South Nation
CONSERVATION
de la Nation Sud

2017 Summary Report: Regional Biodiversity Funding Program Ontario Power Generation
SOW # 2017-JW-01-02

January 2018

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Executive Summary

South Nation Conservation received funds from the OPG Regional Biodiversity Funding Program to partner with the United Counties of Prescott-Russell (UCPR) for a combined lakes/rivers and wetlands restoration project in Larose Forest for the 2017-2019 period. Larose Forest is owned and managed by the United Counties of Prescott-Russell who operate the forest for recreation, timber production and wildlife.

SNC is working with UCPR to restore an area that was planted as a Red Pine plantation that experienced localized die-off due to wet conditions. A 0.5-hectare salvage cut completed five years ago created an opportunity for SNC to develop a project that consists of wetland restoration, channel naturalization and an increase to native plant biodiversity. Activities outlined by year include:

Year 1: Establish baseline conditions of the site, site preparation, design and restore approx. 1,500 meters of channel re-configuration.

Year 2: Site preparation of salvage cut, design and excavation of vernal pools and design of planting scheme.

Year 3: Site stabilization of excavated area with native plantings/seeding, communications and outreach, and effectiveness monitoring.

Activities completed in Year-1 include an inventory of plants at the site, design of the restored channels, brushing and clearing along the channels for access, and restoring the channels following the prepared design. All activities occurred within Lots 26-27, Concession 5 of Clarence Township. This section of Larose Forest is partially Red Pine plantation, with areas of natural re-growth. The three channels were flagged to identify the areas requiring vegetation removal which provided access for the excavator to work on restoring the channels. The brushing and clearing activity was completed on September 27th, 2017.

Once access routes were created, the existing channels were then re-configured to have a less linear shape. The excavator added meanders and “zig-zags” to help re-create channel sinuosity. Natural sloughing, erosion and deposition during high-water periods (typically spring frechet) will, over time, further shape the channel into a more natural form. The channel excavation was completed on November 29th, 2017. Native plants and live-cuttings will be added beginning in the spring of 2018, as the project progresses, to further naturalize and add biodiversity to the project area.

1.0 Introduction

South Nation Conservation

South Nation Conservation (SNC) has a strong history in watershed management and leadership in applying sustainable practices. As an agency established under the Conservation Authorities Act of Ontario in 1947, SNC has decades of practical experience in protecting our environment and engaging communities. Today, SNC employs more than 50 staff while leading hundreds of stewardship projects to success, throughout a 4,384 km2 jurisdiction in Eastern Ontario.

Vision

'Improved Water Quality for a Healthy Ecosystem: Our vision encompasses water levels which satisfy the needs of humans and the environment, healthy rivers and natural shorelines, and safe wastewater management practices.'

Expertise

Conservation is our core competency. SNC offers natural resource management expertise and experience to help our partners contribute to a healthy region. These contributions include forest, wetland, wildlife, fisheries, urban trees, floodplain, natural hazards and water management. Community education and awareness initiatives are also an important component of our conservation efforts.

Working Together

As one of Ontario's 36 Conservation Authorities, SNC protects and restores regional ecosystems. We do this in partnership with 16 Municipalities, comprising portions of: United Counties of Prescott and Russell; United Counties of Stormont, Dundas and Glengarry; United Counties of Leeds and Grenville; and the City of Ottawa. The member municipalities appoint a 12-member, plus past chair, Board of Directors to govern all of SNC's work.

SNC's mandate to manage the natural resources in its jurisdiction includes the following primary roles:

Water Resources Management – SNC manages water resources using integrated, ecologically sound environmental practices to maintain secure supplies of clean water, to protect communities from flooding and to ensure that environmental planning is an integral part of community development.

Forest Resources Management – SNC manages a large forest resource using sound sustainable forest management practices involving agriculture and wildlife habitat improvements which contribute to the health of the watershed's natural environment.

Lifelong Education and Recreation – SNC creates educational and recreational experiences in natural environments that enrich the lives of people of all ages by instilling awareness and appreciation of the watershed's natural heritage.

2.0 2017 Deliverables

South Nation Conservation received funds from the OPG Regional Biodiversity Funding Program to partner with the United Counties of Prescott-Russell (UCPR) for a combined lakes/rivers and wetlands restoration project in Larose Forest for the 2017-2019 period.

The project was undertaken on Lots 26-27, Concession 5 of Clarence Township (Figure 1). SNC worked on restoring headwater drainage features within the project area by using LiDAR technology and natural channel design principles to naturalize three drainage ditches. This area was highly disturbed in the early 1900's until a widespread drought caused farms to fail. At that time, the landscape had as little as 2% tree cover. With no large woody vegetation to hold the top soils, the drought, combined with winds, scoured the area of its valuable topsoil, leaving a barren desert. Tree planting began in earnest in 1928 and continued into the 1970's. The Red Pine plantation within the project area is over 60 years old. Five years ago, a section of the plantation became inundated due to beaver activity. Subsequently, UCPR performed a salvage cut to prevent lumber losses. This provided an opportunity for SNC to develop a project to submit to OPG for funding consideration. Year-1 of the project aimed to:

- restore function and improve habitat in the wetland and headwater drainage features by using natural channel design;
- improve water quality by reducing sedimentation and erosion in the highly erodible sandy soils; and
- increase instream and upland biodiversity by planting a diverse riparian area.

The long-term outcome is that this location in Larose Forest will become more naturalized, and biodiversity will be increased, thereby increasing the resiliency of the area. This project supports Ontario's Biodiversity strategy, and aims to improve biodiversity while reducing risks such as habitat loss, the effects of climate change, pollution, and invasive species.

