



BURNSIDE

**Engineer's Report
Waite Municipal Drain**

**City of Kawartha Lakes
(Geographic Township of Fenelon)
26 Francis Street
Lindsay, Ontario
K9V 5R8**



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26 Francis Street
Lindsay, Ontario K9V 5R8**

**R.J. Burnside & Associates Limited
15 Townline
Orangeville ON L9W 3R4**

**February 2024
300041611.0000**

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Record of Revisions

Revision	Date	Description
0	April 2019	Draft Report. Initial submission to COKL and reviewing agencies.
1	April 2023	Draft Report. Submission to COKL and reviewing agencies.
2	February 2024	Final Report. Submission to COKL and reviewing agencies.

R.J. Burnside & Associates Limited

Report Prepared By:

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EMD:js/cvh



Executive Summary

Authorization

The preparation of this Engineer's Report was authorized through two resolutions of the Council of City of Kawartha Lakes dated September 12, 2017 and March 6, 2018 respectively, in response to petitions filed for drainage works within the geographic township of Fenelon (geographic County of Victoria), in accordance with Section 4 of the Drainage Act, R.S.O 1990.

Objective & Recommendations

The objective of this report includes the following:

- Determine a drainage solution to alleviate the ponding that currently takes place following storm events and snowmelt within the watershed area.
- Provide a legal surface and subsurface drainage outlet for properties within the watershed.
- Enhance the quality of the stormwater leaving the watershed area.

This Report recommends the construction of the Waite Municipal Drain, consisting of three branches, the Eastern, Western, and Southern Branches.

Eastern Branch is a proposed open and closed drain beginning on the eastern property line of the J. Waite property (Roll No 36-800) in Lot 10, Concession 6 and proceeding to the east to outlet on the G. Stewart property (Roll No. 36-500) in Lot 10, Concession 6.

Western Branch is another open and closed system beginning on the north side of Chambers Road in Lot 11, Concession 6. The drain will proceed south and west to outlet in Lot 10, Concession 5.

Southern Branch is a proposed open drain that conveys flows from an existing drainage easement and surrounding properties in Lot 9, Concession 5 north and west to its outlet in the Western Branch on Lot 10, Concession 5.

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Summary of Assessments

A summary of the assessments for this project are as follows:

Canada Owned Lands	\$ 0
Ontario Lands	\$ 157,410
Municipal Lands	\$ 187,130
Privately Owned Non-Agricultural	\$ 120,090
Privately Owned Agricultural — grantable	\$ 322,630
Special Non-Proratable Assessments	<u>\$ 512,740</u>
Total Estimated Assessments	\$ 1,300,000

Acknowledgements

R.J. Burnside & Associates Limited staff would like to acknowledge the assistance and cooperation of the landowners directly involved with this project and the Council and Staff of the City of Kawartha Lakes.

We would also like to acknowledge the assistance and cooperation of staff from the Ministry of Transportation (MTO), Fisheries and Oceans Canada (DFO), Ministry of the Environment, Conservation, and Parks (MECP), and the Kawartha Region Conservation Authority (KRCA).

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Appendices

- Appendix A Allowances
- Appendix B Project Cost Estimate
- Appendix C Special Assessments
- Appendix D Schedules of Assessment
- Appendix E Standard Drain Specifications
- Appendix F Special Provisions
- Appendix G Agency Correspondence
- Appendix H Design Summary
- Appendix I Drawings

Nomenclature

General

ac – acre (0.4047 ha)
ap. – approximately
BSWI – buried surface water inlet
CB – catchbasin
CCTV – closed circuit television
CDT – concrete drain tile
CSP – corrugated steel pipe
c/w – complete with
dia. – diameter
DICB – ditch inlet catchbasin
d/s – downstream
ea. – each
FL – fence line
FPPDT – filtered perforated plastic drainage tubing
H – horizontal
ha – hectare (2.471 ac)
HDPE – high density polyethylene
BJB – buried junction box
km – kilometre
LS – lump sum
m – metre
mm – millimetre
m² – square metre
m³ – cubic metre
OB – observation box
o/s – offset
PDT – plastic drainage tubing
PL – property line
RCSP – riveted corrugated steel pipe
ROW – right of way
S & I – supply and install
Sta. – station (chainage)
SWI – surface water inlet
SWRP – surface water riser pipe
SWWSP – smoothwall welded steel pipe
t – tonne (2,205 pounds)
u/s – upstream
V – vertical

Other

CA – Conservation Authority
DFO – Department of Fisheries and Oceans
MECP – Ministry of Environment, Conservation and Parks
MTO – Ministry of Transportation
NRCS – Natural Resources Conservation Service
OMAFRA – Ontario Ministry of Agriculture, Food and Rural Affairs
SCS – Soil Conservation Service

1.0 Project Authorization

This Report is being prepared in response to two resolutions of the Council of City of Kawartha Lakes, dated September 12, 2017 and March 6, 2018 respectively, to investigate drainage issues on the properties of the petitioning landowner and road authority, within the geographic township of Fenelon, in accordance with Section 4 of the Drainage Act, R.S.O 1990.

1.1 Petition for Drainage Works by Owners

Two petitions were submitted in relation to this project. The first petition, dated August 15, 2017, was submitted by J. Waite (Roll No. 36-800); owner of Pt. Lot 10, Concession 6 in the geographic township of Fenelon.

A second petition was filed on December 8, 2017 requesting an outlet for Cameron Road (City of Kawartha Lakes Road No. 34) in Lots 9 and 10 between Concessions 5 and 6, Fenelon. This petition was submitted by the City of Kawartha Lakes as the governing road authority.

On March 6, 2018, the City of Kawartha Lakes Council directed R.J. Burnside & Associates Limited (Burnside) to combine the two petitions into one Report as per Section 8(4) of the Drainage Act.

1.2 Engineer's Report

The proposed works and costs contained herein are intended to reflect the requirements of the stakeholders and are based on information gathered during field survey, as well as at the landowner meetings and follow-up discussions. Details of the proposed work are described in this report, its appendices and drawing set.

2.0 Background Information

2.1 Municipal Drains

The watershed of the proposed Waite Municipal Drain is not currently assessed to an existing municipal drain.

2.2 Existing Private Drainage Systems

Currently, there are no known systematic private drainage systems installed within the branch watersheds, however, several areas of random drainage were located.

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2.3 Existing Conditions

A private tile is located through the eastern half of the J. Waite property (Roll No. 36-800), but an outlet location could not be determined. This tile does not provide sufficient capacity or length to mitigate the drainage issues observed on the property. The J. Waite property is divided by a ridge that runs generally in a north-south direction, and surface water flows are directed to either side of the property by this topography.

Surface water on the eastern half of the J. Waite property generally ponds on the low-lying eastern area around the J. Waite and D. Wallace (Roll No. 36-700) property line. This water eventually flows east across Highway 35 and outlets into a natural swale across the B. Clive property (Roll No. 36-900). On the B. Clive property, the natural swale conveys surface flows through an existing private pond and under the recreational trail via an existing concrete culvert, out letting into the adjacent wetland on the G. Steward property.

On the western side of the J. Waite property, a surface culvert under Chambers Road outlets water from the M. Leach property (Roll No. 37-200) onto the north edge of the property. Surface water generally flows south and west across workable areas and ponds upstream of the existing Cameron Road surface culvert crossing. This culvert outlets into an existing private pond on the C. Malcolm property (Roll No. 21-300), which drains to a poorly defined channel where flows eventually dissipate to the west into the downstream wetland on the Johnston property (Roll No. 21-402).

The portion of Cameron Road indicated in the City of Kawartha Lakes (COKL) December 2017 petition is currently drained by an existing drainage easement on the southwest side of the right-of-way. This existing easement begins on the M. Melas (Roll No. 32-502) property and terminates at the property line between the F. Hack (Roll No. 32-501) and C. Malcolm properties, which is also the lot line between Lots 9 and 10, Concession 5.

This easement has not been maintained, and it is not legally defined beyond the lot line between Lots 9 and 10 in Concession 5. Beyond this point, surface flows continue overland with little channel definition.

Both existing wetlands that border the Waite Municipal Drain Watershed eventually outlet to the east into Sturgeon Lake.

