Rural Municipality of
Municipalité Rurale de

TACHÉ

Box/*C.P.* 100
Lorette, Manitoba R0A 0Y0

Tel.: 878-3321
Fax: 878-9977
E-Mail: christine@rmtache.ca

June 17, 2016

Tracey Braun,
Director of Environmental Approvals
Manitoba Dept. of Sustainable Development
Box 80, Suite 160, 123 Main Street
Winnipeg, MB
R3C 1A5

Dear Ms. Braun,

Re: Notice of Alternation Landmark Lagoon License No. 2025RR

The Rural Municipality of Taché is submitting a notice of alternation to Landmark Lagoon, License No. 2025 RR for the allowance of a pilot project for a Cattail Bio-platform Harvesting System. This project will measure the effects of cattails on phosphorus filtration and removal in municipal lagoons. The project is being coordinated by Eco-west in partnership with Curry Industries, the RM of Taché, Hanover and Ste. Anne.

The Landmark Lagoon currently services the Local Urban District of Landmark and the rural residents of the R.M. of Tache with a current population of approximately 7,000 people. Under the current regulations, the R.M. of Tache must meet the 1mg/l or less of phosphorus prior to discharge of the lagoon and is actively seeking environmentally responsible alternative for all local governments to meet regulation.

Please see the attached proposal for the pilot project and please contact me if you have any questions or concerns. Thank you for your consideration and look forward to hearing from you.

With regards,

Christine Hutlet, CMMA
Chief Administrative Officer

R.M. of Taché

Floating Cattail Bio-platform Harvesting System

(Pilot Project)

Notice of Alteration

Landmark Lagoon

Presented to:

Manitoba Department of Sustainable Development

June 2016

CURRY INDUSTRIES LTD.

ÉcoOuest
EcoWest

1) Project Overview

It is anticipated that the Cattail Bioplatform Harvesting System™ as designed by Winnipeg's Curry Industries Ltd. will be installed in the secondary treatment cells of three municipal wastewater stabilization ponds (lagoons) – RMs of Ste. Anne, Taché and Hanover - in the spring of 2017. Each of the installations will consist of 250 square meters of grow trays in rectangle floating trays for establishing root growth during the first season.

The purpose of this pilot project will be to field-test a prototype design of floating cattail bio-platforms in a wastewater environment - i.e., municipal lagoon - to study their performance characteristics for growing cattails and sequestering nutrients, to determine the feasibility of using cattails shreddings as biofuel or feedstock, and to evaluate and refine the design for biomass harvesting and nutrient recapture.

The Cattail Bio-platform Harvesting System™ is a structured growing bed for cattails to treat wastewaters passively in sewage lagoons prior to subsequent release into surface waters. The system - invented by Mike Curry of Curry Industries in Winnipeg, MB - has been designed to harvest the cattails when the plant is richest in phosphorous and nitrogen. The cuttings are subsequently shredded by a forage cutter and deposited into a storage bin on the shoreline for further use, and the options for biomass harvesting that are being explored include , in addition to its potential as a biofuel or feedstock, as biomass that can also be used to create heat/electricity or act as a carbon source for composting. One of the advantages of using the harvested cattails as compost is that nitrogen and phosphates are retained for added value, which also means that they can be used as mulch for fertilizing purposes in the agricultural sector.

The use a wastewater site (lagoon) was chosen to allow for the designing of prototype grow beds and processing equipment for harvesting an actual site, and also to assess the technology's potential using cattail platforms that could eventually be scaled for commercial applications in various bodies of water and ecosystems.

The bio-platforms could also provide the following, additional benefits: 1) They may help to dissipate waves and help to promote long-term sediment accretion that would enable natural vegetation to grow and 2) They may provide a restored habitat for wildlife and fish.

This project thus proposes the testing of an innovative technology to reduce nutrient loading in wastewater systems, with potentially wider commercial applications. With the ongoing implementation of stricter provincial guidelines (i.e., total phosphorus at the discharge point) concerning the management of municipal wastewater, this alternative treatment process will be studied to determine its efficacy at removing nutrients from wastewater in a rural, prairie context.