The project will be implemented over three years, to ensure proper timing for pre- and post-monitoring of combined restoration activities, and to ensure the proper restoration of wetlands and headwater drainage features in the area.

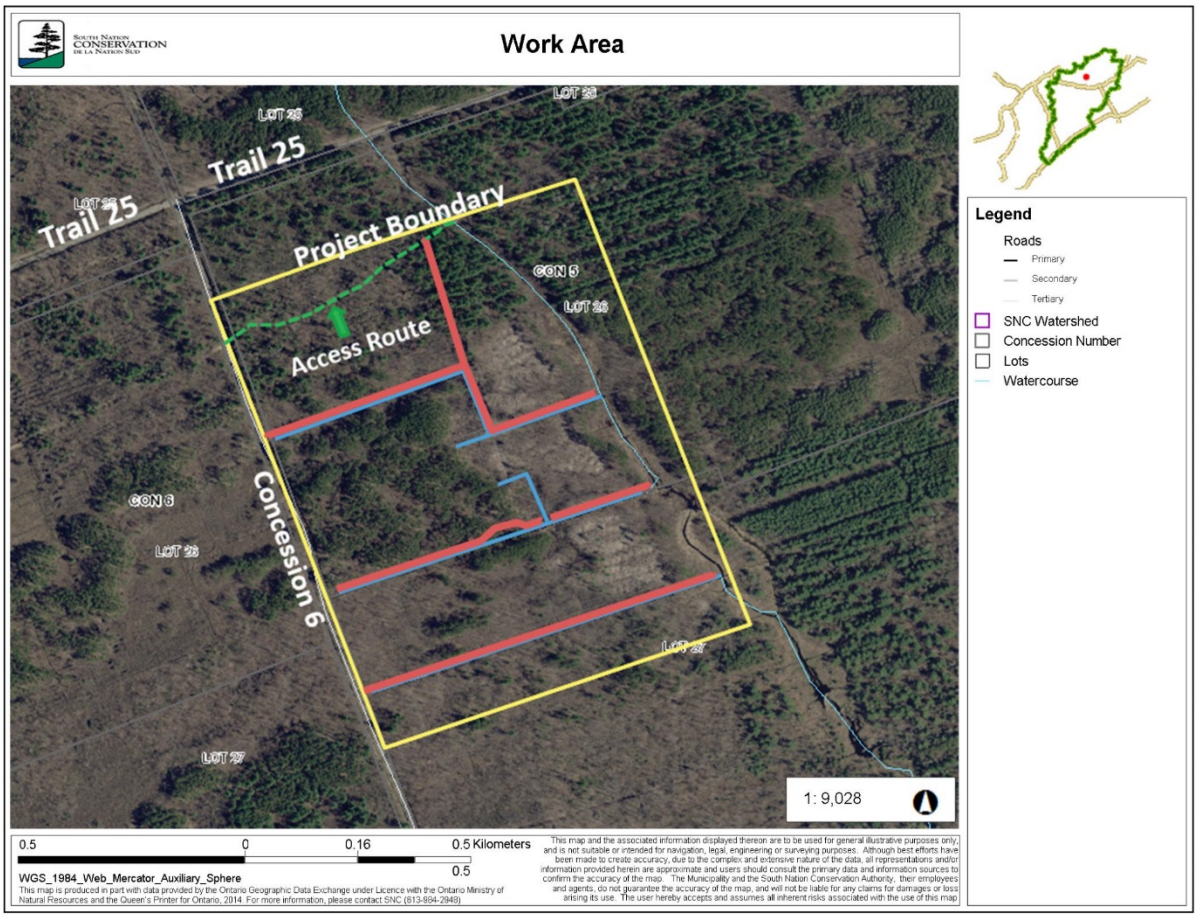

Figure 1 The satellite imagery of the OPG Larose project site shows the drains (in red) and the project outline (in yellow) with the access trail (shown in green dashed line).

Deliverables Completed in 2017:

1) *Partner/volunteer engagement and planning of Year-1:* United Counties of Prescott-Russell assisted with LiDAR imagery of the project site (Figure 2). The LiDAR imagery supported the planning of the engineered drawings and site reconnaissance. SNC Forestry staff assisted with flagging the abandoned agricultural drains to help the cutting contractor know where the vegetation was to be removed. Volunteer engagement will take place in Year-2 since the tree planting was postponed due to weather complications.

