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BENEFITS OF REGIONAL LEADERSHIP IN RESEARCH AND INNOVATION PARTNERSHIP FOR WATER AND WASTEWATER SERVICES

The Environmental Services Committee recommends the adoption of the recommendation contained in the following report dated September 20, 2012, from the Commissioner of Environmental Services.

1. RECOMMENDATION

It is recommended that this report be received for information.

2. PURPOSE

This report is to inform Council of work being performed by Environmental Services in the areas of water and wastewater research and development. Additionally the report reaffirms the Region's ongoing commitment to innovation and industry leadership.

3. BACKGROUND

Key new legislation by Provincial and Federal Environment Ministries looks to drive the water and wastewater industry forward in the areas of science and technology

Following up on the advances in the water industry driven by the 2002 *Safe Drinking Water Act, 2002*, the Ontario Government passed the *Water Opportunities Act, 2010*, under which exists key programs such as Showcasing Water Innovation, and the Water Technologies Acceleration Project. A key intention of the *Water Opportunities Act, 2010* is to advance the level of science and technology in Ontario's water and wastewater industry. Complimenting the provincial efforts are changes to the federal *Fisheries Act* covering levels of wastewater treatment and effluent quality. Together these initiatives serve to protect and preserve water resources.

While specific research and development partnerships are new, the Region strives for industry leadership and innovation in water and wastewater servicing

In the fall of 2008, Council endorsed the first term of an ongoing partnership with the Natural Sciences and Engineering Research Council (NSERC) of Canada Industrial Chair in Drinking Water Treatment at the University of Toronto; the Drinking Water Research Group. While this was a significant step forward in terms of research, innovative projects

have always been a hallmark of the Region. For example, the Georgina Water Treatment Plant, completed in 2005, was one of the first membrane treatment plants to be built in Ontario. The current facility upgrade project for the Keswick Water Pollution Control Plant will make it the first in Ontario to utilize membranes and ultra-violet disinfection for tertiary treatment.

4. ANALYSIS AND OPTIONS

York Region continues research and development as a best management practice

York Region has participated and will continue to participate in studies to support research and development in its water and wastewater operations. Capital projects relate to significant treatment upgrades and new facilities hosting leading edge technology, such as the Keswick Water Pollution Control Plant and proposed Upper York Sewer Solutions. During a recent visit to the Keswick Water Pollution Control Plant, Minister of the Environment, Jim Bradley, commended the Region for its continued leadership and commitment to deliver innovative, environmentally responsible projects and programs.

Success already achieved through projects with the Drinking Water Research Group paved way for renewal of partnership with the NSERC Industrial Chair

Council approved renewal of the partnership with the Natural Sciences and Engineering Council of Canada (NSERC) Industrial Chair September 2011 (Report No. 7 of the Environmental Services Committee). Successful projects that contributed towards approval of the renewal include:

- Microbial based risk assessment evaluation (Quantitative Microbial Risk Analysis)
 - Evaluates a treatment plant's effectiveness against measured pathogens in its raw water source. Extrapolations can be made to predict the risk to public given full or partial failure. This facilitates emergency planning exercises and allows for targeted planning of plant upgrades.
- Assessment of the disinfection practices and procedures at the Keswick Water Treatment Plant
 - Proving a plant has met disinfection requirements is important for public safety. Refinement of disinfection practices will enable the Region to meet regulations and more cost effectively use required chemicals in its operations.
- Evaluation of granular activated carbon for effectiveness and cost efficiency
 - The ability to predict and evaluate the longevity of carbon for removal of taste and odour compounds is important for controlling expenditures and customer satisfaction with water quality.
- Chloramine residual stability and decay studies

- o Chloramine decay through a distribution system is complex. Research into residual stability is important for maintenance of distribution system residuals given the large number of factors involved in a very integrated two-tier water system.

Additional benefits include learning opportunities for staff, networking with industry leaders and our municipal neighbours, plus promotion of Regional programs and practices at industry seminars and conferences.