2) Odour nuisance; Is there any plan in place to monitor dissolved oxygen in the lagoon cell?

During initial trials of the cattail bio-platform system that was deployed at Fort Whyte Alive, no unusual odours were detected. Therefore, under normal operating conditions the proposed pilot project should create no unforeseen odour nuisances. Nevertheless, the dissolved oxygen will be monitored on a regular basis (weekly) by the lead researcher from the University of Manitoba as well as lagoon operators.

3) Pilot Project Timelines

The Cattail Bio-platform harvesting project will run over a 2 1/2 year period from the spring of 2017 to fall of 2019. The following are the milestones expected to be completed throughout the duration of the project:

2017 - Spring – Initial deployment of bio-platforms with rhizomes planted in cells for establishing roots system

2018 - August – First harvest using amphibious harvester

2019 - August – Second harvest with adaptations if needed for plant and harvesting technique improvements

2017 (Initial Deployment)

- Final development and construction of aquatic harvesting system will commence employing Curry design system and engineering services
- Install prototype cattail bio-platforms in rural wastewater treatment ponds for testing system as to its capability of removing phosphorus (P) and nitrogen (N)
- Bio-platforms will contain rhizome in soil mixture establishing roots for first year growth
- Bio-platforms will be housed in netted hooped shelters with side barriers to prevent avian and muskrat intrusion
- Sampling of cattail growth, soil and water at different stages of growth for lab testing
- The bio-platforms will remain in the water during the winter months for renewed growth the following spring (year 2)

2018 (First Harvest Season)

- The harvester is designed to cut, shred and deposit cattail into bin on the shore
- The cattail will be harvested in August when plant is richest in phosphorus and nitrogen
- Regular sampling of cattail growth, soil and water at harvest time for lab testing
- Shredded cattail will be tested as a compost on agricultural land as alternative fertilizer
- Agricultural field will be monitored as to the potential value of this new type of fertilizer
- Evaluate complete system of harvesting and modify design if needed
- The bio-platforms will continue to be deployed for year 3

2019 (Second Harvest Season)

- Identify cattail cell requirements for intake results
- Sampling of cattail growth, soil and water for lab testing
- Monitor results of agricultural field results for crop growth
- Harvest in year three and identify modifications for complete system
- Streamline any procedures within system related to handling of equipment
- Modify any parts of system for maximum efficiency
- Compile laboratory data to identify nutrient intake (translocation) of cattail shoots
- Evaluate opportunities using cattail for wastewater stabilization and subsequent use of shredded plant as compost fertilizer
- Determine ROI of harvesting system based on intakes of P & N for value proposition
- Begin commercialization & marketing phase / sale of biomass product

4) Operations for the pilot project, maintenance & harvesting

The pilot project will be operated by Curry Industries Ltd with additional staff to manage sites and conduct harvesting in collaboration with participating municipal wastewater managers throughout duration of the project. The management team will supervise installation of the system, maintain and monitor bio-platform performance throughout the development cycle. Water sampling and analysis of cattail shredding will be conducted by Dr. Qiuyan Yuan, PEng., Department of Civil Engineering, University of Manitoba.

5) Anchoring of bio-platforms in the lagoon and potential impact of anchoring cattails on lagoon liner integrity

It is proposed to use circular cement blocks with embedded steel loop in center to anchor the bio-platforms in the lagoon(s). These anchors will be positioned on bottom for attaching bio-platform floatation to prevent drifting. The weight of the cement will be design to accepted anchoring techniques currently being employed in wastewater ponds without degrading the integrity of the lagoon liner.

6) Subsequent use of harvested cattails

The system has been designed to harvest the cattails when the plant is richest in phosphorous and nitrogen. The cuttings are subsequently shredded by a forage cutter and deposited into a storage bin on the shoreline for further use. Options for biomass harvesting that are being explored include, in addition to its potential as a biofuel or feedstock, as biomass that can also be used to create heat/electricity or act as a carbon source for composting. One of the advantages of using the harvested cattails as compost is that nitrogen and phosphates are retained for these added-value purposes.