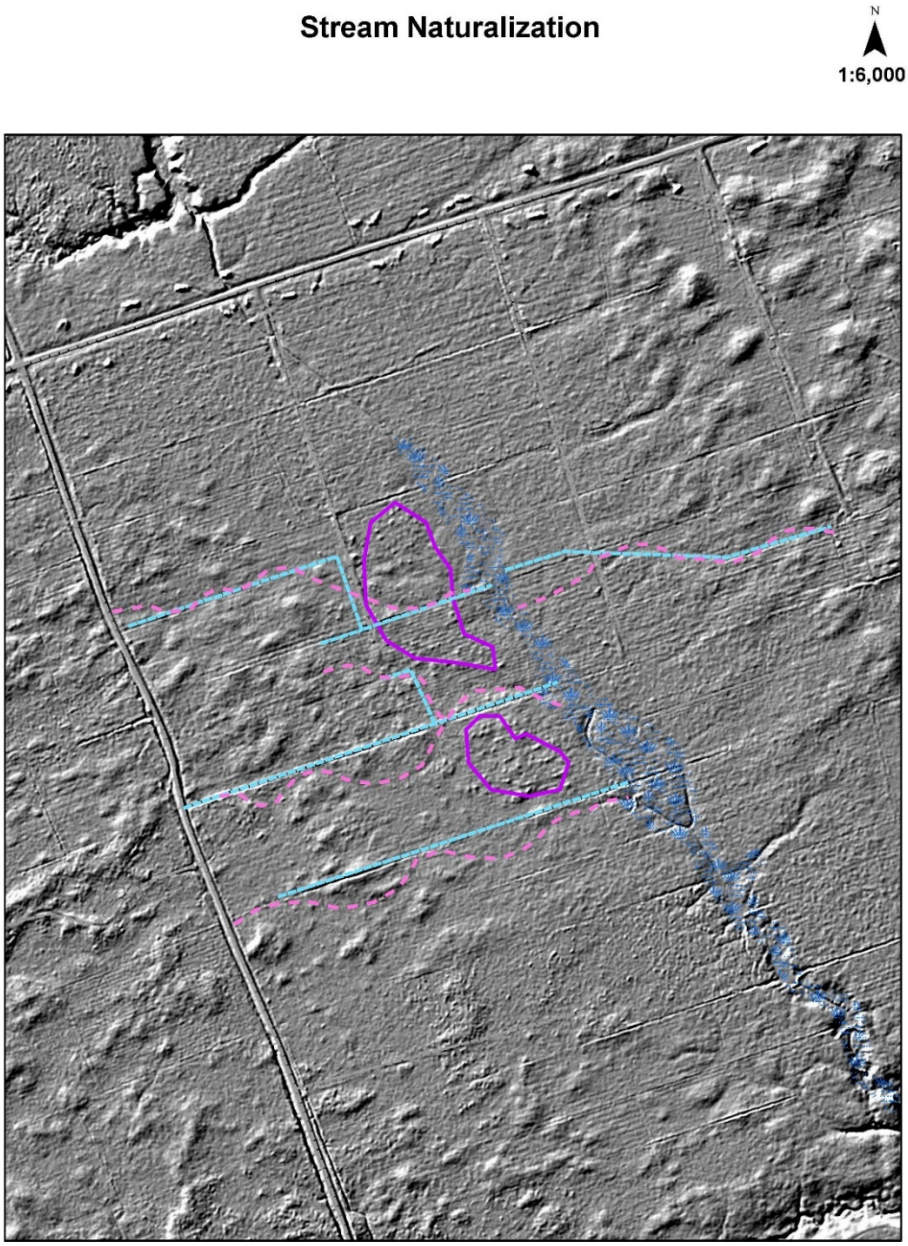

Figure 2 LiDAR imagery shows the salvage cut areas outlined in dark pink, existing drains in light blue, and proposed meanders in dashed light pink lines.

2) *Headwater drainage feature (HDF) monitoring in spring 2017*: Low water levels in the early part of the year resulted in low flows during the early season sampling of HDF's. As a result, only one channel had sufficient water to be sampled using the Ontario protocol (Figure 3).

Figure 3 Looking east from Concession Road 6, this headwater drainage feature is measured for flows, as per the Ontario protocol.

3) *Biological surveys to capture baseline biodiversity (species richness of site):*
On-site surveys focused on vegetation observed within the salvage cut area of the project site. Results are displayed in Table 1. Soil testing was completed to help with plant selection. A complete soil fertility test from three points located within the project site was undertaken by Guelph University's Agriculture and Food Lab. Test results are shown in Appendix A.

Table 1 Vegetation species observed in the Salvage Cut area of the project site on July 19th, 2017.

Meadowsweet *Spiraea alba*	Common Cattail *Typha latifolia*	White Birch *Betula papyrifera*
Ostrich Fern *Matteucia struthiopteris*	Red Maple *Acer rubrum*	Poplar Spp. *Populus spp.*
Sheep Laurel *Kalmia angustifolia*	Royal Fern *Osmunda regalis*	Shining Clubmoss *Huperzia lucidulum*

Short-tailed Rush *Juncus brevicaudatus*	Eastern White Pine *Pinus strobus*	Canada Goldenrod *Solidago Canadensis*
Red Raspberry *Rubus strigosus*	Shrubby Willow *Salix spp*.	Boneset *Eupatorium perfoliatum*
Sensitive Fern *Onoclea sensibilis*	Meadow Horsetail Grass *Equisetum pratense*	Mountain Holly *Nemopanthus mucronatus*
Spinulose Wood Fern *Dryopteris carthusiana*	Bearded Shorthusk *Brachyelytrum erectum*	Pink Lady's-slipper *Cypripedium acaule*

4) *Water quality and base flow monitoring of site*: Base flows were barely perceptible on the date it was tested. Photos show ponded water that was not flowing, or had very little flow (Figure 4).

Figure 4 Conditions during baseflow measurements, as seen in this photo, show that water is ponded and not flowing.

5) *Site design for HDF restoration (1,500m):* SNC Engineering staff designed the channel profile and provided the steps undertaken that resulted in the HEC-RAS models seen in Figure 12. This process is briefly described as follows:

Measurements of the middle drain were taken to calculate the slope and provide a baseline for determining the new channel configuration. Figure 5 shows the locations where measurements were taken. The middle drain is the deepest and is therefore the drain that needed the most design work. Table 2 shows the 6 width and depth measurements taken at roughly 100 metre intervals. Figures 6-8 depict the cross sections of the middle drain. The Ontario Flow Assessment Tool (OFAT) (http://www.gisapplication.lrc.gov.on.ca/OFAT/Index.html?site=OFAT&viewer=OFAT&locale=en-US) was used to calculate the sub watershed characteristics. Only the north and middle drains were assessed using OFAT (Figures 9 & 10, Tables 3 & 4). The third drain is too small and could not be located on the OFAT map. Figures 11 & 12 depict the final design for the middle drain.

