

## SCHEDULE E

### GMF Reporting Submissions

#### Pilot Project Completion Report Template

Please do not hesitate to contact your project officer to receive an electronic copy of the Pilot Project Completion Report template.

***Upon completion of the Pilot Project, a copy of the Final Pilot Project Report must be submitted along with this Pilot Project Completion Report.***

FCM will post your report at its Green Municipal Fund website<sup>1</sup> because one of FCM's mandates is to help municipal governments share their knowledge and expertise regarding municipal environmental projects, plans and studies. Therefore, before you submit a report to FCM, make sure that you hold the copyright in the report (i.e. you own all the rights in the report and can decide who is allowed to reproduce and distribute the report).

#### Confidentiality

If your report contains any confidential information that you would prefer not be made available to the public (e.g. through a case study or other materials produced by FCM that relate to your project), please submit two versions of the report:

- 1. Complete report including confidential information:** Please clearly label this report with the word "**Confidential**". FCM will treat it as confidential.
- 2. Abridged report excluding confidential information:** This report may be posted on the FCM website and otherwise made available to interested third parties.

#### Instructions to complete the Pilot Project Completion Report

The objective of asking applicants to submit a Pilot Project Completion Report is to share the story of a community's experience in undertaking a Pilot Project with others seeking to address similar issues in their own communities.

For this reason, please write the report in plain language that can be understood by people who are not specialists on the subject. A Pilot Project Completion Report is typically in the range of 5-10 pages, but may be longer or shorter, depending upon the complexity of the Pilot Project.

GMF grant recipients must enclose **final** copies of the Final Pilot Project Report as completed for the municipality usually by a consultant and this Pilot Project Completion Report as completed for and/or by the municipality in electronic formats with their final Request for Contribution. The electronic copies of the reports, including all attachments and appendices, must be submitted in MS Word format (.doc or .docx) or PDF (searchable) format.

Portable Document Format (PDF). Reports that are not clearly identifiable as final reports, such as those displaying headers, footers, titles or watermarks containing terms such as "draft" or "for internal use only", will not be accepted by GMF. Additionally, reports must be dated.

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<sup>1</sup> <http://www.fcm.ca/home/programs/green-municipal-fund.htm>

If you have questions about completing this report, please consult GMF staff.

### Pilot Project Completion Report

|   |   |
|---|---|
| <b>GMF number</b>   | 15125   |
| <b>Name of the lead applicant (municipality or other partner)</b>                                     | Loyalist Township   |
| <b>Name, title, full address, phone, fax, e-mail of lead technical contact for this Pilot Project</b> | Rami Maassarani, P.Eng.<br>Project Coordinator<br>263 Main St, Odessa, ON, K0H 2H0<br><a href="mailto:rmaassarani@loyalist.ca">rmaassarani@loyalist.ca</a><br>613-386-7351 x102 |
| <b>Date of the Report</b>   | April 29 <sup>th</sup> , 2020   |

#### Introduction

1. Who was involved in doing the Pilot Project, and what are their affiliations? Please include name, title and contact information. Those involved could include municipal staff, engineering and other consultants, a representative from a nongovernmental organization, and others.

The project team was made up of staff from Loyalist Township and researchers from Queen's University, in Kingston, ON. The contact information of key team members is as follows:

- Rami Maassarani, P.Eng., Project Coordinator – Loyalist Township ([rmaassarani@loyalist.ca](mailto:rmaassarani@loyalist.ca))
- Jenna Campbell, P.Eng., Engineering Manager – Loyalist Township ([jcampbell@loyalist.ca](mailto:jcampbell@loyalist.ca))
- David Thompson, P.Eng., Chief Engineering – Loyalist Township ([dthompson@loyalist.ca](mailto:dthompson@loyalist.ca))
- Dr. Pascale Champagne, Director, Beaty Water Research Centre – Queen's University ([pascale.champagne@queensu.ca](mailto:pascale.champagne@queensu.ca))
- Dr. Geof Hall, Associate Director, Beaty Water Research Centre – Queen's University ([geoffrey.hall@queensu.ca](mailto:geoffrey.hall@queensu.ca))

#### The Pilot Project

2. Please describe the project objectives and the approach used to meet these objectives. Include details on what technology or solution was tested during the Pilot Project. (Indicate relevant sections/pages of the Final Pilot Project Report)

The Amherstview Water Pollution Control Plant (WPCP) uses a series of in-line lagoons as a disinfection step in the plant's treatment process. However, excessive algae growth in these lagoons would lead to high pH values in the plant's final effluent, putting the plant out of compliance with its Environmental Compliance Approval. A previous study demonstrated that the environment a natural wetland in the plant's receiving environment was able to rapidly attenuate the elevated pH values using natural processes.

The objective of the pilot project was to determine if converting one of the existing lagoons into a constructed wetland could be an effective way to attenuate elevated pH values in a passive and sustainable manner.

The Introduction and Design and Commissioning sections of the final report provide more information on the problem statement and proposed solution.

