

ENGINEERING REPORT

For

BIG CREEK DRAIN SYSTEM

Town of Pelham

(Geographic Township of Pelham)

Region of Niagara

Date: February 14, 2022

File No. 20-243



K. SMART ASSOCIATES LIMITED
CONSULTING ENGINEERS & PLANNERS

85 McIntyre Drive
Kitchener, ON N2R 1H6

Tel: 519-748-1199
Fax: 519-748-6100

TABLE OF CONTENTS

1) EXECUTIVE SUMMARY	4
2) BACKGROUND	5
3) DRAINAGE HISTORY	5
3.1) Big Creek Drain	5
3.2) Cyruss Nunn Drain	6
3.3) Disher Drain	7
3.4) Ridgeville Drain	7
3.5) Swayze Drain	8
3.6) Drainage Study	8
4) AUTHORITY FOR REPORT	8
5) WATERSHED DESCRIPTION	9
6) DRAIN STATION CONVERSIONS	9
6.1) Drain Stations	9
7) CULVERTS	10
7.1) Culvert Sizing	10
7.2) Culvert Capacity	13
8) DRAWINGS	13
8.1) Drawings	13
8.2) Alignment of Drains	13
9) COST ESTIMATE	13
9.1) Actual Drain Maintenance Costs	13
9.2) Engineering Cost Estimate	14
9.3) Estimate of Section 73 Costs	14
9.4) Harmonized Sales Tax	14
9.5) Estimated Cost Summary	14
10) ASSESSMENTS	15
10.1) Calculation of Assessments	15
10.2) Benefit Assessments (Section 22 and 24)	16
10.3) Outlet Liability Assessments (Section 23)	16
11) ASSESSMENT SCHEDULES	17
11.1) Schedule A - Schedule of Assessments	17
11.2) Schedule B - Schedule of Assessment for Future Maintenance	17
11.3) Schedule C – Schedule for Actual Cost By-Law	17
12) MAINTENANCE	18
12.1) Governing Reports for Maintenance	18
12.2) Culverts	18
12.3) Access and Obstructions	19
12.4) New Connections	19
12.5) Landowners Inspection of Drains	19
12.6) Updating Future Maintenance Schedules	19
13) GRANT	19
14) PRIVACY OF LANDS	20
15) BY-LAW	20

SCHEDULE A – SCHEDULE OF ASSESSMENTS

SCHEDULE B – SCHEDULE OF ASSESSMENTS FOR FUTURE MAINTENANCE

SCHEDULE C – SCHEDULE FOR ACTUAL COST BYLAW

APPENDIX A – CALCULATION OF ASSESSMENTS FOR SCHEDULE B

DRAWINGS 1 TO 26

Definitions:

"Act" means The Drainage Act RSO 1990

"CSP" means Corrugated Steel Pipe

"Drain" means Big Creek Drain System (This report includes new future maintenance schedules for the Big Creek Drain, Cyruss Nunn Drain, Disher Drain, Ridgeville Drain and Swayze Drain)

"Grant" means Agricultural Drainage Infrastructure Program

"HDPE" means High-Density Polyethylene

"KSAL" means K. Smart Associates Limited

"Ministry" or "OMAFRA" means the Ontario Ministry of Agriculture, Food and Rural Affairs

"Municipality" means Town of Pelham

"Township" means the Geographic Township.

"Tribunal" means Agriculture, Food and Rural Affairs Appeal Tribunal

"Twp" means Township

Tables:

Table 6-1 - Drain Stations	9
Table 7-1 - Culvert Sizing	11
Table 9-1 - Estimated Cost Summary	14
Table 10-1 – Special Benefit Assessments.....	16
Table 10-2 - Runoff Factors	16



K. SMART ASSOCIATES LIMITED

CONSULTING ENGINEERS & PLANNERS

85 McIntyre Drive
Kitchener, ON N2R 1H6

Tel: 519-748-1199
Fax: 519-748-6100

February 14, 2022

File No. 20-243

BIG CREEK DRAIN SYSTEM

Town of Pelham

1) EXECUTIVE SUMMARY

This report is prepared according to Section 76 of the Act.

On November 16, 2020, K. Smart Associates Limited was appointed by resolution of the Town of Pelham Council to prepare a report on the Big Creek Drain, according to Section 76 of the Act.

The Town of Pelham Drainage Superintendent has also requested updates of the maintenance schedules for all of the other municipal drains within the Big Creek Drain watershed.

The first objective of this report is to update maintenance schedules for the Big Creek Drain and confirm watershed boundaries and maintenance provisions.