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2.4 Contributing Watershed

2.4.1 Watershed Area

The total watershed area contributing to the three branches of the **Waite Municipal Drain** is approximately **90.34 ha** (the total contributing watershed). The watershed area was delineated through the examination of topographic contour mapping data with computer aided drafting (CAD) and geographic information systems (GIS) software and confirmed through the review of field survey and observations.

2.4.2 Land Use

Land use within the watershed area is divided approximately, as shown in Table 1.

Table 1: Land Use Summary

Land Use	Affected Area (ha.)	Land Use Area Ratio (%)
Agricultural	65.8	72.9%
Fallow	9.5	10.5%
Bush	2.2	2.4%
Sub-Urban Residential/ Institutional	8.5	9.4%
Municipal Road R.O.W.	2.8	3.1%
Provincial Road R.O.W.	1.5	1.7%
TOTAL	90.3	100.0%

2.4.3 Surrounding Watersheds

The proposed Waite Municipal Drain does not share a watershed boundary with any other municipal drains.

2.5 Soils Summary

Soil mapping of the area previously known as Victoria County from Report No. 25 of the Ontario soil survey (1959), indicates that the predominant soil type within the watershed area is Otanabee loam, with smaller areas of Solmesville clay loam.

- **Otanabee loam** - A moderately stony soil with good drainage and moderately sloping topography.
- **Solmesville clay loam** – A soil with few stones, imperfect drainage and undulating topography.

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Based on the characteristics of the soils and their potential for current or future agricultural use, the Canada Land Inventory (CLI) provides Soil Capability Classification of Agriculture for lands across the country. The soils within the Waite Municipal Drain watershed area have an agricultural capability rating of Class 1 and have no significant limitations in use for crops.

3.0 On-Site Meetings

3.1 Western and Eastern Branches

An on-site meeting for the area described in the August 2017 petition was held on November 7, 2017 at the City of Kawartha Lakes public works offices located at 710 Cameron Road. The meeting was attended by several landowners including the petitioner, as well representatives from the COKL, MTO, KRCA, and Burnside. Attendees who signed-in at the meeting are summarized in the table below.

Table 2: On-Site Meeting Attendance (November 7, 2017)

Name	Title & Roll Number
Joe Waite	Property Owner (Roll No. 36-800)
Josh Stewart	Property Representative (Roll No. 21-300)
Barbara Clive	Property Owner (Roll No. 36-900)
Cheryl Tolles	Ministry of Transportation
Don Lawrence	Ministry of Transportation
Mike Farquhar	City of Kawartha Lakes
Paul Herlihey	City of Kawartha Lakes
Stacy Porter	Kawartha Region Conservation Authority
Brett Tregunno	Kawartha Region Conservation Authority
Ron Warne	Kawartha Region Conservation Authority
Natalie Connell	R.J. Burnside & Associates Limited
Ed DeLay	R.J. Burnside & Associates Limited

The existing drainage conditions were discussed, and the petitioner, Joe Waite, expressed interest in reducing the ponding on his property and obtaining a legal outlet for future systematic underdrainage. Additionally, Mr. Waite indicated that he was interested in reducing the amount overland flow that currently crosses the west side of his property between Chambers and Cameron Roads.

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It was discussed that with surface flows ponding on both the east and west side of the Waite property, any drainage solution would likely need to have a dual outlet, or an outlet on either side of the overall watershed. Given this, drainage of the property would be divided into eastern and western sub-watersheds, and each would be provided with a legal outlet.

The first of the two proposed outlets would serve the eastern sub-watershed and convey flows to the east from the southeast corner of the Waite property across Highway No. 35 and the B. Clive property, crossing the recreational trail to outlet in the east half of Lot 10, Concession 6 on the G. Stewart property. This proposed drain route was found to be similar to the existing and natural surface water flow path.

The second proposed outlet would serve the western sub-watershed by reducing overland flows from the lands north of the Waite property by bringing them into a closed drain and conveying those flows to the southwest, across Cameron Road and through the C. Malcolm property.

Following the meeting, Burnside conducted follow-up site visits with representatives from the affected properties. One visit was held with Claire Malcolm and Josh Stewart of the C. Malcolm property (Roll No. 21-300). Ms. Malcolm and Mr. Stewart indicated that the existing pond on their property just west of Cameron Road currently receives significant flows from the area east of Cameron Road including the J. Waite property, and that they were concerned with the effects a drain outlet could have on this pond with respect to increased flows.

Additionally, they indicated that the fields on the property were currently used for animal grazing and rehabilitation, and they expressed concern with possible safety risks posed to their animals by the construction of a drain through the property. It was discussed that any proposed design for the western sub-watershed would be carried to such a point that it would not negatively affect downstream features. This would likely mean that the proposed design would not outlet into the pond but carry flows downstream to a more suitable outlet.

A follow-up meeting was also held with Barbara Clive (Roll No. 36-900). Ms. Clive expressed interest in maintaining the existing pond on her property for animal use. It was discussed that the proposed drain for the eastern sub-watershed could be designed to incorporate this pond.

3.2 Southern Branch

A subsequent on-site meeting was held on May 2, 2018, in conjunction with information meeting no. 1, at the City of Kawartha Lakes public works offices located at 710 Cameron Road. This site meeting addressed the area described in the

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December 2017 petition submitted by the City of Kawartha Lakes for Cameron Road (COKL Road No. 34).

The existing drainage conditions were discussed, and City staff expressed interest in obtaining a legal outlet for the Cameron Road roadside ditches in Lot 9 between Concessions 5 and 6.

It was found that flows from this section of the road currently flow west from Cameron Road via an existing drainage easement. However, City staff indicated that this easement does not extend to what they consider as a suitable or legal outlet, and surface flows are unable to drain effectively. Given the current conditions, it was proposed that the Cameron Road R.O.W. in question would be given a legal outlet that would convey flows from the downstream end of the existing drainage easement northeast into Lot 10, Concession 5 to join flows from the western sub-watershed.

3.3 Summary of On-Site Meetings

As a result of the two on-site meetings and subsequent site investigations and landowner discussions it was determined that this Report has two primary purposes, which are as follows:

- To provide two legal outlets for the J. Waite property that will allow for improved agricultural operations without negatively impacting adjacent properties.
- To provide a solution that ensures a legal outlet for the section of Cameron Road currently affected by the existing drainage easement.

3.4 Validity of Petitions

3.4.1 J. Waite (Roll No. 010-368-00) Petition

The area requiring drainage for the J. Waite petition was determined by the Engineer at the November 7, 2017 on-site meeting to be part of western part of Lot 10, Concession 6 in the geographic Township of Fenelon.

The petition submitted is valid on the basis that all of the owners in the area requiring drainage have signed it, in accordance with Section 4 (1) (a) of the act.

3.4.2 Cameron Road (City of Kawartha Lakes) Petition

The area requiring drainage for the City of Kawartha Lakes petition was determined by the Engineer at the second on-site meeting on May 2, 2018 to be part of the Cameron Road (City of Kawartha Lakes Road No. 34) R.O.W. in Lot 9, Concessions 5 and 6 in the geographic Township of Fenelon.

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This petition is valid on the basis that it was signed and submitted by the governing road authority for Cameron Road in accordance with Section 4 (1) (c) of the Act.

4.0 Preliminary Investigations

4.1 Soils Investigation

4.1.1 Private Lands

None of the landowners indicated adverse subsoil conditions in the area near the proposed drain installation and a soils investigation was not undertaken on private lands as part of this project.

Shallow bedrock was noted by some landowners and verified through well records data, therefore, costs for the removal of bedrock to allow for construction of the drain have been provisionally included with this report.

4.2 Highway No. 35 Right-of-Way Encroachment

Representatives from the Ontario Ministry of Transportation (MTO) were present at the first on-site meeting on November 7, 2017. At this meeting it was discussed that any work within the Highway No. 35 right-of-way would require an encroachment permit from the Ministry.

A follow up phone conversation was held between Burnside staff and the MTO on March 14, 2019. At this time, the MTO indicated that the encroachment permit would require the completion of a geotechnical investigation, settlement monitoring report and traffic plan at the proposed drain location, prior to the submission of the final report for the proposed municipal drain.

4.3 Utilities Investigation

All public and private utilities shall be located by the contractor prior to the construction of the proposed drain.