3. Did the pilot project include a methodology or approach for verifying or testing the performance of the technology or solution? Please respond Yes or No.

Yes [ X ]

No [ ]

If you answered yes to Question #3, which methodology did you use in this pilot project for testing the performance of the technology or solution?

- Environmental Technology Verification Program
- Engineering Consultant
- Other (please specify): Data collected as part of the plant's regulatory monitoring requirements was used to monitor the effectiveness of the constructed wetland. Data was analyzed by Township staff, in collaboration with researchers from Queen's University.

### **Pilot Project Results:**

4. What are the Pilot Project's recommendations? (You may point to the relevant sections/pages of the Final Pilot Project Report if relevant.)

The Pilot Project has demonstrated that a Constructed Wetland can effectively attenuate high pH values from the effluent of disinfection lagoons, particularly during the spring, summer, and early fall.

More information on the Pilot Project's findings can be found in the Analysis, Lessons Learned, and Future Opportunities sections of the final report.

5. Is the Pilot Project *technically feasible* for full-scale implementation? Please comment on why or why not.

Yes, the project is technically feasible for full scale implementation. The constructed wetland at the Amherstview WPCP was designed as a pilot system to facilitate research, both current and future. The presence of multiple parallel trains within the wetland allows for a side by side comparison of different parameters, such as planting substrate, varying flow rates, water depths, etc.

A full-scale system would have a similar design to the pilot scale wetland developed as part of this project. However, a full-scale system would not necessarily require the same level of complexity to achieve the desired results.

6. What were the financial results of the Pilot Project and is the Pilot Project *financially feasible* for full-scale implementation? Please comment on why or why not.

Yes, the pilot project has demonstrated that a full-scale constructed wetland is a financially feasible method to attenuate high pH streams from disinfection lagoons. The capital costs associated with the construction of the wetland were significantly lower than the alternative, which would have involved replacing the lagoons with a more traditional system, such as a chlorination/de-chlorination or UV irradiation facility.

Furthermore, the passive treatment processes of the constructed wetland will result in substantially lower operational costs when compared to the alternative solutions listed above.

7. Please complete the following table that was part of your pilot project application with the actual results from your pilot project. Please also provide the page numbers where the environmental results of the pilot project can be found in the final report.

| Parameter  | Units | Baseline | Actual     | Notes  |
|------------|-------|----------|------------|--|
| pH         | -     | 10.2     | 9.5 to 7.5 | Significant pH reduction observed during monitoring.   |
| TP         | mg/L  | 0.4      | 0.3        | Slight decrease in TP concentration observed but not within statistical significance. Additional monitoring required.  |
| Alkalinity | mg/L  | 160      | 160        | No change as anticipated compared to baseline  |
| TSS        | mg/L  | 3.8      | 3.3        | Slight decrease in TSS concentration observed but not within statistical significance. Additional monitoring required. |
| CBOD       | mg/L  | 2.3      |            | Parameter not monitored  |

8. Please describe all of the environmental results including any potential negative results or trade-offs that need to be considered.

The addition of a constructed wetland to the treatment process at the Amherstview WPCP will reduce the likelihood of non-compliant pH values in the plant's final effluent. The wetland could provide additional environmental benefits by providing additional treatment to the plant's effluent stream, however additional studies and monitoring will be required before any conclusions can be drawn. This could include additional removal of nutrients (phosphorous and nitrogen) or emerging contaminants.

A potential negative impact resulting from this project could occur when vegetation within the system dies off and begins to decay, at which point an increase in nutrients may take place. It is anticipated that the negative effects from plant die-off will be minimal,

9. Based on the experience gained in the pilot, please update the anticipated social and economic outcomes (community benefits) of full scale implementation of the pilot project. Column B of the following tables shows the anticipated economic and social benefits you noted in your application.

Please complete the table below by describing in Column C the anticipated economic benefits of the pilot project at full scale implementation. Please complete for all that apply in the list below. If there are additional economic benefits, please describe these in the last row of the table.

Figure 1 – Economic benefits

| A  | B  | C   |
|--|--|---|
| <b>Economic benefit</b>                  | <b>As described in your GMF application.</b>   | <b>Anticipated economic benefits of the pilot project at full scale based on pilot experience.</b><br>If the result is different than what was expected in the application form, please indicate <b>why</b> |
| Increased return on investment           |  |   |
| Deferred or avoided capital expenditures | If the constructed wetland was not used to attenuate pH at the end of the polishing lagoons, | The constructed wetland successfully attenuated elevated pH values from the treatment   |