The second objective of this report is to update maintenance schedules for the other municipal drains within the Big Creek Drain watershed. The other drains are the Cyruss Nunn Drain, Disher Drain, Ridgeville Drain and Swayze Drain.

This report also addresses the request by the Drainage Superintendent to bill out the unbilled costs of the maintenance work that was done along the Big Creek Drain totalling \$101,456.18.

The cost to prepare the Big Creek Drain System report is \$79,500. A total of \$180,956.18 of costs assessed to lands in this report.

The total watershed for future maintenance is approximately 3,984.27 hectares (3,817.46 ha Town of Pelham, 68.77 ha Township of West Lincoln and 109.47 ha. the City of Welland).

The watershed served by the Big Creek Drain involves lands and roads in the Town of Pelham (geographic Twp of Pelham), Township of West Lincoln (geographic Twp of Gainsborough) and the City of Welland (geographic Twp of Pelham and Twp of Thorold).

Assessment schedules are provided to distribute the cost of this report and future maintenance of the drainage works.

- Schedule A shows the assessment of the report and incurred maintenance costs.
 - Schedule B will be used for prorating maintenance costs for all drains within the Big Creek Drain watershed.
- Schedule C will be used for levying the project's final actual cost. It indicates estimated net assessments after deducting grants on the unbilled maintenance costs on the Big Creek Drain.
- Appendix A illustrates the calculation of the assessments outlined in Schedule B.

2) BACKGROUND

The Town of Pelham had requested an update to its drain mapping and assessment schedules for the Big Creek Municipal Drain. In August 2020, the Town issued a "Request for Proposal" (2020-PW-23) for engineering services to prepare a report according to Section 78 of the Act. The proposal had also indicated that in the new report to be prepared, the new schedule should include the existing maintenance costs that have not been billed out on the Big Creek Drain.

Based on KSAL's understanding, only a Section 76 report would be required. The last report for the Big Creek Municipal Drain was prepared by J. Spriet, P.Eng. (Spriet Associates), dated October 7, 2002.

On September 25, 2020, KSAL submitted a proposal to Pelham's Town to provide engineering services for a new Engineer's Report for the Big Creek Municipal Drain (Section 76).

On September 26, 2020, KSAL's proposal was accepted and awarded by the Town of Pelham on October 2, 2020.

On November 16, 2020, Council also appointed KSAL to vary and update the maintenance schedules for the other municipal drains within the Big Creek Drain watershed under Section 76 of the Act, as per the Town of Pelham's request Drainage Superintendent.

3) DRAINAGE HISTORY

The following describes the existing Big Creek Drain and the other municipal drains within the Big Creek Drain watershed.

3.1) Big Creek Drain

The Big Creek Drain provides drainage for areas within the Town of Pelham, a small area in the Township of West Lincoln and a small area in the City of Welland.

The Big Creek Drain originally dates back to the 1890s.

The Big Creek Drain was constructed following a report by L. A. Kimmear (OLS) dated July 27, 1916. It was an open drain. On January 6, 1922, the report was updated by Ross & Scott. The drain started at the confluence of two other creeks/drains (now Cyruss Nunn Drain and Swayze Drain) in Lot 14, Concession 13, Township of Pelham (now Town of Pelham) and ends/outlets into the Welland River in Lot 259, Township of Thorold (now City of Welland). The drain was approximately 30,240' (9,580m) in length.

The next report on the Big Creek Drain was prepared by Ross & Scott dated May 30, 1932, and was for an extension of the Big Creek Drain for an improved outlet for Lot 4, Concession 14, Town of Pelham, easterly to a sufficient outlet in the Township of Thorold. The Big Creek Drain was extended 2,050' (625m±) east of the Pelham/Thorold Townline Road.

In 1971, a profile of the Big Creek Drain was prepared by W. J. Smith, P.Eng. (Wilfred J. Smith & Associates Ltd.) dated November 1971.

The next report on the Big Creek Drain was prepared by W. J. Smith, P. Eng. (Wilfred J. Smith and Associates) and R. Blake Erwin, P.Eng. (Blake Erwin & Associates) dated November 6, 1975, and consisted of a full cleanout of the drain over its entire length and also the construction of twelve (12) access crossings on private lands.

In 1977, the Town of Pelham had adopted a program to provide regular maintenance of existing municipal drains.

The most recent report was for preparing a new maintenance schedule for the Big Creek Drain in a report by J. R. Spriet, P.Eng. (Spriet Associates) dated October 7, 2002. This schedule was only for the lands and roads in the Town of Pelham and the Township of West Lincoln.