7) Influence of harvesting period on the nutrient removal rate and expected nutrient removal amount.

Macrophytes (cattails) play a crucial role in an aquatic ecosystem; they supply food and nutrients to native species that populate the habitat. Some macrophytes have unique absorptive qualities that allow them to remove nutrients from the water column. Cattails (Typha spp.) are a common macrophyte found in lagoons, wetlands and other bodies of water and have excellent absorptive qualities for phosphorus (P) and nitrogen (N).

By holding cattails within their structure, the bio-platforms have been designed to increase vegetative cover, while reducing levels of eutrophication through the sequestration of nutrients such as phosphorus and nitrogen, thereby preventing their release into the water column.

Using floating cattail bio-platforms, samples of water, in addition to above-ground and below-ground cattail tissue from the bio-platforms, can be taken and analyzed at regular intervals to be tested for change in total phosphorus concentration. This will enable the project team to observe the translocation of phosphorus throughout the cattail tissue, and to determine the mean total phosphorus before, during and after the growing season. This knowledge will lead to a better understanding of how harvesting cattail can be used to remove phosphorus and other nutrients from the water in order to mitigate eutrophic conditions.

In late summer and early fall, cattail above-ground shoots begin to die off and decompose in the water column, releasing their nutrients back into the water column. Cattails are perennial aquatic macrophytes and must have adaptations to survive harsh winter conditions. Prior to senescence, the shoots translocate the nutrients, such as nitrogen and phosphorus to the below-ground/root tissue to survive freezing and allow re-establishment the following spring.

Towards the end of the month of August, then, is when the cattail reaches its maximum growth and is richest in absorbed nutrients. It is at this time that harvesting will take place, thereby maximizing the load of the plant before the nutrients are allowed to migrate back down into the roots and water (beneath the floating platform) for the duration of the hibernation cycle. Once the cattails have been harvested, the absorbed nutrients will be completely removed from the water column.

Since this is the first study of bio-platform application **in a wastewater lagoon environment**, there is currently no data available on its nutrient removal efficiency. However, a research collaboration has been created with the researchers at the University of Manitoba. We will work closely on monitoring the nutrient dynamic of the lagoon through the year. At the end of each harvest, we will be able to calculate the nutrient removal amount. This information will be included in the annual progress report submitted to Manitoba Conservation and Water Stewardship.

8) Impact of ice thaw on the project

The lingering effects of the winter season did not have any impact on growing beds or bio-platform integrity at Fort Whyte. During the spring, the ice melts faster surrounding the bio-platforms. The thaw is a natural process that assists the plant in absorbing nutrients sooner than cattails that grow naturally in drainage ditches. A senior wetlands/uplands specialist at Native Plant Solutions indicated that climate is not an issue with lagoons generally across the province. Cold or extreme weather does not affect (kill) plants, but rather water that is too deep. A wastewater stabilization pond is a controlled environment with a relatively shallow water depth that is stable (i.e., controlled levels until time of discharge), and so it is not subject to unforeseen fluctuations (i.e., floods) as is the external, natural environment.

9) Contingency plans / risk management

The probability of success for this pilot project is high given the results that were obtained from the cattail harvesting system pilot project at Fort Whyte Alive, a project in which Curry Industries was also involved as the company began to explore design possibilities for floating cattail bio-platforms and their eventual deployment in municipal lagoons.

Of course, there is the distinct possibility that the project could be affected by extreme Acts of God. In this case, the practical approach would be to assess the catastrophic event and consult with stakeholders for potential solutions as well as for implementing adaptations to the project plan if necessary. This type of incident would be recorded and also placed on the agenda for evaluation of incidence on business opportunities in year 3.

10) Planned water sampling to demonstrate the impact of the cattails – frequency, parameters, etc.