Figure 5 Inset photos show the location where the photos were taken within the project site during the bank measurements activity.

Table 2 Bank width and depth of the middle drain/ Drain 2.

Location	Bank Width (m)	Depth (m)	Notes
Downstream	3.85	0.8	
	4	0.83	

	4.6	0.92	
	4.05	0.82	
	4.5	1.25	Bank really high here
Most Upstream (close to road)	3.8	0.9	Shallow part of drain. Needs to be connected to roadside drain

$$Slope\ from\ Lidar\ = \left(\frac{74.37\ m\ -\ 73.89\ m}{494\ m}\right) * 100\ =\ 0.098\%$$

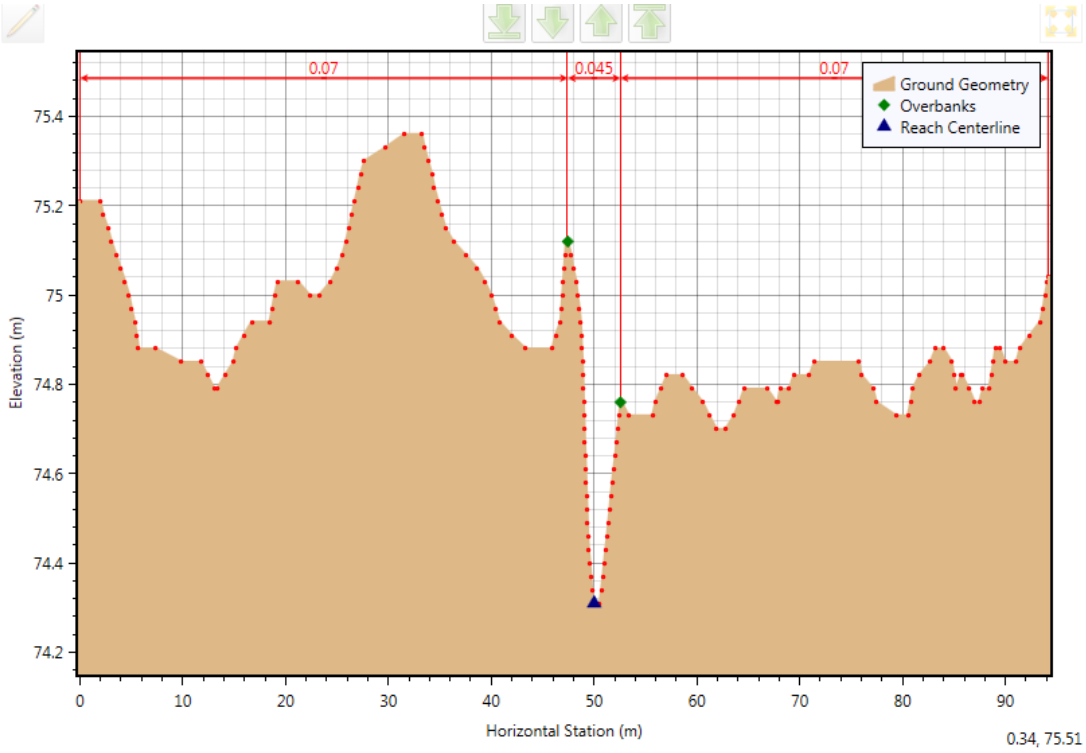

Figure 6 Graph shows Drain 2 upstream cross-sections, not to scale.