4.3.1 Enbridge Gas Distribution – Highway No. 35

In late 2018 and early 2019, Enbridge Gas Distribution's (Enbridge) completed construction of a natural gas pipeline in the area of the proposed Waite Municipal Drain. Work within the affected watershed included the installation of a 150 mm nominal diameter High Pressure Polyethylene pipeline along the west side of the Highway No. 35 R.O.W. Burnside was provided with the as-laid out horizontal drawing and approximate elevation of this gas pipeline. The proposed drain design on the eastern sub-watershed was checked for possible interference with this pipeline.

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The vertical elevation of the installed natural gas pipeline was provided by Enbridge and is shown on the drawing set.

Prior to construction, the exact location and elevation of the pipeline shall be re-located by the Contractor, prior to construction.

Enbridge staff also provided the document entitled "Third Party Requirements in the Vicinity of Natural Gas Facilities, V3.1 2018" (prepared by Enbridge Gas Distribution. This document will govern construction methods and procedures within the vicinity of the pipeline.

5.0 Design Criteria & Engineering Considerations

5.1 Design Summary

A design summary has been included in Appendix H.

5.2 Design Considerations for Water Quality

The loss of sediment and nutrients from cropped land is a major concern to water quality in Ontario. Therefore, this design has incorporated several features to minimize these impacts including:

Channel Features:

- Sediment basins to control channel gradient and retain water and sediment.
- Vegetated riparian buffer strips to act as both a minimum setback distance for agricultural work, as well as a physical barrier for sediment laden runoff entering the channel.
- Rip-rap erosion protection along banks susceptible to erosion to reduce channel degradation.
- A permanent stilling basin designed to dissipate the water's energy as it exits the piped drainage system, leading to reduced erosion in the channel.
- Sediment basins and sediment control structures constructed with filter socks and rock check dams to promote sediment deposition.
- Temporary sediment control structures constructed with filter socks and rock check dams to dissipate energy and allow sediment deposition at closed drain outlets and within the channel.

Closed System Features:

- Directional berms and rip-rap surrounding catchbasins to slow and pond surface water, allowing suspended soil particles and nutrients to fall out of suspension and remain on the soil surface.

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- 300 mm deep sumps on all catchbasins to slow and encourage deposition of suspended soils at these locations.
- Surface water (SWI) and buried surface water inlet (BSWI) to slow and pond surface water, allowing suspended soil particles and nutrients to fall out of suspension and remain on the soil surface.
- A grassed overflow swale to convey floodwaters while minimizing erosion of the overflow pathway.

Additional details on the water quality features included in this report are provided in Appendix H.

6.0 Environmental and Fisheries Considerations

When a new report is prepared that could affect an existing municipal drain, natural watercourse, wetland, or other environmental features, a review of the work is required, and subsequent approvals and / or project requirements must be obtained from the applicable agency.

The preparation of this report included correspondence with the KRCA, MECP, and DFO, which has been summarized in Appendix G.

Various environmental features such as sediment and stilling basins, erosion protection, and riffle structures have been included as mitigation measures to satisfy the requirements of the regulating agencies.

7.0 Stakeholder Meetings

Two additional meetings were organized with the stakeholders involved with this project. At both meetings, Burnside presented the preliminary proposed design, cost estimate and assessment schedules and gathered input and comments from the stakeholders.

These information meetings with stakeholders are not a requirement under the Act. Their purpose is to receive feedback regarding the proposed drain and its associated costs prior to the preparation and submission of a final report.

7.1 Information Meeting No. 1

An Information Meeting was held on May 2, 2018 at the City of Kawartha Lakes public works offices located at 710 Cameron Road. Several landowners were in attendance, as were representatives from the KRCA, the City of Kawartha Lakes, and Burnside staff.

Attendees who signed-in at the meeting are summarized in the table below.

Table 3: Information Meeting No. 1 Attendance (May 2, 2018)

Name & Property	Title & Roll Number
Jim Breadner	Property Owner (Roll No. 20-905)
M. Faith Crozier	Property Owner (Roll No. 20-904)
Frank & Anna Hack	Property Owner (Roll No. 32-501)
Clair Malcolm & Josh Stewart	Property Owner (Roll No. 21-300)
Wayne & Isobel Moore	Property Owner (Roll No. 32-584)
Joe Waite	Property Owner (Roll No. 36-800)
Dave Wallace	Property Owner (Roll No. 36-700)
Mike Farquhar	City of Kawartha Lakes
Paul Herlihey	City of Kawartha Lakes
Stacy Porter	Kawartha Region Conservation Authority
Ron Warne	Kawartha Region Conservation Authority
Natalie Connell	R.J. Burnside & Associates Limited
Ed DeLay	R.J. Burnside & Associates Limited

The proposed design presented for the three branches of the drain included 752 m of channel works, 590 m of closed drain installation and three SWWSP jack and bore road crossings. A cost estimate and landowner assessments were provided to attendees.

The meeting was well attended, and a good discussion took place. The petitioners were generally in agreement with the proposed design.

The owners of Roll No. 21-300 (C. Malcolm) raised concerns regarding the depth and length of the Western Branch open drain on their property. A follow-up discussion was held with Ms. Malcolm and Mr. Stewart on their property following the meeting. Design alternatives to the open drain were discussed, and Burnside agreed to investigate redesigning the Western Branch to be a closed drain through this property.

Following this meeting, the Drainage Superintendent was available to the landowners not in attendance for information on the progress of the project.

7.2 Information Meeting No. 2

A second Information Meeting for the proposed drain was held on July 25, 2018 at the City of Kawartha Lakes public works offices located at 710 Cameron Road. The

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purpose of this meeting was to provide an update to landowners, reviewing agencies, and the COKL on project progress and design changes. Attendees who signed-in at the meeting are listed below.

Table 4: Information Meeting No.2 Attendance (July 25, 2018)

Name & Property	Title & Roll Number
Dan Brown	Property Representative (Roll No. 21-402)
George Bryans	Property Representative (Roll No. 36-300)
Eunice Conner	Property Representative (Roll No. 36-100)
Clair Malcolm & Josh Stewart	Property Representative (Roll No. 21-300)
Wayne & Isobel Moore	Property Representative (Roll No. 32-584)
Joe Waite	Property Representative (Roll No. 36-800)
Dave Wallace	Property Representative (Roll No. 36-700)
Lynn Cowen	Property Representative (Roll No. 36-910)
Matt Leach	Property Representative (Roll No. 37-200)
Julie McLean	Property Representative (Roll No. 36-402)
Ron Peel	Property Representative (Roll No. 37-101)
Muriel Stather	Property Representative (Roll No. 36-901)
Gord Stewart	Property Representative (Roll No. 36-500)
Ralph Whyte	Property Representative (Roll No. 35-300)
Craig McGill	Unknown
Norm Ott	Unknown
Prabin Sharma	Ministry of Transportation
Amelie Norton	Kawartha Region Conservation Authority
Stacy Porter	Kawartha Region Conservation Authority
Brett Treguno	Kawartha Region Conservation Authority
Ron Warne	Kawartha Region Conservation Authority
Mike Farquhar	City of Kawartha Lakes
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The revised drain design presented at this time included 569 m of channel works, 705 m of closed drain installation, and three SWWSP jack and bore road crossings. A revised cost estimate and landowner assessments were provided to attendees.

The meeting was well attended, and the discussions were focused on the project cost and proposed landowner assessments. At the end of the meeting, Burnside indicated that we would move forward to obtain agency approvals and submit the Final Report.

Following this meeting, the Drainage Superintendent and other City staff were available to the landowners not in attendance for information on the progress of the project.

7.3 MTO Crossing

In order to review the proposed Highway 35 crossing on the Eastern Branch, MTO required a foundation geotechnical report for the crossing, which would also recommend the crossing installation method.