The water sampling frequency will be as follows: April - October, weekly. November-March, monthly. The water sample parameters for analysis includes: BOD, pH, DO, temperature, total suspended solids, Nitrogen (ammonia and total nitrogen), Phosphorus (ortho-phosphate and total phosphorus), and *E.Coli*.

11) Proposed reporting to the department – when, what would be included in the report, etc.

At the end of each term agreed by the department and stakeholders the company will provide a update on all aspects of the system. This will include timelines on each project phase, targets met, improvement if needed and overall performance of system.

12) Any other work that is being done or has been done to reduce phosphorus loading from the wastewater treatment lagoon including applying alum, reducing infiltration, trickle discharge, etc.

The Rural Municipality of Taché will be applying Ferric Sulphate through surface broad casting in 2016 to reduce phosphorus levels prior to discharge. The municipality is also looking at long- term plan to pipe the effluent from the secondary cell from the Landmark Lagoon into the new secondary cell at the Lorette Lagoon where it will be mechanically filtered through a phosphorus filtration system designed by Nelson Environmental.

Qiuyan Yuan

Mailing Address: E1-368, Department of Civil Engineering, 15 Gillson St.
University of Manitoba, MB, R3V1L9

Email: qiuyan.yuan@umanitoba.ca

Phone: (204) 474-8604

RECENT RESEARCH & ENGINEERING WORK at the UNIVERSITY OF MANITOBA

- **Principal Investigator**: Evaluation the performance of the tire derived aggregate vs natural aggregate in septic field **2016-2017 NSERC ($130,280)**
- **Principal Investigator:** Development of high value-added products: from crushed glass to zeolite and novel filtration media, **2016-2019 Manitoba Liquor and Lottery ($116,100)**
- **Co-Investigator:** Effectiveness of recycled glass as a wastewater effluent filtration media: A pilot-scale demonstration in Dunnottar, Manitoba, **2016-2019 Manitoba Liquor and Lottery ($132,300)**
- **Principal Investigator**: Impact of pre-treated landfill leachate on biological nutrient removal from wastewater study **2016 URGP ($7,500)**
- **Principal Investigator**: Zero Waste from Organic Waste: Producing High Value Product and Compost **2015-2017 Green Manitoba ($50,000)**
- **Principal Investigator**: Improving understanding of the chemical and biological treatment kinetics of existing wastewater lagoon treatment – Phase II **2016 NSERC Engage Plus ($25,000)**
- **Principal Investigator**: Improving understanding of the chemical and biological treatment kinetics of existing wastewater lagoon treatment – Phase I **2015-2016 NSERC Engage ($25,000)**
- **Principal Investigator**: Characterization of tire-derived aggregate for septic field applications **2015-2016 NSERC Engage ($25,000)**
- **Principal Investigator**: Innovative use of compost at Brady Road Resource Management Facility **2015-2016 Mitacs Accelerate ($30,000)**
- **Principal Investigator**: Impact of pre-treated landfill leachate on biological nutrient removal from wastewater study **2014-2015 NSERC Engage ($25,000)**
- **Principal Investigator**: Sustainable algal wastewater treatment in the Canadian context with energy and phosphorus recovery **2014-2019 NSERC Discovery ($25,000/year)**
- **Principal Investigator**: Evaluation and enhancement of UltraZyme AquaCulture (UZAC) performance to reduce algal bloom **2014-2015 NSERC Engage ($25,000)**
- **Co-Investigator**: Evaluation of physico-chemical pretreatment methods for landfill leachate prior to sewer discharge **2014 NSERC Engage ($25,000)**
- **Co-Investigator**: Options for Improved Nutrient Removal and Recovery from Municipal Wastewater in the Canadian Context **2013-2015 Canadian Water Network ($15,000)**
- **Principal Investigator**: Optimization of low temperature algal nutrient removal from wastewater **2014 URGP ($7,500)**

- **Expert Reviewer**: Microbial consortia with biodegrading potential from Estonian graptolite argillite **2015 Estonian Research Council**
- **Expert Reviewer:** Biogas APADICS: Alkali Pretreatment-Anaerobic Digestion with Integrated Closed System **2015 SDSU Research Foundation**

