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## WATERSHED MANAGEMENT

### Master Drainage & Flood Remediation Plans

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#### Six Nations Master Drainage and Flood Remediation Plan for the McKenzie Creek Watershed

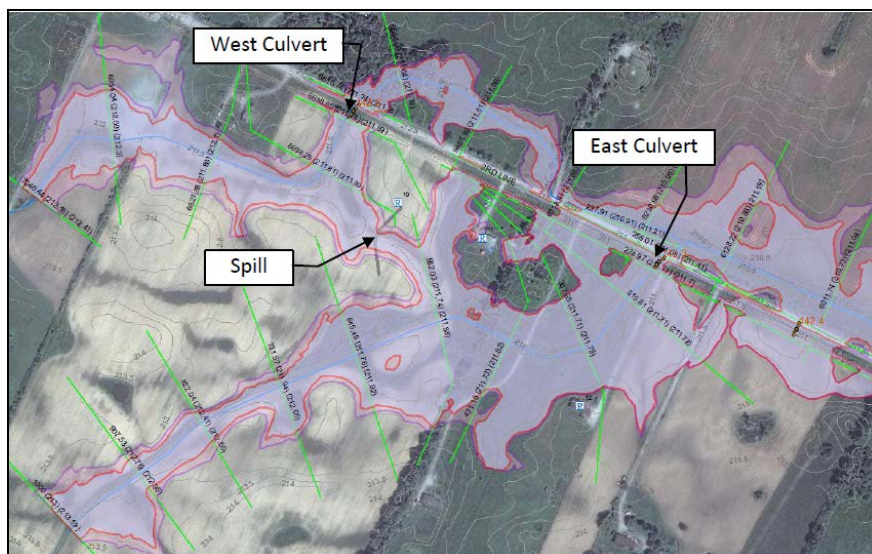
*Client: Six Nations of the Grand River First Nation*

The Six Nations of the Grand River Territory Elected Council (Six Nations) retained GREENLAND® to produce a Master Drainage and Flood Remediation Plan (MDFRP) for the McKenzie Creek Watershed. This MDFRP was part-of a Phase '1' Clean Water Plan proposed to be completed (also by GREENLAND®) for the Six Nations over a few years. The type of flooding investigated was watercourse related caused by inadequacies in the capacity of the creek channel and culvert crossings and which causes flooding to adjacent uses. The MDFRP had regard for climate change adaption and identified solutions using cost-benefit and life cycle costing factors.

GREENLAND® used existing site data and collected stream monitoring data with assistance from members of the community, to generate a hydrologic and hydraulic models of the McKenzie Creek Watershed. These models were verified using observed records and were used to generate flood lines for expected (frequent) storm events, as well as the local Regional storm.

Flood Damage Centres were identified using the flood lines. Within the Flood Damage Centres, GREENLAND® performed a Flood Damage Assessment and determined the Flood Mitigation Options. A Benefit-Cost Analysis was completed to determine the most cost effective solutions.

The final project deliverable (delivered in 2017) included a Master Drainage and Flood Remediation Plan report that marked the first time the community had floodplain mapping to protect existing development and future growth from flooding. This report documented the methodology of creating the hydrologic and hydraulic models used to generate the flood lines, as well as all flood mitigation options and cost-benefit analyses within the flood damage centres.





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## WATERSHED MANAGEMENT

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### Master Drainage & Flood Remediation Plans

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#### **Six Nations & MNCFN Master Drainage and Flood Remediation Plans for the Boston Creek and Rogers Creek Watersheds**

*Clients and Locations: Six Nations of the Grand River Territory and Mississaugas of the New Credit First Nation*

The elected councils of Six Nations of the Grand River Territory (Six Nations) and Mississaugas of the New Credit First Nation (MNCFN) jointly retained GREENLAND® in 2018 to produce the “second of two” Master Drainage and Flood Remediation Plans (MDFRPs) in the area, and specifically for the Boston Creek and Rogers Creek Watersheds. In-kind ISWMS™ models (GREENLAND®) were also prepared for the project.

Awarded thereafter from the well-received McKenzie Creek Watershed MDFRP, this project fell under Phase ‘1’ of an original Clean Water Plan Proposed submitted by GREENLAND® (and in association with Stragis Environmental Services). The type of flooding investigated through this work was watercourse related and has been caused by inadequacies in the capacities of channel or culvert crossings, which in turn cause flooding to adjacent uses. This MDFRP also had regard for climate change adaption and identified solutions using cost-benefit and life cycle costing factors.

GREENLAND® utilized site inventory data and stream monitoring data collected with assistance from Community staff, to generate a hydrologic and hydraulic model of the Boston Creek and Rogers Creek Watersheds. These models were also verified using observed records and then used to generate flood lines for expected storm events, as well as the local Regional Storm. GREENLAND® also assisted both communities by completing a successful funding application to the Federal National Disaster Mitigation Program to undertake this important project too.



Flood Damage Centres were identified using the flood lines. Within the Flood Damage Centres, GREENLAND® completed a Flood Damage Assessment to determine various Flood Mitigation Options. A Benefit-Cost Analysis was also undertaken to determine the most cost-effective solutions.

The final project deliverable (completed in 2019) included flood plain mapping and Master Drainage and Flood Remediation Plan report. This report documented the methodology of creating the hydrologic and hydraulic models used to generate the flood lines, as well as all flood mitigation options and cost-benefit analyses within flood damage centres.





December 2, 2019

Mr. Jim Hartman, P. Eng., Senior Associate  
Greenland International Consulting Ltd  
120 Hume Street  
Collingwood, ON L9Y 1V5

**Re: Six Nations Master Drainage and Flood Remediation Plan (MDFRP) for the  
McKenzie Creek, Boston Creek and Rogers Creek Subwatershed**

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Dear Jim:

On behalf of the Public Works Office of the Six Nations of the Grand River, we would like to thank Greenland International Consulting Limited for the work completed to prepare the Master Drainage and Flood Remediation Plan (MDFRP) for both the Boston Creek and Rogers Creek subwatersheds, as well as the McKenzie Creek Subwatershed. These findings have enabled our office to identify all flood prone residences, building structures and other infrastructure throughout these subwatersheds with the flood plain mapping that has been prepared as part of this assignment.

Greenland has been integral to assisting our Office with identifying and prioritizing the remedial projects to mitigate flooding in the McKenzie, Boston and Rogers Creek subwatersheds that flow through our Community. We also appreciate Greenland's effort in assisting the Six Nations of the Grand River with the preparation of funding applications to secure the resources to complete these remedial works. We are convinced that this MDFRP completed for McKenzie Creek, Boston Creek and Rogers Creek can be used as a template for completing similar drainage and flood remediation works both locally and in other First Nations.

It has been a pleasure to do business with your team and Six Nations of the Grand River looks forward to working with Greenland again in the future. On a personal note, I would be pleased to serve as a professional reference when your firm bids on future projects.

If you have any questions or concerns, please do not hesitate to contact me.

Respectfully,

**Michael R. Montour**  
**Director of Public Works**  
**Six Nations of the Grand River**

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