Several meetings were held throughout this process with the working group (MTO, COKL, and Burnside staff). Golder Associates were sub-contracted to prepare the foundation report, which included a geotechnical site investigation. Due to the MTO tunnelling requirement advised by MTO staff of 3.0 m cover at the Highway 35 centreline and 1.5 m cover at the road ditches, the subsurface crossing must be installed in bedrock. The geotechnical report recommended both the open cut method and micro-tunnelling (a trenchless technology) as options. Burnside prepared cost estimates for both options and presented them to the working group during the Fall of 2022. It was suggested by Burnside staff to provisionally tender both options and select the most cost effective at that time. MTO staff indicated they would prefer to review a draft report prior to finalizing their decision. MTO staff provided input on the draft report in August 2023 where they indicated MTO would require an encroachment permit for the project and approval of the tender for the work on their right-of-way.

A copy of the Golder Associates geotechnical report is available upon request.

8.0 Proposed Work

In accordance with the Drainage Act, R.S.O 1990, the details of the proposed work are contained in the appendices of this report and provide complete details of the entire project. This section of the report is intended to provide only a brief description of the work along the course of the proposed drainage system.

8.1 Proposed Work Summary

The proposed work on each municipal drain has been summarized as follows:

Waite Municipal Drain
February 2024

8.1.1 Eastern Branch

- Ap. 192 m of HDPE (320 kPa) pipe (or approved equal).
- Four concrete structures including one directional berm.
- One road crossing, comprised of ap. 39 m of SWWSP.
- Ap. 174 m of grassed swale construction.
- Ap. 90 m of channel deepening and widening, and riparian buffer construction.
- One outlet stilling basin, and three permanent sediment basins.
- Provisional bedrock removal for drain construction.

8.1.2 Western Branch

- Ap. 647 m of HDPE (320 kPa) pipe (or approved equal).
- Five concrete structures including two directional berms.
- One road crossing comprised of approximately 23 m of SWWSP.
- Ap. 102 m of channel deepening and widening, and riparian buffer construction.
- One outlet stilling basin, and one permanent sediment basin.
- Provisional bedrock removal for drain construction.

8.1.3 Southern Branch

- Ap. 239 m of grassed swale construction to provide an outlet for the existing drainage easement in Lot 9, Concession 5.
- Incorporation of ap. 190 m of grassed swale, also given a design for future maintenance.
- Provisional bedrock removal for drain construction.

8.2 Description of Proposed Work on Each Property

Note: All items described within above as shown on the drawings shall form part of the proposed municipal drain and shall be included when completing future maintenance.

8.2.1 Eastern Branch

G. Stewart (Roll No. 010-365-00)

- Ap. 116 m of channel deepening and widening, and riparian buffer construction.

City of Kawartha Lakes (Roll No. 060-630-00)

- Ap. 66 m of channel deepening & widening, including culvert cleanout, and riparian buffer construction.
- One outlet stilling basin.
- The existing culvert remains private.

Waite Municipal Drain
February 2024

B. Clive (Roll No. 010-369-00)

- One rip-rap pond outlet structure.
- Ap. 143 m of 450 mm dia. HDPE (320 kPa) pipe (or approved equal).
- Ap. 174 m of grassed swale construction.

Highway 35 (Ministry of Transportation)

- Ap. 39 m of 600 mm dia. (Outside Diameter) SWWSP pipe, installed by micro-tunnelling.
- Two - 900 mm x 1,200 mm inline concrete observation boxes (shared).
- One - 600 mm x 600 mm offset concrete ditch inlet catchbasin (shared) c/w directional berm, and ap. 6 m – 300 mm dia. HDPE (320 kPa) pipe (or approved equal) lead.
- The existing road surface culvert remains private.

D. Gardner (Roll No. 010-369-01)

- Ap. 49 m of 525 mm dia. HDPE (320 kPa) pipe (or approved equal).
- One - 900 mm x 1,200 mm inline concrete catchbasin (shared).

8.2.2 Western Branch

B. & K. Johnston (Roll No. 010-214-02)

- Ap. 129 m of channel deepening & widening, and riparian buffer construction.
- One - Outlet stilling basin.
- Ap. 10 m of 450 mm dia. HDPE (320 kPa) pipe (or approved equal).
- One – 900 mm x 1,200 mm inline concrete catchbasin (shared).

C. Malcolm (Roll No. 010-213-00)

- Ap. 150 m of 450 mm dia. HDPE (320 kPa) pipe (or approved equal).
- Two – 900 mm x 1,200 mm inline concrete catchbasins (shared).

Cameron Road (City of Kawartha Lakes)

- One- 900 mm x 1,200 mm inline concrete ditch inlet catchbasin c/w directional berm (shared).
- Two - 900 mm x 1,200 mm inline concrete catchbasins (shared).
- Ap. 23 m of 600 mm dia. SWWSP pipe (Outside Diameter).

J. Waite & A. Williamson (Roll No. 010-368-00)

- Ap. 443 m of 300 mm dia. HDPE (320 kPa) pipe (or approved equal).
- Ap. 44 m of 450 mm dia. HDPE (320 kPa) pipe (or approved equal).
- Two - 900 mm x 1,200 mm inline concrete catchbasins (shared).

Waite Municipal Drain
February 2024

- One - 600 mm x 600 mm concrete ditch inlet catchbasin c/w directional berm (shared).

Chambers Road (City of Kawartha Lakes)

- One - 600 mm x 600 mm concrete ditch inlet catchbasin c/w directional berm (shared).
- The existing road surface culvert remains private.

8.2.3 Southern Branch

B. & K. Johnston (Roll No. 010-214-02)

- Ap. 119 m of grassed swale construction.

C. Malcolm (Roll No. 010-213-00)

- Ap. 121 m of grassed swale construction.

(P.14) F. & A. Hack (Roll No. 010-325-01)

- Incorporation of ap. 50 m of grassed swale, also given a design for future maintenance.

(P.15) WESTLAKE (Roll No. 010-213-00)

- Incorporation of ap. 73 m of grassed swale, also given a design for future maintenance.

(P.13) D. MacDonald & L. King (Roll No. 010-209-05) & (P.12) T. & M. McConnell (Roll No. 010-209-04)

- Incorporation of ap. 67 m of shared grassed swale, also given a design for future maintenance.

Cameron Road (City of Kawartha Lakes)

- Incorporation of ap. 23 m of shared grassed swale, also given a design for future maintenance. The existing road surface culvert remains private.

8.3 Drain Incorporation

The existing surface swale forming the proposed **Southern Branch** shall be incorporated and a portion of it shall be improved under this report.

Section 31 of the Act allows the Engineer to incorporate a private drain as part of a municipal drain and, if applicable, compensate the landowner for the determined cost

through an allowance. Drain incorporation is discussed further under the allowances in Appendix A.

8.4 General Construction

8.4.1 Appurtenances

Appurtenances associated with the work on private lands include the stripping, stockpiling and replacing of topsoil along the tile route, restoration of fence lines disturbed by construction or access routes, and the connection or reconnection of existing field tile encountered during the work.

Appurtenances associated with the work on the road right-of-way include stripping, stockpiling and replacing of topsoil and seeding of all disturbed areas.

8.4.2 Damaged Private Tiles

The replacement of damaged or poorly functioning tile outlets encountered during the installation of the drain will be included as part of the construction costs and protected against erosion with rip-rap, as approved by the Contract Administrator.

The connection and reconnection of existing tiles encountered during the installation of the drain will be included as part of the construction costs.

Private tile outlets and tile connections / reconnections are not to be considered part of the drain for future maintenance.

8.5 Working Space and Access Routes

The working space and access routes being provided to the contractor to undertake this work are described in Appendix F - Special Provisions on the chart entitled "Working Space".

The allowance(s) given for this area is further discussed in Appendix A – Allowances.

8.6 Change Orders

If unforeseen circumstances are encountered following the adoption of this report, the Engineer may issue change orders as required to have the work properly constructed.

9.0 Description of Appendices

9.1 Appendix A — Allowances

9.1.1 General

In accordance with Section 8(1)(d) of the Act, this Appendix provides a breakdown of the allowances provided under Sections 29 to 33 of the Act (if applicable).

9.2 Appendix B — Project Cost Estimate

In accordance with Section 8(1)(b) of the Act, this appendix provides a breakdown of the total estimated cost of the proposed work, including all labour, materials, construction, engineering, administration, and allowances.

9.3 Appendix C — Special Assessments

Assessments under Sections 24 and 26 are summarized in this Appendix (if applicable).