Maintenance work has been done on the Big Creek Drain in numerous locations and over several years. The costs for the work have not been billed out yet, totalling \$101,456.18. The current maintenance costs have been assessed in this report. See Table 9-1 - Estimated Cost Summary for details.

3.2) Cyruss Nunn Drain

The Cyruss Nunn Drain was initially constructed as a Municipal Drain in a report by George Ross, Engineer, dated August 24, 1918. The drain was an open ditch and was slightly less than 3.5 miles (18,480'± or 5,633m±) in length. The drain commenced at the head of the Big Creek Drain in Lot 14, Concession 13, Township of Pelham. It continued northwesterly to the Townline Road between the Township of Pelham (now Town of Pelham) and the Township of Gainsborough (now Township of West Lincoln).

The drain was improved in a report entitled "Cyruss Nunn Drain 2007" by J. R. Spriet, P.Eng. (Spriet Associates) dated September 27, 2007. The report provided for

relocating 235m of an open ditch. It included bank seeding with a soil stabilization mixture in Lot 15, Concession 13 (Township of Pelham) in the Town of Pelham. All report costs were assessed to the landowner (Roll No. 018-11110).

3.3) Disher Drain

The Disher Creek Drain was originally constructed following a report by K. A. Kinnear in 1915. It is unknown what work was done as the original drawings could not be located.

The Disher Drain was last improved following a report of G. K. Strachan, P.Eng. (The Proctor & Redfern Group) dated April 29, 1980, and revised October 26, 1980. The drain commenced at its outlet in the Big Creek Drain in Lot 10, Concession 13 and continued northwesterly then northeasterly to just north of Welland Road. It was all open ditch and was approximately 19,540' (3,459m) in length.

The Disher Drain was last maintained following a new Maintenance Schedule and a plan prepared by J. R. Spriet, P.Eng. (Spriet Associates London Limited) dated May 18, 1999.

3.4) Ridgeville Drain

The Ridgeville Drain was originally constructed in a report entitled "Ridgeville Branch of the Big Creek Drain" by R. Black Erwin, P. Eng. dated September 12, 1946, and consisted of a West Branch open ditch. This report was referred back and revised on March 20, 1947. In the 1947 report, it appears that the East Branch of the Ridgeville Branch was an Award Drain (Private Drain) at that time. The 1947 report would consist only of deepening and widening the West Branch and incorporating the Ridgeville Branch of the Big Creek Drain. The Ridgeville Branch is the portion from the outlet into the Big Creek Drain upstream to the junction of the West Branch. The West Branch is 26,380' (8,041m) in length.

The Ridgeville Drain was improved following a report of D. L. Pataky, P.Eng. (The Proctor & Redfern Group) dated July 22, 1983. The 1983 report proposed a cleanout and grading of the West Branch and re-aligning the drain west of Effingham Street between Canboro Road and Welland Road. The 1983 report is the current report for the Ridgeville Drain.

In 2018, a report entitled "Ridgeville Drain Watershed Master Study" was prepared by Neal Morris, P. Eng. and Sandra Swanton, P. Eng. (K. Smart Associates Limited) dated April 13, 2018. This report identified the tributaries of the Ridgeville Drain, had an inventory of drain crossings with an evaluation of the condition the capacity of each crossing, contained watershed modelling and analyses using PCSWMM, gathered information from landowners regarding drainage concerns and recommended drainage upgrades. A GPS survey of the drain was completed. There was a total of 31 crossings of the West Branch.

The table for the crossings of the West Branch can be seen in Section 7.1 of this 2021 Report.

3.5) Swayze Drain

The Swayze Drain was constructed following a report of C. J. Clarke, P.Eng. dated November 26, 1966 (By-Law 1749). The drain was all open ditch and consisted of the Main Drain with a length of 5,680' (1,731m), an East Branch with a length of 10,509' (3,203m) and a West Branch with a length of 12,020' (3,664m).

In 1997, a new maintenance schedule and plan were prepared for the Swayze Drain by J. R. Spriet, P.Eng. (Spriet Associates London Limited) dated July 17, 1997.

3.6) Drainage Study

In 2017, the Town of Pelham retained GM BluePlan to provide consulting services for a condition assessment of all of their rural and urban drainage systems (municipal drainage and stormwater systems).

Their review of the municipal drainage systems included field investigations and an engineering report for the Kennan Drain, Swayze Drain, Cyruss Nunn Drain, Big Creek Drain, Disher Drain and 15 Mile Drain. The field investigations consisted of reviewing conditions of existing culverts and existing ditches.