Looking forward to the next five year period promises a continuation of some projects and the start of other new projects. Areas of focus for the Research Group will include:

- continuation of the quantitative microbial risk analysis work
- forays into biologically active filtration
- quantification and removal of trace substances through advanced oxidation processes and enhanced removal of organic carbon
- exploring optimization of membrane pre-treatment and membrane cleaning systems
- use of ferrate for zebra mussel control

Knowledge gained from research endeavours informs future Capital projects

Increased knowledge regarding the internal workings of the Region's water treatment plants and distribution systems will inform capital upgrade proposals and master planning exercises. The information will provide cost savings, efficiencies and improved water quality, not only to the Region, but to the industry at large.

In March 2012, the Region became a member of the Water Research Foundation. As a member of the Foundation, the Region gains access to reports, funding, opportunities to partner in research projects and other benefits, such as webinars. Since 1996, the Water Research Foundation sponsored more than \$460 million dollars to understand, manage and solve water utilities most pressing issues. Immediate return on this partnership was demonstrated by the in-kind matching of the Region's contribution of \$10,000 to the "Integrated Billing, Planning and Customer Service Data Guidelines for Water Utilities" project. This project aims to elaborate on the data collection and information management needs of the North American water industry, to include the needs of water utility managers and planners, as well as the needs of other local, regional, provincial, and federal agencies that depend on collection and analysis of municipal water demand data.

Building on the success of its partnerships, the Region has approached the Southern Ontario Water Consortium to discuss the collaborative role the Region might have when projects commence in 2014. The Southern Ontario Water Consortium is provincially,

federally and privately funded with members from universities, municipalities, private industry and government interests. The Consortium's mandate is to support and drive research and technology development to promote the responsible management of water resources.

York Region project in partnership with the University of Toronto receives provincial Showcasing Water Innovation funding

In partnership with the University of Toronto's Drinking Water Research Group and Calgon Carbon: UV Technologies, the Region received \$162,043 in funding from the provincial government for a pilot study at the Keswick Water Pollution Control Plant. Showcasing Water Innovation is a program to fund leading edge, innovative and cost-effective solutions for managing drinking water, wastewater and stormwater systems in Ontario communities and arises from the *Water Opportunities Act, 2010*.

The project evaluates the feasibility, from a financial, energy footprint and treatment process perspective of using advanced oxidation to remove trace substances from wastewater effluent. Trace substances, include but are not limited to, pharmaceuticals, personal care products, persistants and endocrine disruptors. The project is slated for completion December 2013.

Leadership and innovation are also demonstrated through initiatives within Environmental Services projects and programs

Innovations on a smaller scale contained within Environmental Services' projects and programs help to develop new practices and improve our treatment and water quality. Some examples include the elevated tank TideflexTM mixing systems, new biological monitoring capabilities, advanced data capture, sharing and monitoring and analysis of chloramine residuals. These technologies and approaches improve the overall performance of our water and wastewater systems, as well as provide learning opportunities for staff.

Attachment 1 illustrates the number of projects, the project partners and the areas or facilities involved from 2008 to present.

Staff participation at industry events promotes the Region's leadership in water and wastewater programs, as well as facilitates networking with government agencies and industry

In recent years staff actively pursued opportunities to present at conferences and seminars North America wide. Information shared has been well received and has greatly increased the Region's profile in the industry. By demonstrating interest in industry leadership and innovation through projects and knowledge showcased, the Region gains the ability to influence future regulatory initiatives and build appropriate long-term strategies with source partners.

Link to Key Council-approved Plans

Leveraging research and development opportunities enables the Region to go beyond compliance and presents opportunities for staff to influence and shape new water and wastewater initiatives provincially. Leadership and engagement are supported by staff participating on projects and attending conferences and seminars. This networking supports the Region's ability to build key partnerships for the future. For Environmental Services, continuing to pursue excellence and innovation supports enhanced water and wastewater delivery. Furthermore, this work supports the objective to continue to partner with all levels of government to facilitate the delivery of environmentally sustainable infrastructure in the 2011 to 2015 Strategic Plan.

5. FINANCIAL IMPLICATIONS

The Region currently spends \$80,000 per year on research through our partnership with the Drinking Water Research Group by approval of Council. This commitment will continue for five years (2012 to 2017). In 2012, the Region subscribed to the Water Research Foundation at a cost of \$43,393.14. These funds are available in the capital and operating budget. As a member of the Water Research Foundation, the Region is eligible to apply for grants that support advances in water technologies and research.