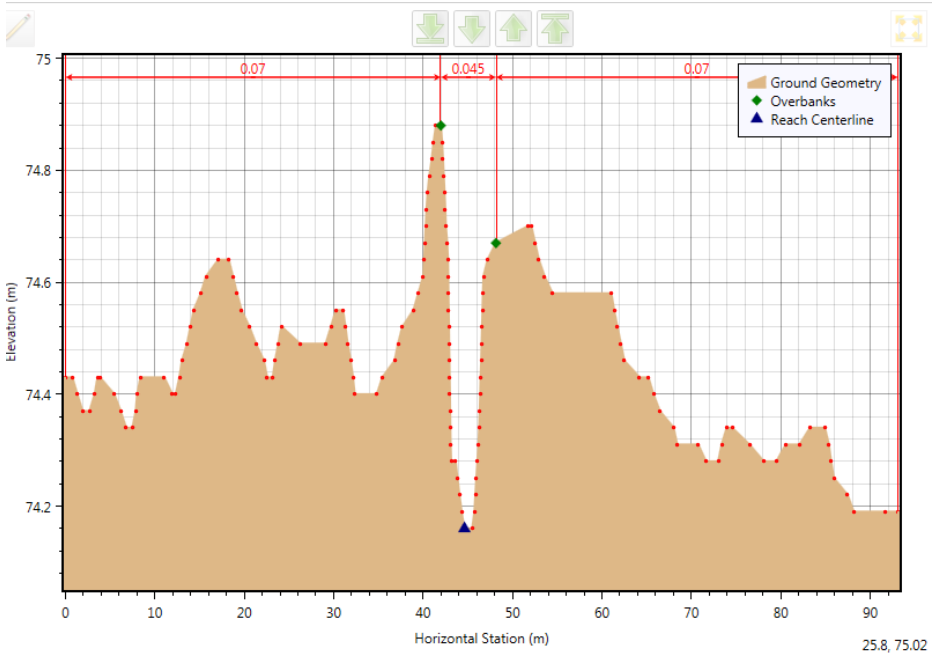

Figure 7 Graph shows cross-section of middle portion of Drain 2, not to scale

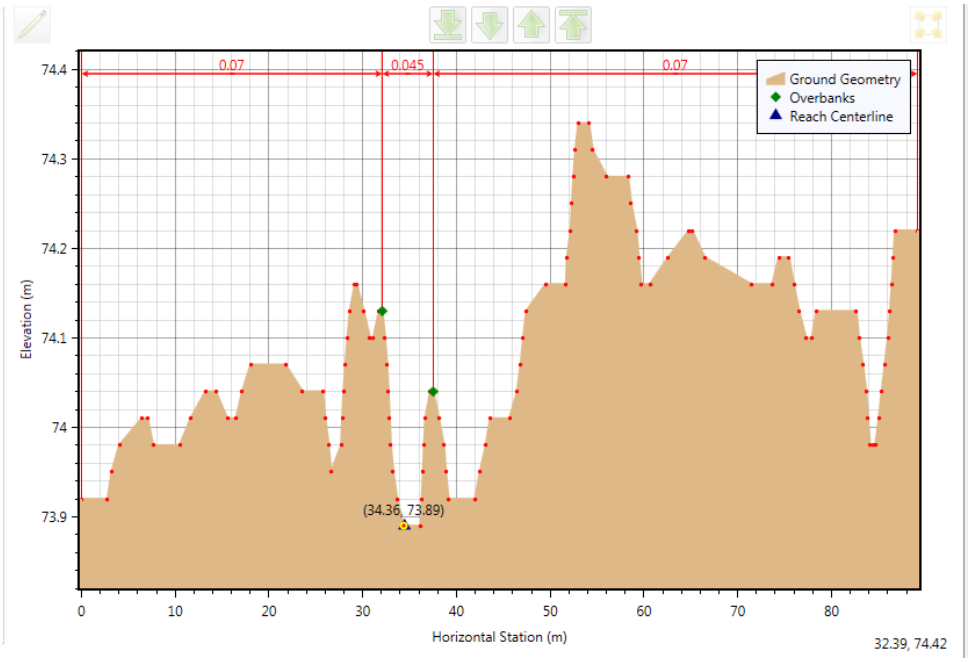

Figure 8 Graph shows cross-section of the lower portion of Drain 2, not to scale.

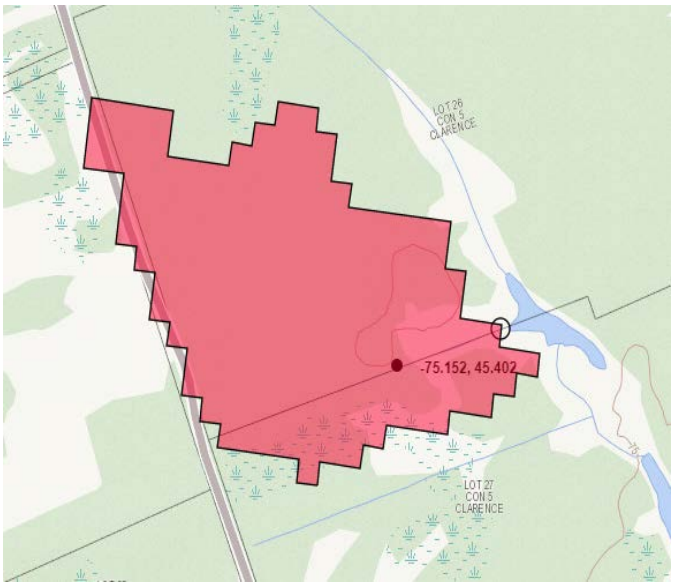

Figure 9 Drain 2 watershed characteristics using Ontario Flow Assessment Tool.

Table 3 Drain 2 sub watershed measurements pulled from OFAT.

Drainage Area (km²)	0.175
Shape Factor ()	4.708
Length of Main Channel (km)	0.909
Maximum Channel Elevation (m)	77.170
Minimum Channel Elevation (m)	74.930
Slope of Main Channel (m/km)	2.460
Slope of Main Channel (%)	0.246
Area Lakes/Wetlands (km²)	0.011
Area - Lakes (km²)	0.000
Area - Wetlands (km²)	0.011
Mean Elevation (m)	75.697
Maximum Elevation (m)	77.168
Mean Slope (%)	0.634
Annual Mean Temperature (°C)	6.100
Annual Precipitation (mm)	1015.000

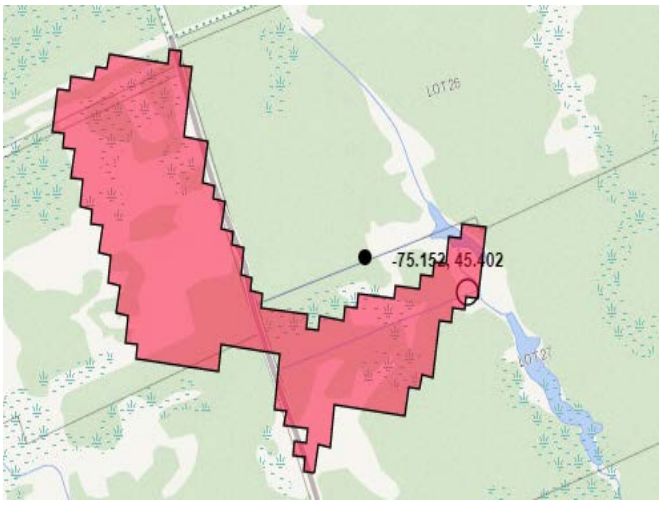

Figure 10 Drain 1 sub watershed characteristics using Ontario Flow Assessment Tool.