Regarding the conditions of the Big Creek Drain and drains within its watershed (Cyruss Nunn Drain, Disher Drain and Swayze Drain), it was determined that most of the road culverts and culverts along the drain were overall in good condition. However, private crossings had debris in them, and many were in poor condition. Most of the drains needed to be cleaned out.

The study included a "System Improvement and Management Plan" table that showed a 10-year program for ditch cleanouts, bi-annual culvert inspections, cleanout and rehabilitation, at an average expenditure of \$187,000 per year.

4) AUTHORITY FOR REPORT

On November 16, 2020, K. Smart Associates Limited was appointed by resolution of the Town of Pelham Council to prepare a report on the Drain under Section 76 of the Act. The Town of Pelham Drainage Superintendent had also requested the updates to the maintenance schedule for the other municipal drains within the Big Creek Drain watershed. This report provides for the major watershed boundary, sub-watershed maintenance provisions for culverts, and each drain's maintenance schedules.

Due to the severances and age of existing maintenance schedules, the Town of Pelham appointed KSAL under Section 76 of the Act to prepare new Schedules of Assessment for Future Maintenance for all municipal drains within the Big Creek Drain watershed.

5) WATERSHED DESCRIPTION

As defined in this report, the watershed and sub-watersheds of the Big Creek Drain system were established based on aerial photography, topographic information, available digital elevation model data, historical reports in the watershed, site examination and abutting drain watersheds.

Land use in the watershed in the Town of Pelham and Township of West Lincoln is predominately agricultural except for road allowances, scattered bush (forest) areas and numerous residential lots. Land use in the City of Welland watershed is predominantly an urban area (residential, commercial and institutional lots), roads, and some bush/park-like nature areas.

The Big Creek Drain perimeter watershed has a common watershed with the Keenan Drain (1998).

The other existing drains within the watershed of the Big Creek Drain are the Cyruss Nunn Drain, the Disher Drain, the Ridgeville Drain and the Swayze Drain.

6) DRAIN STATION CONVERSIONS

6.1) Drain Stations

The following table converts the historic drain stations for the Big Creek Drain and Swayze Drain into meters for this report.

Table 6-1 - Drain Stations

Drain (Year)	Current Report (feet)	2021 report (m)
<u>Big Creek Drain (1971)</u>	0+00	0+000
	16+00	0+488±
	32+00	0+975±
	45+80	1+396±
	47+78	1+455±
	60+00	1+829±
	67+00	2+044±
	76+50	2+332±
	81+00	2+469±
	99+00	3+018±
	142+00	4+328±
	163+00	4+968±
	173+50±	5+288±
	233+60	7+120±
	244+70±	7+458±
	294+60±	8+980±
296+40±	9+035±	

Drain (Year)	Current Report (feet)	2021 report (m)
Cyruss Nunn Drain (1918)	The plan from this report did not have any stations on it, and a profile could not be found for it. The 2021 Report stations are in metres and are approximate.	
Disher Drain (1980)	The plan from this report did not have any stations on it, and a profile could not be found for it. The 2021 Report stations are in metres and are approximate.	
Ridgeville Drain (1983)	It is to be noted that the Ridgeville Drain stations are in metres	
Swayze Drain (1966) Main Drain	0+00	0+000
	31+29	0+945±
	38+17	1+163±
	56+80	1+731
Swayze Drain (1966) West Branch	56+80	1+731
	94+03	2+866±
	135+87	4+141±
	156+28	4+763±
	173+10	5+276±
Swayze Drain (1966) East Branch	177+00	5+395±
	0+00	0+000
	20+10	0+613±
	46+70	1+423±
	64+50	1+966±
	81+43	2+482±
	91+27	2+782±
105+09	3+203±	

7) CULVERTS

7.1) Culvert Sizing

Table 7-1 Culverts Sizing specifies minimum sizing for future culverts for all Municipal Drains in the Big Creek Drain watershed that landowners may install at their expense, subject to the Municipality's approval as required by the "Maintenance" section of this Report. An equivalent culvert shall have the same capacity as in Table 7-1.