|   |   |   |
|---|---|---|
|   | alternate disinfection measures would likely need to be implemented. These measures would require extensive capital outlay estimated to be \$3 to \$5 million if UV irradiation was the chosen disinfection method. Another alternative would be chlorination followed by dechlorination, which has been found by the Township to have a higher life-cycle cost than UV disinfection.                               | stream of the Amherstview WPCP. As such, the need for alternative measures, such as UV irradiation or chlorination/de-chlorination systems, was no longer necessary, thereby avoiding significant capital expenditures.   |
| Decrease in facility operating or maintenance costs   | Operating and maintenance costs for the constructed wetland will be very limited and there will be no regular operating costs. Regular operating costs such as hydro or chemical costs would be extensive if UV irradiation or chlorination/dechlorination were used in place of the polishing ponds. Chemicals costs would also be high if chemicals were used to attenuate pH instead of the constructed wetland. | The constructed wetland operates in a passive manner and does not require any energy or chemical inputs to attenuate high pH values.<br><br>The implementation of this natural system has therefore resulted in a significant reduction in operating costs when compared to UV irradiation of chlorination/de-chlorination systems. |
| Extended lifespan for facility  |   |   |
| Increased municipal revenue streams (e.g. property tax, user fees, etc.)                    |   |   |
| Lower taxes   |   |   |
| Stimulus for local economy (use of local business, capacity for local business development) |   |   |
| Increased employment options or job retention   |   |   |
| Increased transit ridership   |   |   |
| Attraction of new businesses  |   |   |
| Other (please specify)  |   |   |

10. Please complete the table below by describing in Column C the anticipated social benefits of the pilot project at full scale implementation. Please complete for all that apply in the list below. If there are additional social benefits, please describe these in the last row of the table.

Figure 2- Social benefits

| A               | B                                     | C  |
|-----------------|---------------------------------------|--|
| Social benefits | As described in your GMF application. | Anticipated social benefits of the pilot project at full scale |

|   |  |  |
|---|--|--|
|   |  | <b>implementation based on pilot experience</b><br>If the result is different than what was expected in the application form, please indicate <b>why</b>                                   |
| Improvements to public health                                     |  |  |
| Improvements to public safety                                     |  |  |
| Improvements to community quality of life                         |  |  |
| Increased opportunities for community engagement                  | Upon completion of the project, members of the public will be able to schedule tours of the sewage plant and be learn about constructed wetlands and their benefits.   | Township Staff have already begun giving tours of the constructed wetland.   |
| Increased public education or awareness                           |  |  |
| Community revitalization  |  |  |
| New housing and infrastructure                                    |  |  |
| New or enhanced public space or public facilities                 |  |  |
| Improved access to recreation and physical activities             | This project will allow members of the Kingston Field Naturalist to continue accessing the premises of the treatment plant for the purposed of monitoring and counting waterfowl/shore bird migrations as part of their ongoing census operations for migrant birds through the Kingston area during the spring, late summer and fall seasons. | The Kingston Field Naturalists were able to regain access to the site upon the completion of construction and have resumed monitoring the migration patterns of waterfowl and shore birds. |
| Reduced urban sprawl  |  |  |
| Increased civic pride, ownership and participation                |  |  |
| Improved quality and efficiency of service provision to residents |  |  |
| Reduced opportunities for crime                                   |  |  |
| Other (please specify)  |  |  |

## **Lead Applicant's Next Steps**

11. What next steps does your municipality plan to take based on the findings and recommendations of the Pilot Project?

The constructed wetland will continue to be used to conduct research on the effectiveness of these systems as part of the treatment process for wastewater treatment plants in smaller, rural municipalities. Specifically, the removal of emerging contaminants in wastewater streams is of particular interest.

Additional information can be found in the Future Opportunities section of the Final Report.

## **Lessons Learned**

In answering the questions in this section, please consider all aspects of the Pilot Project—from the initial planning through each of the essential task until the Final Report of the Pilot Project was prepared.

12. What would you recommend to other municipalities interested in doing a similar Pilot Project? What would you do differently if you were to do this again?

Yes, the installation of a constructed wetland as part of the treatment process of the Amherstview WPCP has proven to be an effective solution in addressing pH values. When compared to traditional disinfection solutions such as chlorination/de-chlorination or UV irradiation, the lower capital and operating costs of a constructed wetlands make them an attractive solution for smaller and rural municipalities that have enough space to install these systems.

One major lesson learned during this project was that early involvement of operations staff during the design phase of a project is extremely beneficial. Specifically, input received from plant operators resulted in the development of a simple yet effective flow control structure that addressed the hydraulic issues which occurred when the system was first commissioned.

13. What barriers/challenges (if any) did you encounter in doing this Pilot Project? How did you overcome them?

The major barriers in this project pertained primarily to controlling the depth and flow of water through the constructed wetland. The ability to control water depths in the system, especially during the planting phase, is crucial to creating the proper growth conditions for vegetation.

These barriers were overcome through the in-house design and construction of flow control structures which were installed throughout the wetland, allowing for greater control of water depth within individual cells.

## Knowledge Sharing

14. Is there a website where more information about the Pilot Project can be found? If so, please provide the URL.

In addition to the Pilot Project results, has your Pilot Project led to other activities that could be of interest to another municipality (for example, another pilot project, sharing of the results of this pilot project with other municipalities formally or informally, changes to existing policies and/or practices etc.)? If so, please list these outcomes and include copies of the relevant documents (or website links).

N/A

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