



SP0158 Final Report

Please answer the following questions and return the completed form to the [SPF Staff](#) via e-mail.

Project Title: Sustainable Rainwater and Flood Management

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Actual Project Start Date: [Click here to enter a date.](#) **Actual Project End Date: 5/15/2018**

1. Please summarize the project and its key accomplishments in 1-2 sentences.

(400 characters maximum)

Develop a sustainable and cost-effective rainwater management plan for McGill's downtown campus to sustainably capture rainwater on site and address flooding. The main accomplishments are a sustainable master plan tested through PCSWMM simulations and hydraulic designing of two sustainable measure for on-site implementation.

2. Your team listed the following goal in your application:

To supplant traditional and archaic forms of rainwater management by developing and implementing a comprehensive and low cost campus rainwater management plan to sustainably capture rainwater on site and address flooding.

Did your team achieve your project's goal? In your answer, please describe the impact your project had on McGill's structures, processes, and/or systems. Also, please specify how this positively transformed people's behaviors/perspectives/habits on McGill campus(es).

(Unlimited characters, suggested minimum ½ page or approximately 250 words)

Yes, we successfully achieved the expected goals of the project. The project was supposed to have two expected outcomes. First, we wanted to provide a low cost and sustainable rainwater management system plan for McGill's downtown campus. Second, we wanted to implenet two measures for demonstration purposes to educate students, staff, and the public. The first objective has been achieved, and the second will be achieved shortly (once the weather is more appropriate) through successive project stages such as data collection, stakeholder engagement, alternative management scenarios evaluation through PCSWMM simulations, and preparation of a master plan. The implementation and demonstration of low impact development (LID) measures, and finally, on-site visits and tours to promote and educate the McGill community about McGill's new sustainable rain and flood water plan will occur this spring/summer.

The project started late and faced many challenges such as significant data limitations, a lack of underground drainage infrastructure details, uncertainty in estimating soil hydrological parameters necessary for the hydraulic design of LIDs, and severe weather which delayed onsite construction. However, the SPF design and planning team managed to address these challenges and successfully designed a master plan, including a hydraulic design and detailed implemented measures. In addition, McGill students and staff were engaged at all stages of the project to promote social awareness and learning about sustainable rain and flood water management. Another important component of the project was stakeholder engagement. The purpose of the stakeholder engagement was to obtain insights and recommendations for the stormwater management of McGill University's downtown campus. It also helped in promoting McGill's new sustainable rain and flood water master plan among different groups. An attempt was made to involve participants with

diverse interests and areas of expertise. The process for stakeholder engagement was carried out over a period of approximately six weeks.

3. Please describe the key successes and challenges of your project. (Minimum of two examples for each)

(Unlimited characters, suggested minimum ½ page or approximately 250 words)

The limited data available in terms of rainfall, discharge, soil hydrological properties, etc., and uncertainty regarding the layout of underground structures were the most significant challenges. Detailed correspondence with climatologists at Environment and Climate Change Canada, the Director of the Radar Observatory at McGill, and using the website of Adjusted and Homogenized Canadian Climate Data (AHCCD), helped in addressing rainfall data issues, while 140 years of daily data from three meteorological stations (McGill, McTavish and Montreal/Saint-Hubert A) within a 5 km radius was collected. Moreover, soil survey maps created by the Canadian Soil Information Service (CanSIS), Agriculture and Agrifood Canada were helpful in providing information regarding soil hydrological characteristics. Links between network elements remains unclear despite our best efforts; as such, we cannot do a better assessment of the network existing within the model. Challenges of modeling the existing drainage network in PCSWMM were successfully accomplished through a physical survey by verifying the existing drainage network details on GIS maps.

The most significant success was stakeholder engagement using individual semi-structured interviews. Stakeholders of diverse interests and areas of expertise were engaged to obtain insights and recommendations for the stormwater management of McGill's downtown campus. Eleven stakeholder groups were engaged. Stakeholders helped in sorting the most feasible nonstructural measures that could be applied to the lower campus. This process also helped in engaging and educating students, staff, and the public about the project. Another success was developing a PCSWMM model for the downtown campus under the significant constraints of limited information. The model can be used in the future for developing and checking different sustainability plans and will also be used to provide learning opportunities.

4. What key points of advice or *lessons learned* would you give to other SPF teams either regarding your experience managing your project or the project itself?

(Unlimited characters, suggested minimum ½ page or approximately 250 words)

According to the nature of the project, we suggest involving graduate students in a project (in addition to undergraduate students). However, we also noticed that due to the short stay of most students on campus (2-4 years), it is difficult to maintain continuous student participation in sustainable projects (e.g., longer than 3-4 months). While students are a great resource and have the power to push for change on campus, not all of them are aware of sustainable stormwater management practices and so the learning curve can be steep. In light of this, we recommend having at least one graduate student who is an 'expert' on the topic of the SPF project be involved throughout the entire project with the different undergraduate students. This will likely be very beneficial.