EDUCATION

Ph.D. Major in Environmental Engineering Sept. 2006 – Feb. 2012
Department of Civil Engineering, University of Manitoba

PROFESSIONAL REGISTRATIONS

- **Professional Engineer (PEng)** Association of Professional Engineers of Manitoba

TEACHING EXPERIENCES

Undergraduate level:

Environmental Engineering Design (CIVL. 3700), Total students taught: 200

Hazardous Waste Treatment (CIVL.4350), Total students taught: 16

Graduate level:

Environmental Engineering Lab (CIVL 7950), Total students taught: 20

Solid Waste Composting and Disposal (CIVL 7210), Total students taught: 7

Theory of Waste Treatment (CIVL 7930), Total students taught: 8

WORKING EXPERIENCES

Assistant Professor July 2013-
Department of Civil Engineering, University of Manitoba

Design Specialist Jan. 2011-July. 2013
Stantec Consulting, Winnipeg, Manitoba, Canada
Projects:

- *SouthEnd wastewater treatment plant upgrade design*
- *Rural Municipality of Headingley Wastewater Treatment Plant Design Build Project*
- *Snow Lake Wastewater Treatment Plant Upgrade/Expansion Design Project*
- *Manitoba Hydro Generating Station: Limestone, Long Spruce, Miss Falls, Kettle and Notigi Domestic Water and Wastewater Treatment System Upgrade Project*
- *Banff Wastewater Treatment Plant Upgrade Project*
- *Manitoba Hydro BPIII HVDC Keewatinoow Converter Station Wastewater Treatment Preliminary Engineering Design*
- *R. M. of West St. Paul and St. Andrews Sewage Treatment Plant Design Project*
- *City of Flin Flon Wastewater Treatment Plant Operations and Troubleshooting Project*

- *Upgrade Lockport Wastewater Treatment Facility Project*

Research Assistant Sept. 2006- April 2011

Department of Civil Engineering, University of Manitoba, Manitoba, Canada

- Carry out multiple research projects
- Write research reports and proposal
- Supervise undergraduate students for the NSERC summer research projects

PUBLICATIONS

a. Articles in refereed publications:

1) Q.Yuan, M. Poveda, J. Jia, (2016) Study on the effect of landfill leachate on nutrient removal from municipal wastewater, Journal of Environmental Science, (In Press)
2) P. Jabari, G. Munz, Q. Yuan, J. Oleszkiewicz (2016) Free nitrous acid inhibition on biological phosphorus removal in integrated fixed-film activated sludge (IFAS) system, Chemical Engineering, Vol. 287 39-46.
3) F. Zurzolo, Q. Yuan, J. Oleszkiewicz (2015) Increase of soluble phosphorus and volatile fatty acids during co-fermentation of wastewater sludge. Waste and Biomass Valorization, DOI 10.1007/s12649-015-9443-7.
4) M. Poveda, Q. Yuan, J. Oleszkiewicz (2016) The effect of pretreatment methods on COD and ammonia removal from landfill leachate. International Journal of Environmental Science and Development, Vol. 7 (4)257-262.
5) Q.Yuan, R. Sparling, J.Oleszkiewicz (2015) Polyhydroxybutyrate production from municipal wastewater activated sludge with different carbon sources. Air, Soil and Water Research, 2015:8, 53-58.
6) M. Poveda, Q. Yuan, S. Lozecznik, J. Oleszkiewicz (2015) Evaluation of physico-chemical pre-treatment methods for landfill leachate prior to sewer discharge. Journal of Residuals Science & Technology, Vol. 12 (3), 165-175
7) M. Lashkarizadeh, Q. Yuan, J. Oleszkiewicz (2015) Influence of carbon source on nutrient removal performance and physical-chemical characteristics of aerobic granular sludge. Environmental Technology, Vol. 36 (7), 2161-2167
8) Q. Yuan, J. Oleszkiewicz (2011) Low temperature biological phosphorus removal and partial nitrification in a pilot SBR system. Water science & technology, 63(12), 2802-2807
9) Q. Yuan, J. Oleszkiewicz (2011) The effect of dissolved oxygen on the biological nutrient removal by denitrifying phosphorus accumulating organisms in a continuous flow system. Water Environment Research, 83, 2107-2114.
10) Q. Yuan, M. Baranowski, J. Oleszkiewicz (2011) No carbon addition needed. Biosolids Techn. Bull. WEF, 17 (1), 12-14.
11) Q. Yuan, R. Sparling, J. Oleszkiewicz (2011) VFA generation from waste activated sludge: Effect of temperature and mixing. Chemosphere, 82, 603–607.
12) Q. Yuan, R. Sparling, P. Lagasse, Y. M. Lee, D. Taniguchi and J.A. Oleszkiewicz, (2010)

