



**REPORT TO CORE AREA LIQUID WASTE MANAGEMENT COMMITTEE
MEETING OF WEDNESDAY, FEBRUARY 13, 2013**

**SUBJECT REQUEST FOR FUNDING FOR INNOVATIVE RESEARCH FOR ADVANCED
WASTEWATER TREATMENT**

ISSUE

The Capital Regional District (CRD) has an opportunity to participate in a research project entitled 'Development of a Microalgae Based Advanced Wastewater Treatment System for Nutrient and Emerging Substances of Concern (ESOC) Removal.'

BACKGROUND

The Canadian Water Network (CWN)¹ is a federally incorporated, non-profit company led by an independent Board of Directors that oversees the financial and operational sustainability of the organization. It focuses on three core water management challenges: protecting public health, protecting watersheds and ecosystems, and ensuring sustainable water infrastructure. CWN has received \$61 million in total funding as part of the Networks of Centres of Excellence. As the federal funding will come to an end in 2015, CWN is in transition to an industry funded company. CWN now requires researchers to seek matching industry funding for their research projects. In the fall of 2012, CWN issued a request for expression of interest (EOI) on two focus areas namely:

1. Fate, Transport and Impact of ESOCs in Municipal Biosolids Applied to Agricultural Lands under Canadian Conditions.
2. Options for Improved Nutrient Removal and Recovery from Municipal Wastewater under Canadian Conditions.

Professor Banu Ormeci responded with the above noted EOI. The EOI was reviewed by an expert panel and the Canadian Municipal Water Consortium Management Committee and selected for preparation of a full proposal which was due at the end of January.

Using microalgae for advanced wastewater treatment is a very promising technology that offers several benefits that include:

1. Removal of nitrogen and phosphorus;
2. Reduction of biochemical and chemical oxygen demand;
3. Removal of pathogenic and indicator bacteria;
4. Removal of heavy metals; and
5. Removal of ESOCs.

1. For information on CWN, go to www.cwn-rce.ca.

Algae naturally grow in wastewater and have a very rapid growth cycle (1-2 weeks). It is a simple and inexpensive technology and can potentially be optimized for advanced wastewater treatment which is the main objective of this proposal. After wastewater treatment, algae can be harvested and used as a renewable energy source such as for biofuel production. It can also be co-digested with primary and activated sludge and increase the biogas generation at sludge digestion facilities such as that planned for the Core Area Wastewater Treatment Program.

The goal of this study is to evaluate the use of microalgae for advanced wastewater treatment, identify the optimum environmental and operational conditions for microalgae treatment, and determine the removal rates for nutrients, organic matter, ESOCs, heavy metals and pathogens. The research will lay the groundwork for an algae-based treatment process that can be incorporated in existing wastewater treatment facilities. The project will contribute to the development of a novel and sustainable technology.

The budget for the two-year research is \$250,000, of which the researcher has to raise \$125,000. In order to ensure that the research is carried out on real samples of sewage, the CRD will provide in-kind support in the form of information on local sewage and samples. For the purpose of the proposal the in-kind support has been valued at a total of \$10,000. In addition, an annual contribution of \$25,000 has been offered with the clear understanding that the funding is subject to CRD Board approval. The funds would be used primarily for analysis of sewage for ESOCs before and after the treatment process. Because of the very low levels of ESOCs in sewage, the analytical costs are extremely high. Without cash contributions the analytical work on ESOCs is unlikely to be undertaken.

The CRD has historically been a strong supporter of collaborative research with universities. For example the CRD provided \$1 million over 10 years for the Research Chair in Environmental Management of Water at the University of Victoria and was instrumental in establishing the Research Chair. This work allowed the CRD to make informed decisions in connection with the expansion of the Sooke Reservoir. Other collaborations included research on the Sooke Reservoir sediments, analysis of climate change using the 100 years of precipitation records for Sooke Reservoir; research into the relationship between price and demand for water (price elasticity) in the region and metagenomics using the Leech watershed as control. Funding has been in the form of cash contributions and in-kind support.

ALTERNATIVES

1. That the Core Area Liquid Waste Management Committee recommend to the Board funding of \$25,000 in 2013 and 2014 for research on 'Development of a Microalgae Based Advanced Wastewater Treatment System for Nutrient and Emerging Substances of Concern (ESOC) Removal,' with funding from the Core Area Wastewater Treatment Program budget.
2. That the Core Area Liquid Waste Management Committee receive this report for information.

IMPLICATIONS

Alternative 1

Innovation and advancement in wastewater treatment technology is the result of research. Without research, innovation and advancement in wastewater treatment technology is less likely to occur. There is limited incentive for the private sector to fund research given the limited market for commercialization of research outcomes, as typically there is a limited number of new wastewater treatment plants being constructed or upgraded at any time, although this may change with the new federal regulations. With the increasing emphasis on sewage as potential source of energy (heat and biogas) and nutrients (nitrogen and phosphorus) by municipalities, research is needed to look at innovative and economically viable ways to exploit the resource. There is also increasing interest by municipalities on the implications of ESOCs on human health and the environment and the removal of ESOCs from sewage treatment plant discharges. It is our understanding that Metro Vancouver has indicated support for this research proposal.

Alternative 2

If the CRD is unable to provide financial support, the research on removal of ESOCs will be curtailed due to lack of funding for analytical work.

CONCLUSION

With the introduction of the federal *Wastewater Systems Effluent Regulation* Canadian municipalities will be looking at the best available technology to comply with the regulations. Today sewage is no longer being regarded as a waste but as a potential source of energy, nutrients and organics. By participating in research, the CRD will be contributing to the potential development on new, innovative treatment technologies.

RECOMMENDATION

That the Core Area Liquid Waste Management Committee recommend to the Board funding of \$25,000 in 2013 and 2014 for research on 'Development of a Microalgae Based Advanced Wastewater Treatment System for Nutrient and Emerging Substances of Concern (ESOC Removal,' with funding from the Core Area Wastewater Treatment Program budget.

J.A. (Jack) Hull, P.Eng., MBA
Interim Program Director
Core Area Wastewater Treatment Program

Kelly Daniels
Chief Administrative Officer
Concurrence

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