Another issue which one needs to consider during the implementation of structural measures on the lower campus are the number of trees and their extensive root networks. During the stakeholder phase of the project, most of the stakeholders suggested that any of the structural measures would have to work around the layout of trees and roots. They further warned that if structural measures were applied to the lower campus, students, staff, and administrators may react negatively to further construction on campus. Furthermore, funding and long-term maintenance are issues because the university may not have available funds to repair damage accrued over time. We also recommend focusing more on on-site data collection and asking questions about uncertain data during stakeholder engagement processes. Although these issues are specific to our project, most SPF projects should focus on identifying and engaging key stakeholders to ensure that issues that the SPF team might not have considered, are considered.

5. What recommendations do you have for the future of this project to be continued and are there any opportunities for complementary projects? Who will take responsibility for the project's future and how can interested persons be in touch? The SPF team will also be in touch with this contact for updates on the project's progress in coming years, if ongoing.

(Unlimited characters, suggested minimum 1 paragraph)

Sustainable stormwater management has become a concern for the design and layout of McGill University’s downtown campus. Under the City of Montreal’s by-laws, McGill University must implement stormwater management measures that will reduce the flow rate of runoff on campus. This will require the application of measures that reduce runoff velocities and volume and hence highlights the need for SPF or similar projects to be continued. In addition, we think this project has had, and will have, many positive impacts in terms of improving campus landscaping, flood water management, and social awareness. Another aspect is the repair and maintenance requirement of implemented measures, which highlight the need for a complementary project. Continuation of the SPF will help in further implementation of the proposed master plan and will support increasing biodiversity and the restoration of natural hydrological cycles for McGill's downtown campus.

In the future (post implementation), McGill's Buildings and Grounds department will be tasked with regular maintenance of the systems given that the implemented measures involve landscaping practices and that the water collected in the rain barrels will be used by the Grounds team. This has been agreed upon by Mr. Philippe St-Jean, a partner in our project.

6. Would you or your project team member(s) be willing to serve as a mentor to SPF project teams?

Please choose one. If yes, SPF Staff will contact you with more information. (800 characters maximum)

Yes No

7. In your application, you listed the following sources of funding: Professor Adamowski will provide some funding from his budget. Ultimately, funding to build all the components of the rain and flood management system will come from the FMAS department as part of the city’s requirements for them to manage the rainwater related to the Leacock terraces, McTavish Gates and Roddick Gats renovations (among others). They have already committed 60 000 + tax to collect the data we need.

Please confirm if you received this funding in the space below. In your response, please list the actual amount (in dollars) that you received. Note: If you received funding from a McGill Department or Unit, please attach a letter from its Financial/Budget Officer confirming the actual amount of support.

(1,800 characters maximum)

Dr. Adamowski provided significant funding to both Dr. Khalil (around 25 000\$) and Dr. Baig (around 30 000\$).

Facilities Management and Ancillary Services (FMAS) spent \$38,980 on the project so far with another \$16,000 earmarked to complete the master plan. This has been confirmed by Mr. Philippe St-Jean, a partner in this project.

8. Did you purchase equipment or make an installation on campus? Yes No

If yes, please briefly describe how these items will be maintained and used in the future.

(1,800 characters maximum)

McGill's Buildings and Grounds department will be tasked with regular maintenance of the systems given that the implemented measures involve landscaping practices and that the water collected in the rain barrels will be used by the Grounds team.

9. The following Key Success Indicators were indicated in your project application and selected for tracking. Please indicate the actual results that you have achieved in the "Actual" column.

Selected Key Success Indicators	Target	Actual
# of selected volunteers engaged on project (target 3 per semester)	6	6
# of measures of the McGill Sustainable Rain and Flood Water Master Plan implemented by November 1, 2017	2	0
# of tours given on campus to promote and educate about the new McGill Sustainable Rain and Water Master Plan by December 1, 2017	15	10

If there is a significant difference in the target numbers and the actual numbers achieved, please explain. If you have any additional information to share about these success indicators, please also include it below.

(1,800 characters maximum)

<p>The performance with respect to key indicators mentioned above indicates that the project is progressing well. Some targets such as the implementation of LID measurements and on campus tours still need to be met. Implementation of management measures was delayed due to winter conditions. We are hoping to complete it by the end of April 2018. Until now, in spite of challenges and study breaks, a promising number of students have been engaged. More engagements and tours are expected in May 2018 after the implementation of two further LID measures.</p>
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10. Please report on your results for the standard SPF Key Success Indicators in the "Actual" column.