9.4 Appendix D — Schedule(s) of Assessment for Construction and Maintenance

In accordance with Section 8(1)(c) of the Act, these Appendices show the distribution of the total estimated cost over the lands and roads involved and are in accordance with Sections 21, 22, 23, 24 and 26 of the Act.

A description and breakdown of Section 24 – Special Benefit and Section 26 - Special Assessments is shown in Appendix C.

In accordance with Section 38 of the Act, an assessment schedule for future maintenance of the drain has been included as the basis on how to divide such costs. Affected lands located upstream of the maintenance shall be determined by the Drainage Superintendent and assessed according to this schedule.

9.5 Appendix E — Standard Drain Specifications

The Standard Drain Specifications have been provided in Appendix E and govern the work described herein.

9.6 Appendix F — Special Provisions

Special Provisions are specific directions for this project and detail requirements not encompassed by Appendix E – Standard Drain Specifications. Special Provisions shall take precedence over Standard Drain Specifications where a conflict between the two documents may exist.

9.7 Appendix G — Agency Correspondence

Project correspondence, recommendations, and requirements from the reviewing agencies are listed in this Appendix.

9.8 Appendix H – Design Summary

This appendix provides a summary of design criteria, standards, hydrologic and hydraulic simulations and analyses, and the results used in the design of the drainage system.

9.9 Appendix I — Drawings

Eight drawings are included with this report, consisting of a plan, profiles and details pertinent to the construction of the proposed drain.

10.0 Maintenance and Future Considerations

10.1 General

The City of Kawartha Lakes (COKL) will be responsible for the maintenance of the drain after construction is complete. However, sections of the Act dealing with obstruction of, damage, and injury to a municipal drain, namely Sections 80 and 82, are brought to the attention of the property owners. Under these sections, both the property owners and the COKL have responsibilities to ensure that a municipal drain is properly maintained and kept in good working condition.

Any areas of washout, settlement, erosion or other disrepair within the proposed municipal drain shall be maintained as needed by the Drainage Superintendent. Relevant drainage features shall be inspected on a periodic basis by the Drainage Superintendent and cleaned out as required to maintain the efficiency of the structures and to prevent sedimentation or erosion of the channel, and these may include:

- Inlet, outlet, and conveyance structures
- Rip-rap erosion protection
- Riparian buffers
- Sediment basins
- Stilling basins, etc.

Although the maintenance of the drain must be completed through the COKL, landowners can and should assist with the maintenance activity by:

- Making regular inspections of the drain and inlet structures.
- Clearing debris from the inlet structures in a timely manner (prior to storm and snowmelt events).

Waite Municipal Drain
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Any problems should be reported to the COKL so that the Drainage Superintendent can take proper action.

10.2 Maintenance Eligibility

Regarding future maintenance works, the COKL shall be responsible for maintaining the municipal drains as described in the table below.

Table 5: Summary of Maintenance Eligibility

Section	Station Range
Western Branch (Open)	Sta. -W0+138 to W0+000
Western Branch (Closed)	Sta. W0+000 to W0+670
Southern Branch (Swale)	Sta. S0+000 to S0+452
Eastern Branch (Open)	Sta. -E0+181 to E0+000
Eastern Branch (Swale)	Sta. -ES0+000 to ES0+174
Eastern Branch (Closed)	Sta. E0+000 to E0+231

All proposed works outlined by this report shall be maintained by the COKL in the future with the exception of any new and / or existing private crossings, structures, or tile, and any private tile work, including outlet replacement, erosion protection, connections and / or reconnections.

Table 6: Summary of Existing Inline Culvert Status

Section	Culvert Type	Station Range	Status
Western Branch (Closed)	Surface	Sta. W0+160 to W0+183	Private
Southern Branch (Swale)	Surface	Sta. S0+429 to S0+452	Private
Eastern Branch (Open)	Channel	Sta. -E0+061 to -E0+051	Private
Eastern Branch (Swale)	Surface	Sta. ES0+174 to ES0+195	Private

10.3 Maintenance Costs

The Waite Municipal Drain shall be maintained by COKL at the expense of the upstream lands and roads, as determined by the Drainage Superintendent in accordance with Section 74 of the Act.

Costs shall be distributed among the upstream property owners using the **Maintenance Assessment Schedule(s)** found in Appendix D and in the same relative portions until such a time as they are varied in accordance with the Act.

The City of Kawartha Lakes (COKL) shall be entirely responsible for the cost of the maintenance of the drain located within the following right-of-ways:

- Rail Trail (Lot 10, Con 6)
- Cameron Road

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- Chambers Road

The Ministry of Transportation (MTO) shall be entirely responsible for the cost of the maintenance of the drain located within the following right-of-way:

- Highway No. 35.

All work on the above noted right-of-ways shall form part of the costs, including catchbasins and road crossings.

10.4 Future Connections

Connections by the property owners or their contractors not approved by the COKL may be removed at the expense of the owner of the land upon which the connection was made.

If in the future, another Owner requests a subsurface connection or disconnection to the drain, a new report should be prepared under Section 65(3) for a subsequent connection to or Section 65(4) for a subsequent disconnection from the drainage system in accordance with the Drainage Act, R.S.O. 1990.

10.4.1 Open Drains

After construction, new private tile drains may be installed and outlet directly into the proposed drain, provided that each one is installed with a corrugated steel or dual-wall HDPE outlet pipe complete with a rodent grate, sufficient rip-rap erosion protection and is identified along the bank of the drain with a proper outlet marker or sign to the satisfaction of the Drainage Superintendent.

Any outlets not installed as described above and causing damage or erosion to the drain may be upgraded as described above or removed by the Drainage Superintendent at the expense of the owner responsible for the connection.

10.4.2 Closed Drains

All future connections must be made at a plugged inlet (knockout) provided in a precast concrete structure or an approved core drilled hole into the pipe (per the detail in the drawing set), with approved fittings and materials and / or in a manner acceptable to the Drainage Superintendent.



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Appendix A

Allowances

Appendix A

Allowances

1.0 General

In accordance with Section 8(1)(d) of the Act, this Appendix provides a breakdown of the allowances provided under Sections 29 to 33 of the Act (if applicable). These sections are:

- Section 29 – Right-of-Way
- Section 30 – Damages
- Section 31 – Existing Drains
- Section 32 – Insufficient Outlet
- Section 33 – Loss of Access

Allowances will be deducted from total assessments in accordance with Section 62(3) of the Act. The land and crop values used for these calculations were determined based on recent land sales and a general understanding of these values within this geographic area and are described in the following sections.

A summary of the allowances provided under each Section of the Act is included in this Appendix. Details regarding working space can be found in the Special Provisions.

2.0 Section 29 – Right-of-Way

Section 29 the Act states:

The engineer in the report shall estimate and allow in money to the owner of any land that it is necessary to use,

- (a) *for the construction or improvement of a drainage works;*
- (b) *for the disposal of material removed from drainage works;*
- (c) *as a site for a pumping station to be used in connection with a drainage works; or*
- (d) *as a means of access to any such pumping station, if, in the opinion of the engineer, such right of way is sufficient for the purposes of the drainage works,*

the value of any such land or the damages, if any, thereto, and shall include such sums in the estimates of the cost of the construction, improvement, repair or maintenance of the drainage works R.S.O. 1990, s. 29.

The right-of-way (R.O.W.) is a type of easement along the length of the drain; however, it is not typically registered on the property's title. The associated R.O.W. allowances are typically provided to the properties where a R.O.W. is required for a new open or closed drain. It may be used as access and working space for the Contractor during construction and also by the city for future maintenance work.

The average width of the working R.O.W. or working space allowance provided is typically 10 m to access and maintain the drain in the future. The landowner is also compensated for the area used by the drain itself, such as a new channel, since that area will no longer be usable. A R.O.W. allowance would not be provided for sections of the open drain that are not being realigned as those allowances would have been given under a previous report.

Right-Of-Way Value

A base land value of **\$24,710** per hectare (i.e., **\$10,000** per acre) for workable, agricultural land has been used to calculate the R.O.W. allowances provided in this report. The allowances provided for R.O.W. are varied based on a number of factors which are summarized in Table 1 below.

Open Drain

Western Branch & Eastern Branch

An **average 10 m** width R.O.W. has been provided along the open drain as a current and future working space for the length of the channel to allow for the deepening and widening of the open drain, topsoil stripping, and placement of spoil. A 1/3 value was used since the working space may still be used by the landowner.