6. LOCAL MUNICIPAL IMPACT

Pursuing research and development opportunities, as well as advocating for the Region's best interests will continue to enhance York Region's treatment processes, provide efficiencies in operations and enhance water quality. Local municipal operations staff have participated in research and are made aware of findings. This coordination allows for collaborative approaches to water and wastewater system operations and has strengthened the communication and partnership between York Region and municipal operations staff. Continued knowledge sharing with local municipalities will provide learning opportunities for staff to enhance operational planning and practices.

7. CONCLUSION

The Region's pursuit of research and development opportunities demonstrates strong leadership and proactive responsibility for emerging issues related to water and wastewater. Improved knowledge, successful partnerships and increased profile create a strong position for the Region with regards to Federal and Provincial policy and regulatory changes and enhances our standing in the water and wastewater industry within North America.

For more information on this report, please contact Brett Bloxam, Director of Operations Maintenance and Monitoring at Ext. 5320.

The Senior Management Group has reviewed this report.

(The attachment referred to in this Clause is attached to this report.)

Recent Projects and Programs Relating to Water and Wastewater

Project	Partners	Facility or Area	Brief Description of Project
Georgina Water Modelling and Annular Reactor Study	Town of Georgina, Stantec Consulting Inc.	Georgina and Keswick water systems	Development of a full pipe hydraulic and water quality model. Combine with results of Annular Reactor study able to predict disinfection by-product concentrations and residual decay to aid in water system maintenance.
Hub 3 Annular Reactor Study	Stantec Consulting Inc.	Newmarket and Queensville well supplies	Bench scale project emulating a distribution system to evaluate water age, residuals and effects of maintenance practices.
Passive Tideflex Mixing Systems	Conestoga Rovers and Associates, Tideflex, Landmark	Magna, Bathurst, Ridge Road and London Road storage facilities	Installation of mixing systems an industry best management practice for elevated tanks to ensure good residual content. Also developed a small model to predict outlet chlorine residuals.
Hub Report Cards	ProF&E	all Water and Wastewater hubs	For reporting key metrics on a monthly basis and to identify areas for improvement.
CT Calculator for Disinfection	Stantec Consulting Inc., University of Toronto Drinking Water Research Group	Keswick Water Treatment Plant	Evaluation of current CT (CT being the disinfectant concentration multiplied by the contact time) practices plus implementation of a real time CT calculator. Will assist staff in demonstrating regulatory compliance for inspections.
CT-Computational Fluid Dynamic Study of Keswick Water Treatment Plant	University of Toronto Drinking Water Research Group	Keswick Water Treatment Plant	Analysis of flow paths to determine disinfection effectiveness and to identify opportunities for efficiency with respect to dosage (chemical usage).
Granular Activated Carbon source water matching	University of Toronto Drinking Water Research Group	Keswick and Georgina Water Treatment Plants	Using Rapid Small Scale Column tests filter influent was matched to optimal Granular Activated Carbon for effective removal of taste and odour causing compounds.

RECENT PROJECTS AND PROGRAMS RELATING TO WATER AND WASTEWATER

Environmental Services

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Quantitative Microbial Risk Analysis	University of Toronto Drinking Water Research Group	Georgina Water Treatment Plant	Sampling completed for risk analysis on raw water. Study shows how pathogens present can present risk to public health with full or partial failure of parts of treatment system.
Removal of Micropollutants from Municipal Wastewater: Lake Simcoe/ Municipality of York Pilot Project	Ministry of the Environment, University of Toronto Drinking Water Research Group, Calgon Carbon: UV Technologies	Keswick Water Pollution Control Plant	The project evaluates the feasibility, from a financial, energy footprint and treatment process perspective of using advanced oxidation to remove trace substances from wastewater effluent.
Investigations into chloramine residual decay and stability	University of Toronto Drinking Water Research Group	All of the York Water System	Investigations into complex water chemistry involving blending of surface and ground waters to provide a chloramine secondary residual.
Use of Ferrate for water treatment	University of Toronto Drinking Water Research Group	Keswick Water Treatment Plant	New cost effective methods to produce ferrate initiated an evaluation of the chemical's ability to serve as a coagulant at the Keswick Water Treatment Plant.
Open Source Reporting Tool for SCADA data (eSCADAr)	Eramosa	All areas	Open source code used to interface with data collection server in order to show water and wastewater system data as trends, tables etc. System facilitates data sharing and analysis.

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