Standard SPF Key Success Indicators	Actual #
# of volunteers directly or indirectly engaged in the project	20
# of people (student, staff, or other) trained in the context of the project	10
\$ raised for project activities subsequent to SPF funding	0
# of partnerships or collaborations developed between the project team and other McGill administrative units, student groups, community groups, other universities, and/or other groups/organizations.	15

Regarding the last Key Success Indicator, please list the groups and/or organizations that you counted.

(Unlimited characters; point form acceptable.)

McGill Bioresource Engineering Department

<p>University of Montreal Faculty Members Utilities and Energy Management Department Campus and Space Planning Department McGill's Farmers' Market Post Graduate Student' Society (PGSS) Students' Society of McGill University (SSMU) Buildings and Grounds Department McGill Office of Sustainability (MOOS) Green infrastructure expert Landscape architect Faculty members at McGill University Cocordia University Faculty members Local vendors Computational hydraulics international (CHI)</p>

If you have any additional information to share about the Standard SPF Key Success Indicators, please include it below. (1,800 characters maximum)

11. Please indicate the McGill stakeholder groups that were involved with your project as a team member or collaborator/partner. Choose all that apply.

- Undergraduate
 Postgraduate
 Administrative Staff
 Academic Staff
 Alumni

12. Please rate your project team’s overall satisfaction with the support provided by the SPF Staff. Choose only one response.

- Very Dissatisfied
 Dissatisfied
 Neither Satisfied Nor Dissatisfied
 Satisfied
 Very Satisfied

13. Please provide any feedback or recommendations regarding your team’s experience with the SPF.

(Unlimited characters, suggested minimum 1 paragraph)

Under the City of Montreal’s by-laws, McGill University must implement stormwater management measures that will reduce the flow rate of runoff on campus and keep it within a limit of 35 liters per hectare per second. During our site investigations, PCSWMM modeling exercise and stakeholder engagement we observed that the green infrastructure considered might not meet this criterion. However, the combination of green infrastructure, conventional measures, and nonstructural measures were quite feasible for the lower campus.

14. If there is additional information you would like to share about your project, please use the field below.

(Unlimited characters)

15. Has involvement in this SPF project positively impacted your team in the area of professional growth?

Please choose one. If you would like to elaborate, please use the field below. (800 characters maximum)

- Yes
 No
 Prefer Not to Share

16. Has involvement in this SPF project positively impacted your team in the area of personal growth?

Please choose one. If you would like to elaborate, please use the field below. (800 characters maximum)

- Yes
 No
 Prefer Not to Share

17. Which of the following skills or attributes has your team improved through involvement in your SPF project? Choose all that apply.

- | | | |
|--|--|--|
| <input type="checkbox"/> Budgeting | <input type="checkbox"/> Negotiating | <input checked="" type="checkbox"/> Stakeholder Engagement |
| <input checked="" type="checkbox"/> Communications | <input checked="" type="checkbox"/> Networking | <input checked="" type="checkbox"/> Stakeholder Identification |
| <input type="checkbox"/> Conflict Resolution | <input checked="" type="checkbox"/> Planning | <input checked="" type="checkbox"/> Systems Thinking |
| <input type="checkbox"/> Leadership | <input type="checkbox"/> Problem Solving | <input checked="" type="checkbox"/> Teamwork |
| <input checked="" type="checkbox"/> Listening | <input checked="" type="checkbox"/> Project Management | <input type="checkbox"/> Technology |
| <input checked="" type="checkbox"/> Mentoring | <input checked="" type="checkbox"/> Public Speaking | <input checked="" type="checkbox"/> Time Management |

Writing

Other (Please specify in

the field below)

Other: Modeling and simulation, Alternative scenario management analysis, Sustainable master plan development

18. Since starting your SPF project, has your team improved its knowledge of sustainability?

Please choose one. If you would like to elaborate, please use the field below. (800 characters maximum)

Yes No Prefer Not to Share

The project helped my team in understanding process of stakeholder engagement for sustainability, environmental management and development of sustainable plans through computer modeling.

19. (Optional) If applicable, please list the total number of team members voluntarily self-identifying as members of marginalized communities:

Please identify the represented communities below. (e.g. women, Indigenous people, people of colour, LGTTQI, student parents, members of ethnic minorities, immigrants, people with disabilities)

(1,800 characters maximum)

Thank you for completing your Final Report!

Please e-mail your report to the [SPF Staff](#) attaching any additional information that you would like to share about your project (e.g. other reports, research, documents, photos, etc.). Please note that this Final Report will be shared publicly on your SPF project's webpage.