Southern Branch

An allowance for the width of the surface swales (**Average width of 5 m**) has been given at full value as restrictions exist for landuse. The associated working space (**Average width of 10 m**) given at a 1/3 value since the area can still be used by the landowner. In combination with the closed allowance, the entire average R.O.W. for the closed and swale section is 20 m in width along this length.

Closed Drain

Western Branch & Eastern Branch

An **average 10 m** width R.O.W. has also been provided for the closed drain as a working space for the length of the drain to allow for the installation of the tile drain, topsoil stripping, soil placement, and travel along the drain.

Access Routes (AR)

An allowance of **\$500** for a 6 m width R.O.W. has been provided to the applicable properties for access to the municipal drain both during construction and in the future as detailed in the Special Provisions and as shown on the drawings.

This value is based on the limited use of the R.O.W. during construction where a damage allowance is also paid for this area and during future drain maintenance, which is typically performed following the harvest of cash crops when damage allowances no longer apply.

Drain and Land Use Factors

The Drain Factor shown in Table 1 is varied based on the anticipated long-term effects to the land on which the drain is proposed to be located. For example, the drain factor has full value (a factor of 1.0) for the width of a channel or other feature, which would render that land unusable for any other purpose in the future. However, the drain factor is decreased to one third (a factor of 0.33) for the working areas on the basis that the land over these portions of the drain will still be useable by the landowners following construction.

The Land Use Factor shown in Table 1 is varied based on the land type that the proposed drain will be located on. For example, the reduction in this factor is on the basis that undeveloped land such as forest/bush (factor of 0.5) would be less valuable than developed agricultural land (factor of 1.0) or residential land (factor of 1.25-4.0).

The Net Factor shown in Table 1 is determined by multiplying the drain factor and land use factor together. The net factor is then multiplied by the base land value and the total R.O.W. area to calculate the Section 29 allowance.

Future Maintenance

No permanent buildings, structures, or plantings should be allowed within the ROW, to allow for the future maintenance of this drain.

Table 1: Section 29 - Right-of-Way Allowance Factors

Scenario No.	Drain Feature	Description	Drain Factor	Land Type	Land Use Factor	Net Factor	Allowance Width (m)	Allowance (\$/ha)	Ex. Application
1	Ex. Open Drain	Channel Footprint	0.00	Agricultural /Rural & Residential	1.00	0.00	Average TOB Width	\$0	Eastern & Western Branches
2	Ex. Open Drain	Working Space	0.33	Agricultural /Rural & Residential	1.00	0.33	10	\$8,240	Eastern & Western Branches
3	New Open Swale	Swale Footprint	1.00	Agricultural /Rural & Residential	1.00	1.00	Average TOB Width (10 m typ.)	\$24,710	Southern Branch
4	New Open Swale	Working Space	0.33	Agricultural /Rural & Residential	1.00	0.33	10	\$8,240	Southern Branch
5	New Open Swale	Swale Footprint	1.00	Bush	0.5	0.50	Average TOB Width (10 m typ.)	\$12,355	Southern Branch
6	New Open Swale	Working Space	0.33	Bush	0.5	0.17	10	\$4,120	Southern Branch
7	Ex. Open Drain	Riparian Buffer	1.00	Agricultural /Rural & Residential	1.00	1.00	6 total (3 m on each side)	\$24,710	Eastern & Western Branches
8	New Closed Drain	Working Space	0.33	Agricultural /Rural & Residential	1.00	0.33	10	\$8,240	Eastern & Western Branches

Scenario No.	Drain Feature	Description	Drain Factor	Land Type	Land Use Factor	Net Factor	Allowance Width (m)	Allowance (\$/ha)	Ex. Application
9	New Closed Drain	Working Space	0.33	Bush	0.5	0.17	10	\$4,120	Eastern & Western Branches
10	All	Access Route	0.33	Agricultural /Rural & Residential	1.00	0.33	6	N/A	All MDs

Note: Scenario No. 10 for Access Routes has a value of \$500 per instance.

3.0 Section 30 – Damages

Section 30 of the Act states:

“The engineer shall determine the amount to be paid to persons entitled thereto for damage, if any, to ornamental trees, lawns, fences, lands and crops occasioned by the disposal of material removed from a drainage works and shall include such sums in the estimates of the cost of construction, improvement, repair or maintenance of the drainage works. R.S.O. 1990, c. D.17, s.30.”

A damage allowance may be generally defined as compensation given to properties affected by the construction of the drain, such as crop loss. It is typically used as a working space for the contractor during construction; however, it does not apply to future maintenance work on the drain. The width of the damage allowance given is typically 10 m to 20 m or larger due to increased activity within the area during the construction of the drain.

Damage Values

A base value of **\$2,471** per hectare (**\$1,000** per acre) for workable, agricultural land has been applied to the calculation of the damage allowances, as crop damage may be necessary during the construction of this drain. This value is intended to reflect the input costs from the current cropping season leading to construction. The following assumptions have been used regarding crop losses for the specified width of the working area:

- Complete crop loss in the year of construction.
- No loss in crop productivity thereafter due to topsoil stripping and replacement.

Minimum Value

A minimum damage allowance of **\$200** was given to properties affected by minor construction activities on their properties; an example of this being the placement of a catchbasin on an upstream property line of the drain.

Open Drain

Western Branch & Eastern Branch

A **10 m average** width working corridor has been provided along the open drain as a working space for the length of the channel to allow for the deepening and widening of the open drain, topsoil stripping, and placement of spoil.

Southern Branch

A **10 m average** width working corridor has been provided along the swale as a working space for the length of the swale to allow for construction, including topsoil stripping, equipment access, and placement of excavated soil.

Closed Drain

Western Branch & Eastern Branch

A **20 m average** width working corridor has been provided for the closed drain as a working space for the length of the drain to allow for the installation of the tile drain, topsoil stripping, soil placement, and travel along the drain.

Access Routes (AR)

A **6 m average** width is provided for access routes, as detailed in the Special Provisions and as shown on the drawings. Damage given for access during construction only of **\$200** were given to all properties where a construction access may be required to reach the drain from public property.

Restoration

Cropped agricultural areas shall be restored through topsoil stripping and the given damage allowances.

Non-agricultural lands are not typically provided a damage allowance but are restored to their previous condition or better.

Bush and forested areas shall be brushed and / or cleared and grubbed as required and detailed in the Special Provisions. These areas do not receive a damage allowance since the timber is left for the landowners' use.

Roadways and residential areas are typically restored to their previous condition or better as part of the work completed by the Contractor. Alternatively, these landowners may have the option to complete the work themselves with the associated costs given as a damage allowance in the report.



APPENDIX A - ALLOWANCES

PROJECT: Waite Municipal Drain
DATE: February-24

MUNICIPALITY: Kawartha Lakes
PROJECT #: 300041611

Conc.	Lot	Owner	Roll No.	Plan No.	Access Route	Right of Way (Sect.29)	Damages (Sect.30)	Totals
<u>Western Branch</u>								
5	Pt.10	B. & K. Johnston	(010-214-02)		1A	\$ 3,440	\$ 410	\$ 3,850
5	Pt.10	C. Malcolm	(010-213-00)		1B & 5	\$ 1,740	\$ 940	\$ 2,680
6	Pt.10	J. Waite & A. Williamson	(010-368-00)		2 & 3	\$ 5,010	\$ 2,810	\$ 7,820
6	Pt.11	Nanda Properties Inc.	(010-372-00)		4	\$ -	\$ -	\$ -
Total - Western Branch						\$ 10,190	\$ 4,160	14,350
<u>Southern Branch</u>								
5	Pt.10	B. & K. Johnston	(010-214-02)		1A	\$ 2,430	\$ 200	\$ 2,630
5	Pt.10	C. Malcolm	(010-213-00)		1B	\$ 2,990	\$ 200	\$ 3,190
5	Pt.9	F. & A. Hack	(010-325-01)	14	N/A	\$ 1,030	\$ 200	\$ 1,230
5	Pt.9	A. & K. Welch	(010-325-02)	15	N/A	\$ 1,500	\$ 200	\$ 1,700
5	Pt.9	T. & D. McConnell	(010-209-04)	12	N/A	\$ 960	\$ 200	\$ 1,160
5	Pt.9	D. MacDonald and L. King	(010-209-05)	13	N/A	\$ 960	\$ 200	\$ 1,160
Total - Southern Branch						\$ 9,870	\$ 1,200	11,070
<u>Eastern Branch</u>								
6	Pt.9 & Pt.10	G. Stewart	(010-365-00)		6	\$ 2,910	\$ 720	\$ 3,630
6	Pt.10	B. Clive	(010-369-00)		7	\$ 5,300	\$ 2,780	\$ 8,080
6	Pt.10	D. Gardner	(010-369-01)		N/A	\$ 900	\$ 440	\$ 1,340
6	Pt.10	J. Waite & A. Williamson	(010-368-00)		8	\$ 500	\$ 500	\$ 1,000
Total - Eastern Branch						\$ 9,610	\$ 4,440	14,050
TOTAL ALLOWANCES						\$ 29,670	\$ 9,800	\$ 39,470