Table 4 Drain 1 sub watershed measurements pulled from OFAT.

Drainage Area (km²)	0.326
Shape Factor ()	8.591
Length of Main Channel (km)	1.673
Maximum Channel Elevation (m)	77.280
Minimum Channel Elevation (m)	74.980
Slope of Main Channel (m/km)	1.380
Slope of Main Channel (%)	0.138
Area Lakes/Wetlands (km²)	0.072
Area - Lakes (km²)	0.001
Area - Wetlands (km²)	0.071
Mean Elevation (m)	75.956
Maximum Elevation (m)	77.296
Mean Slope (%)	0.591
Annual Mean Temperature (°C)	6.100
Annual Precipitation (mm)	1015.000

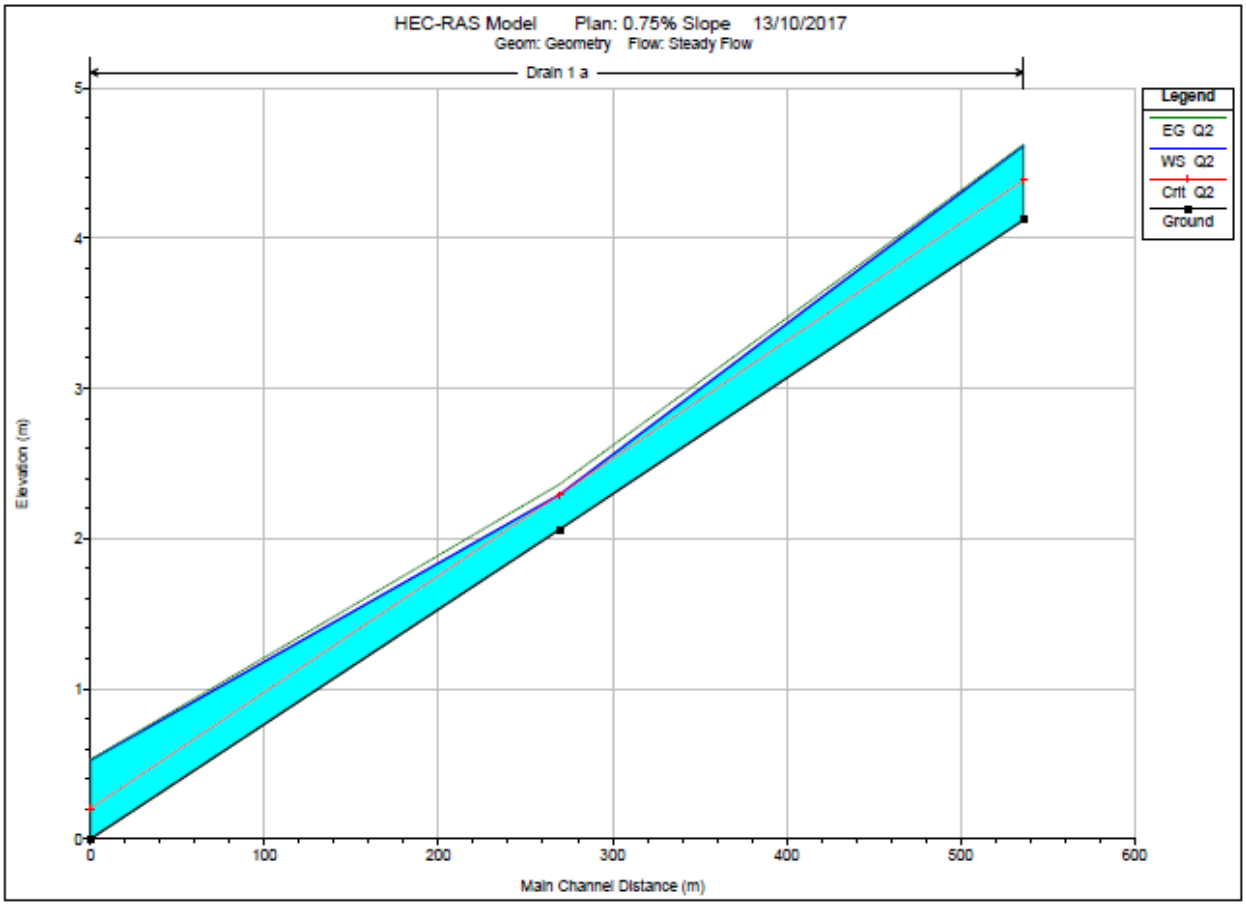

Figure 11 Graph shows project site slope calculated using a Trimble unit, not to scale.