Table 7-1 - Culvert Sizing

	RECOMMENDED CULVERT SIZE		
	Access Culverts	Local Road Driveways	Regional and MTO Roads
Big Creek Drain			
Int 1, Sta. 9+035 (Welland River) to 6+815 (Town of Pelham/City limit line)	Twin 3300mm CSP's or equivalent	Twin 3300mm CSP's or equivalent	Twin 3600mm CSP's or equivalent
Int 2, Sta. 6+815 (Town of Pelham city limits) to 5+288 (Ridgeville Drain)	Twin 3300mm CSP's or equivalent	Twin 3300mm CSP's or equivalent	Twin 3600mm CSP's or equivalent
Int 3, Sta. 5+288 (Ridgeville Drain) to 2+044	Twin 2700mm CSP's or equivalent	Twin 3000mm CSP's or equivalent	Twin 3300mm CSP's or equivalent
Int 4, Sta. 2+044 to 1+455 (Disher Drain)	Twin 3300mm CSP's or equivalent	Twin 3300 CSP's or equivalent	Twin 3600mm CSP's or equivalent
Int 5, Sta. 1+455 (Disher Drain) to -0+165 (Swayze Drain)	2000mm CSP or equivalent	2200mm CSP or equivalent	2400mm CSP or equivalent
Cyruss Nunn Drain			
Int CN-1 (Sta. -0+085 to 1+960)	1800mm CSP or equivalent	1800mm CSP or equivalent	2000mm CSP or equivalent
Int CN-2 (Sta. 1+960 to 2+920)	1600mm CSP or equivalent	1800mm CSP or equivalent	1800mm CSP or equivalent
Int CN-2 (Sta. 2+920 to 3+660)	1400mm CSP or equivalent	1800mm CSP or equivalent	1800mm CSP or equivalent
Int CN-2 (Sta. 3+660 to 3+690)	900mm CSP or equivalent	1100mm CSP or equivalent	1200mm CSP or equivalent
Swayze Drain			
Main Drain (Sta. 0+000 to 1+731)	Twin 2000mm CSP's or equivalent	Twin 2200mm CSP's or equivalent	Twin 2400mm CSP's or equivalent
West Branch Int SW-1 (Sta. 1+731 to 4+141)	2000mm CSP or equivalent	2200mm CSP or equivalent	2400mm CSP or equivalent
West Branch Int. SW-2 (Sta. 4+141 to 5+395)	1800mm CSP or equivalent	2000mm CSP or equivalent	2200mm CSP or equivalent
East Branch Int SE-1 (Sta. 0+000 to 1+875)	1800mm CSP or equivalent	1800mm CSP or equivalent	2000mm CSP or equivalent

	RECOMMENDED CULVERT SIZE		
	Access Culverts	Local Road Driveways	Regional and MTO Roads
East Branch Int SE-2 (Sta. 1+875 to 3+203)	1400mm CSP or equivalent	1600mm CSP or equivalent	1600mm CSP or equivalent
<u>Disher Drain</u>			
Int D-1 (Sta. 0+000 to 1+007)	Twin 2400mm CSP's or equivalent	Twin 2400mm CSP's or equivalent	Twin 2700mm CSP's or equivalent
Int D-2 (Sta. 1+007 to 3+515)	2400mm CSP or equivalent	2400mm CSP or equivalent	2700mm CSP or equivalent
Int D-3 (Sta. 3+515 to 5+955)	1400mm CSP or equivalent	1400mm CSP or equivalent	1600mm CSP or equivalent
<u>Ridgeville Drain</u>			
Int R-1 (Int R-1 (Sta. 0+000 to 0+230)	Triple 1400mm CSP's or equivalent	N/A	N/A
Int R-2 (Sta. 0+230 to 0+786)	Twin 1400mm CSP's or equivalent	N/A	N/A
Int R-3 (Sta. 0+786 to 2+489)	Twin 1200mm CSP's or equivalent	Twin 1700mm CSP's or equivalent	2400mm CSP or equivalent
Int R-4 (Sta. 2+489 to 3+940)	1800mm CSP or equivalent	Twin 1100mm CSP's or equivalent	N/A
Int R-5 (Sta. 3+940 to 5+090)	1800mm CSP or equivalent	2.2m wide x 1.65m high arch CSP or equivalent	N/A
Int R-6 (Sta. 5+090 to 6+460)	1600mm CSP or equivalent	1800mm CSP or equivalent	N/A
Int R-7 (Sta. 6+460 to 8+295)	Twin 900mm CSP's or equivalent	1600mm CSP or equivalent	N/A

Costs for culverts for all drains shall follow Maintenance Section 12.2 in this 2021 Report.

7.2) Culvert Capacity

Access (laneway) culverts in fields and driveways along the municipal drains are sized for the 2-year storm.

Municipal (local road) crossings and culverts along roads along the municipal drain are sized for the 5-year storm.

Regional road crossings along the municipal drains are sized for the 10-year storm.

8) DRAWINGS

8.1) Drawings

The location of the Big Creek Drain and the other Municipal Drains in its watershed are shown on Drawings No. 1 to 26 included with this report.