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Appendix B

Project Cost Estimate

Appendix B - Project Cost Estimate

The estimate of the cost of all labour, equipment and material required to construct this project is as follows:

Note: Refer to the Special Provisions (in Appendix F) for additional details of work.

Item	Description	Approx. Quantity	Cost Estimate
<u>E. EASTERN BRANCH</u>			
Work on Private Property			
E00	Mobilization.	LS	\$ 2,400
E0	a) Hand or hydroseeding (Ap. 3 m width) grassed buffer on both sides of channel (6 m total width) with approved seed mix and matrix, including nurse crop of annual rye grass. (Sta. -E0+108 to -E0+064)	LS	\$ 940
	b) Hydroseeding side and bank of channel (Ap. 3 m width) with approved seed mix and matrix, including nurse crop of annual rye grass. Also including Hand or hydroseeding of the remaining disturbed areas (not cropped) on replaced native topsoil. (Sta. -E0+108 to -E0+064)	LS	\$ 550
	c) Hydroseeding grassed swale (Ap. 7 m width) with approved seed mix and matrix, including nurse crop of annual rye grass. Also including Hand or hydroseeding of the remaining disturbed areas (not cropped) on replaced native topsoil. (Sta. ES0+020 to ES0+167)	LS	\$ 3,710
E1	a) Supply and install one (1) bio-filter sediment control structure (see accompanying details). (Sta. -E0+108 to Sta. -E0+100)	1 ea.	\$ 1,200
	b) Excavation of one (1) permanent sediment basin (5 m long, 600 mm bottom width, and 600 mm deep). (Sta. -E0+100 to Sta. -E0+095)	1 ea.	\$ 600

E2	Deepening and widening of existing channel. (Sta. -E0+095 to -E0+064)	LS	\$ 370
E3	a) Construction of grassed swale as specified. (Sta. ES0+020 to ES0+035, Sta. ES0+067 to ES0+167)	LS	\$ 1,090
	b) Construction of one (1) pond outlet spillway c/w ap. 15 m ² erosion protection. (Sta. ES0+035)	LS	\$ 1,920
E4	a) Supply & Install two (2) lengths of 375 mm dia. solid bell & spigot HDPE dual-wall (320 kPa) outlet pipes c/w rodent grates. OR S & I one (1) length of 450 mm dia. solid bell & spigot HDPE dual-wall (320 kPa) outlet pipe c/w rodent grate. (Sta. E0+000 to E0+006)	LS	\$ 1,110
	b) Supply and install two (2) runs of 375 mm dia. solid PDT. OR S & I one (1) run of 450 mm dia. HDPE (dual-wall) pipe. (Sta. E0+006 to E0+143)	LS	\$ 41,100
E5	a) Supply and install 525 mm dia. HDPE dual-wall (320 kPa) pipe. (Sta. E0+182 to E0+231)	LS	\$ 16,170
	b) Supply and install one (1) 900 mm x 1,200 mm inline concrete CB c/w directional berm. (Sta. E0+231)	LS	\$ 5,400
E6	a) Provisional Item: Bedrock investigation. Based on excavating to cut depth at 25 m intervals along the proposed alignment prior to any construction. (Sta. -E0+100 to -E0+064, Sta. E0+002 to E0+143, Sta. E0+182 to E0+231) & (ES0+067 TO ES0+167)	LS	\$ 1,080
	b) Provisional Item: Hard bedrock removal. Based on ap. 0.5 m ³ /m. (Sta. -E0+100 to -E0+064, Sta. E0+002 to E0+143, Sta. E0+182 to E0+231) & (ES0+067 TO ES0+167)	LS	\$ 27,360
Total Estimated Cost of Construction Private Property			\$ 105,000

Work on City of Kawartha Lakes (Rail Trail) R.O.W.

E7	a) Sediment cleanout of existing culvert. (Sta. -E0+061 to -E0+051)	LS		\$ 2,400
	b) Excavation of two (2) permanent sediment basin (5 m long, 600 mm bottom width, and 600 mm deep). (Sta. -E0+066 to -E0+061, Sta. -E0+051 to -E0+046)	2	ea.	\$ 1,200
	c) Supply & install of approx. 40 m² total OPSS R-50 quarry stone rip rap erosion protection c/w geotextile underlay. Supply & install of approx. 20 m² total rounded riverstone erosion protection. (Sta. -E0+061 and Sta. -E0+051)		LS	\$ 5,760
E8	a) Deepening and widening of existing channel. (Sta. -E0+046 to -E0+010)		LS	\$ 430
	b) Construction of a stilling basin, including river stone and quarry stone rip-rap erosion protection c/w geotextile underlay as per the accompanying details. (Sta. -E0+010 to E0+000)	1	ea.	\$ 7,800
	c) Supply and install grassed swale construction as specified. (Sta. ES0+000 to ES0+020)		LS	\$ 190
	d) Supply and install one (1) bio-filter sediment control structure (see accompanying details). (Sta. ES0+000 to ES0+010)	1	ea.	\$ 1,200
E9	a) Hand or hydroseeding (Ap. 3 m width) grassed buffer on both sides of channel (6 m total width) with approved seed mix and matrix, including nurse crop of annual rye grass. (Sta. -E0+064 to E0+000)		LS	\$ 1,370
	b) Hydroseeding side and bank of channel (Ap. 3 m width) with approved seed mix and matrix, including nurse crop of annual rye grass. Also including Hand or hydroseeding of the remaining disturbed areas (not cropped) on replaced native topsoil. (Sta. -E0+064 to E0+000)		LS	\$ 670
	c) Hydroseeding grassed swale (Ap. 7 m width) with approved seed mix and matrix, including nurse crop of annual rye grass. Also including Hand or hydroseeding of the remaining disturbed areas (not cropped) on replaced native topsoil. (Sta. ES0+000 to ES0+020)		LS	\$ 500

	d) Provisional Item: Bedrock investigation. Based on excavating to cut depth at 25 m intervals along the proposed alignment prior to any construction. (Sta. -E0+064 to E0+002) & (Sta. ES0+000 TO ES0+020)	LS	\$ 360
	e) Provisional Item: Hard bedrock removal. Based on ap. 0.5 m ³ /m. (Sta. -E0+064 to E0+002) & (Sta. ES0+000 TO ES0+020)	LS	\$ 6,960
	Total Estimated Cost of Construction		\$ 28,840
	City of Kawartha Lakes (Rail Trail) R.O.W.		
	Work on Highway 35 R.O.W.		
E10	a) Supply and install one (1) 900 mm x 1,200 mm inline concrete CB. (Sta. E0+143)	LS	\$ 4,800
	b) Supply and install one (1) 600 mm x 600 mm offset concrete DICB c/w directional berm and 6 m of 250 mm dia. HDPE dual-wall (320 kPa pipe). (Sta. E0+143)	LS	\$ 4,700
	c) Supply and install 600 mm dia. O.D. SWWSP (6.35 mm min. thickness) by the boring (Micro-Tunnelling) method. (Sta. E0+143 to E0+182)	LS	\$ 187,200
	d) Supply and install one (1) 900 mm x 1,200 mm inline concrete CB. (Sta. E0+182)	LS	\$ 5,400
	e) Supply and install grassed swale construction as specified. (Sta. ES0+167 to ES0+174)	LS	\$ 60
	f) Erosion protection of existing surface culvert (ap. 20 m2 total). (Sta. ES0+174 & ES0+194)	LS	\$ 1,920
	g) Hydroseeding grassed swale (Ap. 7 m width) with approved seed mix and matrix, including nurse crop of annual rye grass. Also including Hand or hydroseeding of the remaining disturbed areas (not cropped) on replaced native topsoil. (Sta. ES0+167 to ES0+174)	LS	\$ 180
	h) Provisional Item: Bedrock investigation. Based on excavating to cut depth at 25 m intervals along the proposed alignment prior to any construction. (Sta. E0+143 to E0+182) & (Sta. ES0+167 TO ES0+195)	LS	\$ 240

i) Provisional Item: Hard bedrock removal.