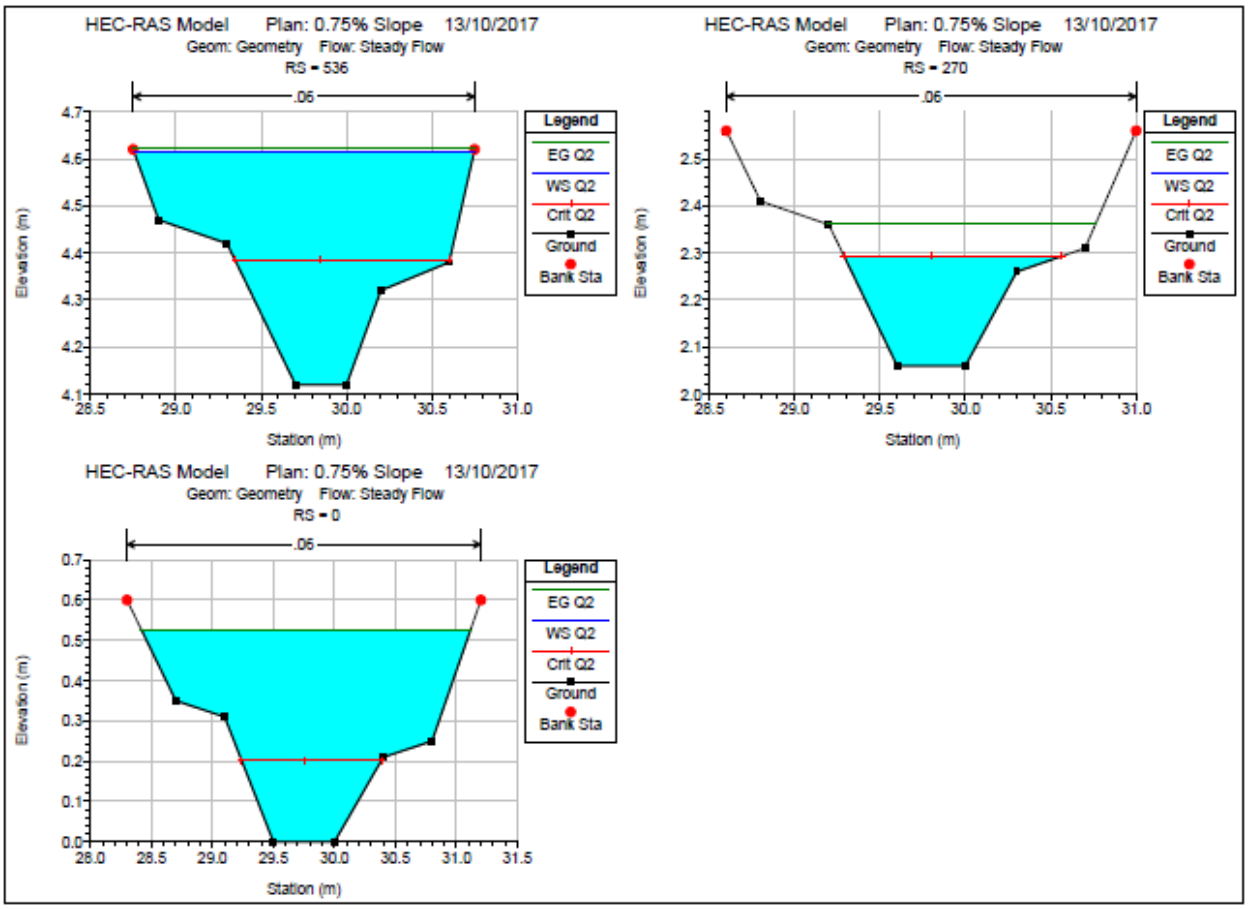

Figure 12 Each graph is showing the HEC-RAS program calculated basin cross-section profiles. The mouth is RS=536, the middle section is RS=270 and RS=0 is the most upstream position.

6) *Site preparation for HDF restoration*: Brushing and vegetation removal was contracted to a local business that has substantial experience with this activity. The Contractor was selected from the businesses that bid on the Request for Quotes issued by SNC. The successful applicant completed the vegetation removal along 1,500 metres of drainage works to provide access for the excavator (Figure 13).

Figure 13 Looking west towards Concession 6 Road, this photo shows the north bank 3-metre clearance cut by the Contractor (seen in blue shirt).

7) *Site restoration of (1,500m*): Excavation took place in late November. The contractor used a small excavator that weighed approximately 3,600 Kg with wide tracks to prevent deep ruts and the risk of sinking. The project channels were outfitted with silt fencing at approximately 30 metres upstream of the outlet to prevent large volumes of sediment from entering the wetland. After installing the silt fence, the contractor began excavating at the outlet-end of the channel and worked upstream (Figure 14). This action prevented water from impounding above the work area. The silt fences were removed, apart from one that was frozen in Drain 1. That silt fence will be removed early in the spring, to prevent water backing-up.

Figure 14 Excavation works created meanders in the channel to help recreate natural shaping caused when water levels are high. This will typically take place during the spring freshet.

8) *Communication of project outcomes:* Communications issued in 2017 resulted in a single news release on September 29, 2017 entitled "SNC Plans River and Wetland Habitat Restoration in Clarence-Rockland" circulated to media outlets in our region. This release was the result of an onsite funding announcement with OPG, UCPR, SNC and the City of Clarence-Rockland. To view the press release, please go to this link: http://www.nation.on.ca/resources/media/press-releases/snc-plans-river-and-wetland-habitat-restoration-clarence-rockland

3.0 Budget

The proposed Year-1 budget is shown in Table 5. Table 6 shows the actual expenses alongside the proposed expenses, for better comparison.

Table 5 This table shows the proposed budget for the Year-1 term of this project.

YEAR 1	**Total**	**OPG**	**SNC**		**Other Partner**	
		Cash	Cash	In-kind	Cash	In-kind
Materials, Supplies, Contracted Services	$43,000	$43,000				
Outreach and Education	$4,691	$4,691				
Other (monitoring, transportation, volunteer planting, office equipment, financial and senior management support)	$38,798	$12,309	$5,155	$9,334		$12,000
Contingency	**$6,000**		**$6,000**			
TOTAL	**$92,489**	**$60,000**	**$11,155**	**$9,334**	**$0**	**$12,000**

Table 6 The table shows actual expenditures in 2017. Costs were much less than anticipated due to the inclement weather that caused delays. Certain activities had to be postponed to 2018 to ensure proper timing.