Drawing 1 is an overall plan showing the Big Creek Drain and the other municipal drain locations in the watershed.

Drawings 2 to 26 are plan enlargements and show assessment roll numbers, stations (distance in metres) along each drain, forest (bush) and greenhouse areas, and the affected hectares for each property and road.

8.2) Alignment of Drains

For maintenance purposes, the drain locations shown on Drawings No. 1 to 26 reflect the actual location of the drains constructed under the current governing reports and as shown on current aerial photography.

All drains shall be maintained generally to the alignment as noted on the plans (drawings) in this 2021 Report. In the absence of survey bars, existing fences and similar boundary features are assumed to represent property lines.

Should landowners desire a more precise location for the drains concerning their property line, or if there is a dispute about the location of any property line, landowners may obtain a legal survey at their own cost before maintenance.

9) COST ESTIMATE

This project's estimated cost consists of maintenance, engineering, and other associated costs.

9.1) Actual Drain Maintenance Costs

The maintenance costs are given in Table 9-1 Estimated Cost Summary have already been incurred and will be assessed per this report.

9.2) Engineering Cost Estimate

Engineering costs include report preparation, preparation of the new future maintenance schedules, and preparing for and attending the Council meetings to consider the report and the Court of Revision

Report preparation costs are usually not altered after the report is submitted unless the report is referred back or appealed to the Tribunal, resulting in additional costs. The amounts shown for meetings are an estimate. The final cost will be based on the actual time required for meetings. Engineering costs are summarized in Table 9-1 Estimated Cost Summary.

9.3) Estimate of Section 73 Costs

Section 73(2) and 73(3) of the Act direct that the cost of services provided by municipal staff and Council to carry out the Act process shall not form part of the final cost of the drain. However, Section 73(1) outlines that the following costs incurred by the municipality can be included in the cost of the drain: "*cost of any application, reference or appeal and the cost of temporary financing.*" The estimate of Section 73 costs is included to cover the cost of carrying out the required procedures under the Act. Section 73 costs are summarized in Table 9-1 Estimated Cost Summary.

9.4) Harmonized Sales Tax

The Harmonized Sales Tax (HST) will apply to most costs on this project. The Municipality is eligible for a partial refund on HST paid. The remaining net HST is 1.76% and is included in the cost estimates in this report.

9.5) Estimated Cost Summary

Table 9-1 - Estimated Cost Summary

i) Drain Maintenance Costs on Big Creek Drain

Stations	Description	Drain & Interval	Cost
5+350	Install Culverts	Big Creek Drain Interval 2	\$49,087.62
5+350	Bank Protection	Big Creek Drain Interval 2	\$5,800.32
3+400	Beaver Dams and Cleanout	Big Creek Drain Interval 3	\$4,427.57
1+1600	Install Culvert	Big Creek Drain Interval 4	\$3,256.32

2+000	Install Culvert	Big Creek Drain Interval 4	\$22,234.56
1+425	Beaver Dams	Big Creek Drain Interval 5	\$740
2+400	Beaver Dam	Disher Drain Interval D-2	\$864.96
0-1260	Beaver Dams and Cleanout	Cyruss Nunn Drain Interval CN-1	\$7,677.60
0+260	Beaver Dam	Swayze Drain Interval S-1	\$300
7+150	Install Culvert	Ridgeville Drain Interval R-7	\$7,067.23
TOTAL ACTUAL DRAIN MAINTENANCE COST:			\$101,456.18
	Report Preparation	\$75,620	
	Consideration of The Report(Public meeting)	\$1,500	
	Court of Revision	\$1,500	
	Net HST (1.76%)	\$1,375	
TOTAL ENGINEERING COST ESTIMATE:			\$79,395
	Printing of reports	\$100	
	Net HST (1.76%)	\$5	
TOTAL SECTION 73 COSTS:			\$105
GRAND TOTAL:			\$180,956.18

10) ASSESSMENTS

The Drainage Act requires that the total estimated cost be assessed to the affected lands and roads under the categories of Benefit (Section 22), Outlet Liability (Section 23), Injuring Liability (Section 23), Special Benefit (Section 24) and Increased Cost (Section 26). This report involves assessment for Benefit, Special Benefit, and Outlet Liability.

10.1) Calculation of Assessments

Appendix A in this report shows the method of calculating the assessments in Schedule B for future maintenance of the drains. The drains are divided into Branches and Intervals. The estimated costs for each interval are then determined. The next step in determining the assessment for each interval is determining the benefit assessment to the affected lands and roads along the drain. After deducting the total benefit assessments from the interval cost, the balance of the cost is then assessed as outlet liability on a per hectare basis to all lands and roads in the affected watershed.

