been detected in drinking water sources. In a CWN survey, stakeholders from across the country identified PPCPs as the number 1 contaminants requiring addressing through wastewater treatment plants (WWTPs).

PPCPs have a wide range of effects on ecosystem and human health. The impacts of PPCPs on aquatic organisms has been widely documented in recent years. Even low concentrations of these compounds can induce a potentially harmful biological response and can impair the growth, survival and reproduction of aquatic organisms. PPCPs also continue to exacerbate major issues such as antibiotic resistance and eutrophication. Studies also suggest that PPCPs can accumulate in aquatic organisms. Notably, a 2017 study found bioaccumulation of PPCPs in the organs of fish in multiple trophic levels in the Niagara River (Arnnok et al., 2017). The Thames River is not currently being tested for PPCPs and with WWTP's unable to remove them, it is inevitable that the effluence from these treatment plants will have a detrimental impact on the health of the Thames River ecosystem and on that of the residents in the City of London if action is not taken now.

The levels of PPCPs and microplastics in our water sources are inadequately monitored and unregulated. Currently, most wastewater treatment plants (WWTP) across Ontario, including those in the City of London, do not have the technology in place to effectively remove emerging contaminants such as PPCPs. The Wastewater Systems Effluent Regulations (SOR/2012-139) baseline effluent quality standards are outlined for four compounds: suspended solids (SS), carbonaceous biochemical oxygen-demanding material (CBOD), total residual chlorine, and un-ionized ammonia (NH₃). The Ontario Ministry of Environment and Climate Change regulates wastewater effluents through Environmental Compliance Approvals (ECAs). Many of these ECAs have stringent regulations for compounds such as phosphorus, but nothing noting PPCPs.

Recently, the City of London retrofitted Oxford Pollution Control Plant with membrane bioreactors to increase water quality. These membranes target ammonia, nutrients, microplastics, trace organic compounds. While this is a step in the right direction, we believe there is still much work to be done. As decisions are being made regarding the City of London's water treatment, the public should be actively engaged, included, and informed. We believe that policy reform is needed to address the growing threat to our water quality. It is important to note the growing concern of municipal water contamination is not new and will only continue to grow in severity and support. Below, we outline a few suggestions that we believe would be a good first step for the City of London to set precedent for municipalities in addressing the issue:

1. Begin monitoring the level of certain ECs in the Thames River; this is the most crucial initiative involving discussion and collaboration of the City of London's municipal government.
2. Host an annual public meeting to update the public on relative water treatment decisions and environment initiatives, included with a question period for the City of London's citizens voices to be heard.
3. Include information on the proper usage and discarding of PPCPs in the Active & Green Communities Pilot Project, either in the Climate Impact calculator or as an additional info page.
4. Public awareness campaign to increase knowledge on proper disposal of PPCPs and other household waste.
5. Add an additional teacher resource under wastewater lessons (on the City of London website) providing tips on how to reduce students' impact on wastewater pollution.
6. Include an information page on the London Source Water Protection page.

In this letter, we have highlighted some of the reasons why municipalities need to be paying closer attention to their waste water treatment process. We have suggested some strategies for reduction of ECs in wastewater and noted areas for policy reform. We appreciate you taking the time to read this letter and your careful consideration of this issue. We know that the City of London aims to be as transparent with the citizens of London as possible, and we look forward to a documented response in how change can be made. We hope that we can work together to educate the public, create meaningful change, and improve the quality of our water for future generations to come before it is too late.

Sincerely,

The Western University iGEM team.

The University of Western Ontario

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The CWN report can be found in its entirety here: <http://cwn-rce.ca/project/canadas-challenges-and-opportunities-to-address-contaminants-in-wastewater/>

Selective Uptake and Bioaccumulation of Antidepressants in Fish from Effluent-Impacted Niagara River

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