Item	Proposed	Actual
Materials, Supplies, Contracted Services	$43,000	$17,602.52
Outreach & Education	$4,691	$604.00
Other (monitoring, transportation, etc.)	$38,798	$28,911.18
Contingency	$6,000	$0
Total	$92,489	$46,217.70

4.0 Summary

Costs incurred fell short of the projected expenses for Year-1. The weather in 2017 was not favorable towards excavation. The frequent precipitation caused delays which meant that certain activities proposed for 2017 are being planned instead for 2018. Those activities include native plantings (cuttings, seeding, potted stock, volunteer-assisted plantings, monitoring of the plantings) erosion protection and excavation site reinforcement. Additional Outreach and Education will take place in 2018 and 2019 to compensate for the shortfall in 2017.

Appendix A – Soil Fertility Test Results

UNIVERSITY of GUELPH
LABORATORY SERVICES
Agriculture and Food Laboratory

FINAL Report
Submission# **17-066660**
Reported: 2017-Aug-30

Submitted By:
Client ID: **1784956**
SOUTH NATION CONSERVATION
MS NAOMI LANGLOIS
38 VICTORIA STREET P.O. BOX 29
FINCH, ON K0C1K0

Phone: 613 984-2948
Fax: 613 984-2872
Sampling Date: 2017-Aug-16
Received Date: 2017-Aug-18

Owner:
NAOMI LANGLOIS

Soil Fertility Complete Method ID:CHEM-172,SNL-626,631
Date Authorized: 2017-Aug-30 11:48

Sample ID	Client Sample ID	Specimen type	Sampling date / time	Test	Result	Units	Note
0001	#1	Soil	17-Aug-16	Phosphorus (Extractable)	3.8	mg/Lsoil dry	
0001	#1	Soil	17-Aug-16	Magnesium (Extractable)	47	mg/Lsoil dry	
0001	#1	Soil	17-Aug-16	Potassium (Extractable)	18	mg/Lsoil dry	
0001	#1	Soil	17-Aug-16	Sodium (Extractable)	13	mg/Lsoil dry	
0001	#1	Soil	17-Aug-16	Calcium (Extractable)	260	mg/Lsoil dry	
0001	#1	Soil	17-Aug-16	Manganese (Extractable)	2.4	mg/Lsoil dry	
0001	#1	Soil	17-Aug-16	Zinc (Extractable)	2.4	mg/Lsoil dry	
0001	#1	Soil	17-Aug-16	Copper (Extractable)	0.24	mg/Lsoil dry	
0001	#1	Soil	17-Aug-16	Iron (Extractable)	220	mg/Lsoil dry	
0001	#1	Soil	17-Aug-16	pH	4.9		
0001	#1	Soil	17-Aug-16	Buffer pH	5.7		
0002	#2	Soil	17-Aug-16	Phosphorus (Extractable)	2.6	mg/Lsoil dry	
0002	#2	Soil	17-Aug-16	Magnesium (Extractable)	32	mg/Lsoil dry	
0002	#2	Soil	17-Aug-16	Potassium (Extractable)	15	mg/Lsoil dry	
0002	#2	Soil	17-Aug-16	Sodium (Extractable)	14	mg/Lsoil dry	
0002	#2	Soil	17-Aug-16	Calcium (Extractable)	230	mg/Lsoil dry	

Agriculture and Food Laboratory - 95 Stone Rd West, Guelph, ON N1H 8J7 - www.guelphlabservices.com

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Printed: 2017-Aug-30

NAOMI LANGLOIS

FINAL Report

Submission# **17-066660**

Reported: 2017-Aug-30

Soil Fertility Complete Method ID:CHEM-172,SNL-626,631 ....**Continued**

Date Authorized: 2017-Aug-30 11:48

0002	#2	Soil	17-Aug-16	Manganese (Extractable)	1.8	mg/Lsoil dry
0002	#2	Soil	17-Aug-16	Zinc (Extractable)	0.45	mg/Lsoil dry
0002	#2	Soil	17-Aug-16	Copper (Extractable)	0.15	mg/Lsoil dry
0002	#2	Soil	17-Aug-16	Iron (Extractable)	160	mg/Lsoil dry
0002	#2	Soil	17-Aug-16	pH	5.3	
0002	#2	Soil	17-Aug-16	Buffer pH	6.1	
0003	#3	Soil	17-Aug-16	Phosphorus (Extractable)	2.9	mg/Lsoil dry
0003	#3	Soil	17-Aug-16	Magnesium (Extractable)	54	mg/Lsoil dry
0003	#3	Soil	17-Aug-16	Potassium (Extractable)	7.8	mg/Lsoil dry
0003	#3	Soil	17-Aug-16	Sodium (Extractable)	14	mg/Lsoil dry
0003	#3	Soil	17-Aug-16	Calcium (Extractable)	600	mg/Lsoil dry
0003	#3	Soil	17-Aug-16	Manganese (Extractable)	6.1	mg/Lsoil dry
0003	#3	Soil	17-Aug-16	Zinc (Extractable)	2.0	mg/Lsoil dry
0003	#3	Soil	17-Aug-16	Copper (Extractable)	0.43	mg/Lsoil dry
0003	#3	Soil	17-Aug-16	Iron (Extractable)	180	mg/Lsoil dry
0003	#3	Soil	17-Aug-16	pH	5.4	
0003	#3	Soil	17-Aug-16	Buffer pH	6.3	

Comments:

Extraction methods
Phosphorous – Sodium bicarbonate extraction (Olsen method)
Magnesium, potassium, calcium and sodium – Ammonium acetate extraction
Manganese – Phosphoric acid extraction
Zinc, copper and iron – DTPA extraction

Supervisor: Nicolaas Schrier MSc, Animal Health Laboratory 519 823 1268 ext. 57215 nschrier@uoguelph.ca