10.2) Benefit Assessments (Section 22 and 24)

Section 22 benefits were calculated for lands that benefit from the existence of the drain and are not proportional to watershed area. Where applicable, Section 22 benefits have been included in the assessments in the new maintenance schedules (Schedule B). The benefits are listed in Appendix A.

Section 24 special benefit is assessed to lands and roads for costs that do not affect the drain function. The work to update the maintenance schedules, the Engineering/Report Preparation costs and Section 73 costs of this report have been assessed as Section 24 special benefits based on the following table.

Table 10-1 – Special Benefit Assessments

Property Class	Assessment Each (\$)	Notes
<i>Small</i>	20	Properties < 0.5ha in size
<i>Large</i>	40	Properties ≥ 0.5ha in size
<i>Roads</i>	100	
<i>MTO</i>	100	
<i>Other</i>		

10.3) Outlet Liability Assessments (Section 23)

Section 23(3) of the Drainage Act states that outlet liability assessment is based on the volume and rate of flow of the water artificially caused to flow. Therefore, in the maintenance schedules, the lands and roads in the watersheds of the drains are assessed on a per hectare basis, with adjustments made to recognize the different amounts of runoff generated by different land uses. The adjusted hectares are shown in Appendix A included in this Report. The basis for the adjustments is 1 hectare of cleared agricultural land, contributing surface and subsurface water to the drain. Land uses with a different runoff rate are adjusted by the factors given in Table 10-2 - Runoff Factors.

Table 10-2 - Runoff Factors

Land Use	Runoff factor
Agricultural	1.0
Forest (Bush)	0.5
Built-up/ Greenhouses	1.5
Unopened Road	1.0
Gravel Road	1.5
Paved Road	2.0

11) ASSESSMENT SCHEDULES

In the assessment schedules, each parcel of land assessed has been identified by the municipal assessment roll number when preparing this report. The size of each parcel was established using the assessment roll information. Each parcel is also identified by the current street/road address for convenience only.

There are no grants available towards the cost of preparing a Section 76 report. However, assessments for maintenance costs may be eligible for the grant. Grant eligibility will be determined when actual maintenance costs are levied.

11.1) Schedule A - Schedule of Assessments

The estimated cost for this report is distributed among lands and roads as shown in Schedule A. In addition, Schedule A distributes incurred maintenance costs to upstream lands and roads on the Big Creek Drain, based on Schedule B-1.

11.2) Schedule B - Schedule of Assessment for Future Maintenance

According to Section 74 of the Act, the drains must be maintained by the municipality in which they reside. The maintenance cost is assessed to lands and roads upstream of the maintenance location.

Amounts in Schedule B are not payable at this time. They would be used to prorate maintenance costs. The amounts in Schedule B are derived from the cost distribution shown in Appendix A.

Schedule B is divided into columns to reflect the different drain intervals for maintenance work. These intervals assist in identifying upstream lands and roads to be assessed for maintenance. The percentages shown in Schedule B determine the share of maintenance to be levied on a property or road. For example, a \$1,000 beaver dam removal, ditch cleanout or repair will result in a \$50 assessment to a property with a 5% maintenance assessment.

A minimum assessment of 0.01% is to be applied to all future small lots in the watershed per drain/branch per interval affected.

11.3) Schedule C – Schedule for Actual Cost By-Law

Actual assessments will be determined using Schedule C to prorate the actual costs. Schedule C also includes the maintenance costs billed out on the Big Creek Drain. Schedule C illustrates the estimated net assessments after deducting grants on maintenance costs from the total assessments shown in Schedule A. Actual assessments determined from Schedule C will be levied to the owner of the identified parcel and the roads when the Actual Cost By-Law is passed.

12) MAINTENANCE

The following paragraphs apply for the maintenance of the drains in the Big Creek Drain System.