Enhanced biological phosphorus removal with glycerol. Water science & technology, 61(7), 1837-1843.

13) Q. Yuan, J.A. Oleszkiewicz, (2010) Selection and enrichment of denitrifying phosphorus accumulating organisms in activated sludge. Desalination and Water Treatment, 22, 72-77.
14) Q. Yuan, M. Baranowski, J. A. Oleszkiewicz, (2010) Effect of sludge type on the fermentation products. Chemosphere, 80, 445–449.
15) Q. Yuan, J. Oleszkiewicz (2010) Biomass fermentation to augment biological phosphorus removal. Chemosphere, 78, 29-34.
16) Q. Yuan, J. Oleszkiewicz (2010) Interaction between denitrification and phosphorus removal in SBR phosphorus removal system. Water Environment Research 82(6), 536-540.
17) Q. Yuan, R. Sparling, J. Oleszkiewicz (2009) Waste activated sludge fermentation: Effect of solids retention time and biomass concentration. Water Research, 43, 5180-5186.

b. Book chapter:

Fungi in landfill leachate treatment in **Biodegradation and Bioremediation of Polluted Systems - New Advances and Technologies,** Edited by R. Chamy, F. Rosenkranz and L. Soler, ISBN 978-953-51-2238-8, 176 pages, Publisher: InTech.

c. Other refereed contributions-Conference Proceedings:

1) P. Jabari, Q. Yuan, J. Oleszkiewicz (2015) Potential of hydrolysis of particulate COD under long anaerobic condition to enhance Bio-P removal. IWA Nutrient Removal and Recovery 2015: moving innovation into practice, May 18-21, 2015. Gdansk, Poland.
2) M. Poveda, Q. Yuan, S. Lozecznic, J Oleszkiewicz (2014) Physical-chemical pre-treatment of Brady Load Landfill leachate, Global Waste Management Symposium, Jun22-25, 2014. Olando, USA.
3) S. Basu, Q. Yuan, B. Doug, A. Colin (2012) Treatment of Septic Wastewater with High Ammonia and Sulphide for Nutrient Removal – A Success Story at the Headingley Wastewater Treatment Facility. 84rd Annual Water Environment Federation Technical Exhibition and Conference, 2012, Chicago, USA.
4) Q.Yuan, S. Basu, J. Oleszkiewicz (2011) Phosphorus recovery: principle, technology and feasibility. West Canada Water Annual Conference and Exhibition, September 20-23, 2011. Saskatoon, Canada.
5) Q. Yuan, J.A. Oleszkiewicz, (2011) Low temperature biological phosphorus removal and partial nitrification in a pilot SBR system. Nutrient Recovery and Management 2011: Inside and Outside the Fence. 9-12, Jan. 2011, Miami, USA.
6) Q. Yuan, J.A. Oleszkiewicz, (2010) Biological nutrient removal by denitrifying phosphorus accumulating organisms in a continuous flow, one-biomass system. 83rd Annual Water Environment Federation Technical Exhibition and Conference, 2-6, Oct. 2010, New Orleans, USA.
7) Q. Yuan, R. Sparling and J.A. Oleszkiewicz, (2010) VFA generation from waste activated sludge: Effect of temperature and mixing. Proceeding: IWA World Water Congress &