12.1) Governing Reports for Maintenance

The following reports shall govern the drains, grades, shapes and specifications for maintenance of these drains:

- The Big Creek Drain profile by Wilfred J. Smith & Associates Ltd. dated November 1971 and the report by W. J. Smith, P. Eng. (Wilfred J. Smith & Associates) and R. Black Erwin, P.Eng. (Blake Erwin & Associates) dated November 6, 1975, are to be used for maintenance purposes and Schedule B from this 2021 report for billing out assessments for maintenance.
- The Cyruss Nunn Drain report by George Ross, Engineer, dated August 24, 1918, and the Cyruss Nunn Drain 2007 report by J. R. Spriet, P.Eng. (Spriet Associates) dated September 27, 2007, are to be used for maintenance purposes and Schedule B from this 2021 report for billing out assessments for maintenance.
- The Disher Drain report by G. K., Strachan, P.Eng. (The Proctor & Redfern Group), dated Revised October 26, 1980, is to be used for maintenance purposes and Schedule B-3 from this 2021 report for billing out assessments for maintenance.
- The Ridgeville Drain report by D. L. Pataky, P. Eng. (The Proctor & Redfern Group), dated July 22, 1983, is to be used for maintenance purposes and Schedule B from this 2021 report for billing out assessments for maintenance.
- The Swayze Drain report by C. J. Clarke, P.Eng. dated November 26, 1966, is to be used for maintenance purposes and Schedule B from this 2021 report for billing out assessments for maintenance.

12.2) Culverts

- The cleaning costs through all culverts shall be assessed as drain maintenance to upstream lands and roads.
- The cost for future structural repair, extension or replacement of road culverts will be assessed fully to the road authority.
- Each private property along the drain shall be allowed one crossing that is assessed 50% to the abutting landowner and the remainder to the upstream watershed and using the capacity/sizing shown in Table 7-1 Culvert Sizing in this

2021 report. The crossing shall have a 5m drivable top width with 2:1 side slopes to the bottom of the drain.

- The cost of additional crossings or lengths from the paragraph above is to be paid by the landowner.
- Prior approval of the applicable Municipality is required before a landowner installs a culvert. The culvert shall be installed per sizing specified in this report and the design grade specified in the governing report. If culverts smaller than the minimum recommended size are installed, such culverts have been deemed an obstruction to the drain and removed at the landowner's expense.

12.3) Access and Obstructions

According to Section 74 of the Act, right-of-ways along the drains and access routes to the drains exist for the Municipality to maintain the drains. The right-of-ways for the drains and the drains shall remain free of obstructions. The cost for removing obstructions is the responsibility of the owner.

12.4) New Connections

Any landowners making new connections to the drains shall notify the applicable Drainage Superintendent before making the connection. If the Drainage Superintendent is not notified, the cost to remedy new connections that obstruct or otherwise damage the drain will be the owner's responsibility.

12.5) Landowners Inspection of Drains

All parties affected by/along the drains are encouraged to periodically inspect the drain and report any visible or suspected problems to the applicable Municipality.

12.6) Updating Future Maintenance Schedules

To ensure future maintenance assessments are equitable, the assessments provided in this report should be reapportioned under Section 65. Section 65 reapportionments shall occur when parcels are changed, subsequent connections of new lands or land-use changes occur. If a future land-use change causes the drain's capacity to be exceeded, a report under Section 4 or 78 may be required to provide increased capacity.

13) GRANT

There are no grants available towards the cost of preparing a Section 76 report. However, assessments for maintenance costs may be eligible for the grant. Grant eligibility would be determined when actual costs are levied.

Under the provisions of Section 85 of the Act, a grant not exceeding 1/3 (33-1/3%) may be available on the assessments against lands used for agricultural purposes. The current OMAFRA grant policy defines agricultural lands as privately owned parcels of

land with the Farm Property Class Tax Rate. Based on Municipal assessment roll information, parcels with the Farm Property Tax Class are identified with an 'F' in the first column of the assessment schedules.

Section 88 of the Act allows the municipality to apply for this grant. The grant is applied after the 3rd reading of the By-Law and the appeal periods have expired. The municipality must confirm the Farm Property Tax Class on the assessed parcels when the grant application is completed and submitted to OMAFRA. OMAFRA has the authority to determine grant eligibility regardless of the designation herein.

14) PRIVACY OF LANDS

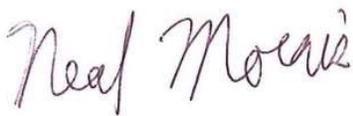
Although a municipal drain is situated on the property of various landowners, one landowner may not enter another landowner's property using the drain. Persons authorized to enter private lands to carry out duties authorized under the Act include Engineers (or their assistants), Contractors (or their assistants) and the appointed Drainage Superintendents (or their assistants).

15) BY-LAW

This report, including the assessment schedules, appendices and drawings, when adopted by By-law following the Act, provides the basis for maintenance of the Big Creek Drain and the other municipal drains (Cyruss Nunn Drain, Disher Drain, Ridgeville Drain and Swayze Drain) within its watershed.

All of which is respectfully submitted,

K. SMART ASSOCIATES LTD.



N. Morris, P. Eng.

mw