Exhibition, 19 – 24, September 2010, Montreal, Canada

8) Q. Yuan, M. Baranowski, J. A. Oleszkiewicz, (2010) Acid sludge fermentation products vary with the type of sludge. Proceeding: Residuals and Biosolids 2010, Savannah, Georgia, USA.
9) Q. Yuan, J.A. Oleszkiewicz, (2010) Nutrient release from fermentation with different type sludge. Proceeding: Annual Conference and General Meeting of the CSCE-2010, 11th International Environmental Specialty Conference, Winnipeg, Canada.
10) Q. Yuan, R. Sparling, P. Lagasse, Y. M. Lee, D. Taniguchi and J.A. Oleszkiewicz, (2009) Enhanced biological phosphorus removal with glycerol. Proceeding: 2nd IWA Nutrient management in wastewater treatment process, Krakow, Poland, 2009. pp. 265-274.
11) Q. Yuan, J.A. Oleszkiewicz, (2009) Exploiting the value added products in activated sludge biomass, Proceeding: 5th Canadian Residuals and Biosolids Conference, Ontario, 2009.
12) Q. Yuan, J. Oleszkiewicz (2008). Interaction between denitrification and phosphorus removal in SBR phosphorus removal system. Proceeding: *81st Water Environmental Federal Technical Exhibition and Conference 2008, Chicago, USA. pp. 43-54.*
13) Q. Yuan, J. Oleszkiewicz (2008) Effect of different carbon sources on biological phosphorus removal and polyhydroxybutyrate production. Proceeding: *81st Water Environment Federal Technical Exhibition and Conference 2008, Chicago, USA. pp. 193-201.*
14) Q. Yuan, R. Sparling, J. Oleszkiewicz (2008) Production of polyhydroxybutyrate from industrial wastewater. Oral presentation: *International Water Association – Chemical Industries 2008, Beijing.*

d. Non-refereed contributions

1) Report for Canadian Water Network, (563 pages), 2015. J. Oleszkiewicz, D. Kruk, T. Devlin, M. Lashkarizadeh, Q. Yuan, S. Lobanov, D. Mavinic, G. Nakhla. B. MacBride, Options for Improved Nutrient Removal and Recovery from Municipal wastewater in the Canadian Context
2) Report for City of Winnipeg, Water and Waste Department (176 pages), 2010. J. Oleszkiewicz, JH, Hwang, Q. Yuan G. Munz. Digester #11 incident on Nov 29, 2009 North End Water Pollution Control Center, City of Winnipeg
3) Co-author of the lecture: Nutrient Removal in Small Systems: Principles, at Small system Nutrient Removal Seminar, 15-16, Jan. 2009, Winnipeg, Canada
4) Co-author of the workshop: Nutrient removal from wastewater in cold climate, at IWA World Water Congress & Exhibition, 19-24, Sept. 2010, Montreal, Canada
5) Reviewer since 2009 for the journals: Water Research, Bioresource Technology, Chemosphere, Journal of Hazardous Materials, Environmental Science and Technology

AWARDS

Laboratory Analyst Excellent Award, 2015, Western Canada Water Environment Association.

MEMBERSHIP ON COMMITTEES

- Member of Editorial Board of Journal of Environmental Technology, (2013 – present)
- Member of Canadian Society for Civil Engineering (CSCE) Technical Publication Committee, (2014-2016)
- Scientific committee member of Nutrient Removal and Recovery Conference 2011, 2013, 2015, 2016
- Program committee member of Water Environment Federation Nutrient Symposium 2015
- Organizing committee member of Solid Waste Association of North America Conference, 2015
- Organizing committee member of Manitoba Community for Women in Engineering, Science, Trades and Technology, 2015
- Organizing committee member of 2nd IWA conference: Nutrient Management in Wastewater Treatment Process, 2009. Krakow, Poland