Based on ap. 0.5 m³/m.

(Sta. E0+143 to E0+182) & (Sta. ES0+167 TO ES0+195)

LS \$ 4,800

**Total Estimated Cost of Construction
Highway 35 R.O.W.**

\$ 209,300

**Total Estimated Cost of Construction
Eastern Branch**

\$ 343,140

W. WESTERN BRANCH

Work on Private Property

W00 Mobilization.

LS \$ 2,400

W0 a) **Hand or hydroseeding** (Ap. 3 m width) grassed buffer on both sides of channel (6 m total width) with approved seed mix and matrix, including nurse crop of annual rye grass.

(Sta. -W0+139 to W0+000)

LS \$ 2,310

b) **Hydroseeding** side and bank of channel (Ap. 3 m width) with approved seed mix and matrix, including nurse crop of annual rye grass.

Also including **Hand or hydroseeding** of the remaining disturbed areas (not cropped) on replaced native topsoil.

(Sta. -W0+139 to W0+000)

LS \$ 1,380

W1 a) Supply and install one (1) bio-filter sediment control structure (see accompanying details).

(Sta. -W0+110 to Sta. -W0+102)

1 ea. \$ 1,200

b) Excavation of one (1) permanent sediment basin (5 m long, 600 mm bottom width, and 600 mm deep).

(Sta. -W0+102 to -W0+097)

1 ea. \$ 600

c) Deepening and widening of existing channel.

(Sta. -W0+102 to -W0+010)

LS \$ 1,400

d) Construction of a stilling basin, including river stone and quarry stone rip-rap erosion protection c/w geotextile underlay as per the accompanying details.

(Sta. -W0+010 to W0+000)

1 ea. \$ 7,800

W2	<p>a) Supply & Install two (2) lengths of 375 mm dia. solid bell & spigot HDPE dual-wall (320 kPa) outlet pipes c/w rodent grates. OR S & I one (1) length of 525 mm dia. solid bell & spigot HDPE dual-wall (320 kPa) outlet pipe c/w rodent grate. (Sta. W0+000 to W0+006)</p>	LS	\$ 1,110
	<p>b) Supply and install one (1) 900 mm x 1,200 mm inline concrete DICB c/w directional berm. (Sta. W0+010)</p>	LS	\$ 5,400
	<p>c) Supply and install two (2) runs of 375 mm dia. solid PDT. OR S & I one (1) run of 450 mm dia. HDPE (dual-wall) pipe. (Sta. W0+010 to W0+160)</p>	LS	\$ 46,200
	<p>d) Supply and install one (1) run of 375 mm dia. solid PDT. OR S & I one (1) run of 300 mm dia. HDPE (dual-wall) pipe. (Sta. W0+227 to W0+670)</p>	LS	\$ 106,320
W3	<p>a) Provisional Item: Bedrock investigation. Based on excavating to cut depth at 25 m intervals along the proposed alignment prior to any construction. (Sta. -W0+107 to W0+670)</p>	LS	\$ 3,480
	<p>b) Provisional Item: Hard bedrock removal. Based on ap. 0.5 m³/m. (Sta. -W0+107 to W0+160, Sta. W0+227 to W0+670)</p>	LS	\$ 85,440
Total Estimated Cost of Construction			\$ 265,040
Private Property			\$ 265,040

Work on Cameron Road Right-of-Way

W4	<p>a) Supply and install one (1) 900 mm x 1,200 mm inline concrete DICB c/w directional berm. (Sta. W0+160)</p>	LS	\$ 5,400
	<p>b) Supply and install 600 mm dia. O.D. SWWSP (6.35 mm thickness) by the boring (jack and bore) method. (Sta. W0+160 to W0+183)</p>	LS	\$ 27,600
	<p>c) Supply and install one (1) 900 mm x 1,200 mm inline concrete CB. (Sta. W0+183)</p>	LS	\$ 4,800

d) Supply and install two (2) runs of 375 mm dia. solid PDT. OR S & I one (1) run of 450 mm dia. HDPE (dual-wall) pipe. (Sta. W0+183 to W0+227)	LS	\$ 13,200
e) Supply and install one (1) 900 mm x 1,200 mm inline concrete CB c/w directional berm. (Sta. W0+227)	LS	\$ 5,400
f) Provisional Item: Bedrock investigation. Based on excavating to cut depth at 25 m intervals along the proposed alignment prior to any construction. (Sta. W0+183 to W0+227)	LS	\$ 240
g) Provisional Item: Hard bedrock removal. Based on ap. 0.5 m ³ /m. (Sta. W0+183 to W0+227)	LS	\$ 5,280
Total Estimated Cost of Construction Cameron Road R.O.W.		\$ 61,920

Work on Chambers Road Right-of-Way

W5 a) Supply and install one (1) 900 mm x 1,200 mm inline concrete DICB c/w directional berm. (Sta. W0+670)	LS	\$ 5,400
b) Provisional Item: Bedrock investigation. Based on excavating to cut depth at 25 m intervals along the proposed alignment prior to any construction. (Sta. W0+183 to W0+227)	LS	\$ 120
c) Provisional Item: Hard bedrock removal. Based on ap. 0.5 m ³ /m. (Sta. W0+183 to W0+227)	LS	\$ 240
Total Estimated Cost of Construction Chambers Road R.O.W.		\$ 5,760

<u>Total Estimated Cost of Construction Western Branch</u>		<u>\$ 332,720</u>
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S. SOUTHERN BRANCH

Work on Private Property

S00	Mobilization.		LS	\$ 1,200
S0	a) Hydroseeding grassed swale (Ap. 7 m width) with approved seed mix and matrix, including nurse crop of annual rye grass. Also including Hand or hydroseeding of the remaining disturbed areas (not cropped) on replaced native topsoil. (Sta. S0+000 to S0+239)		LS	\$ 6,050
S1	a) Supply and install one (1) bio-filter sediment control structure (see accompanying details). (Sta. S0+000 to S0+008)	1	ea.	\$ 1,200
	b) Erosion protection at swale outlet (ap. 20 m ² total). (Sta. S0+000)		LS	\$ 1,920
	c) Supply and install grassed swale construction as specified. (Approximately 287 cu.m of excavation required) (Sta. S0+000 to S0+425)		LS	\$ 2,270
S2	a) Provisional Item: Bedrock investigation. Based on excavating to cut depth at 25 m intervals along the proposed alignment prior to any construction. (Sta. S0+000 to S0+239)		LS	\$ 1,200
	b) Provisional Item: Hard bedrock removal. Based on ap. 0.25 m ³ /m. (Sta. S0+000 to S0+239)		LS	\$ 14,400
Total Estimated Cost of Construction Private Property				\$ 28,240

Total Estimated Cost of Construction Southern Branch

\$ 28,240

C. CONTINGENCIES

C1	Tile connections and existing tile reconnections to the drain (as approved by the Engineer).			
	a) 100 mm dia. pipe – Reconnection	5	ea.	\$ 750
	b) 100 mm dia. pipe – Reconnection	5	ea.	\$ 600
	c) 100 mm dia. pipe – Connection	5	ea.	\$ 900
	d) 150 mm dia. pipe – Connection	5	ea.	\$ 750
C2	Install drain on specified depth of 19 mm dia. crushed clear stone bedding in areas of soil instability, as directed by the Engineer. This cost represents the additional unit price for installation by excavator and will be paid in addition to the cost of installation specified by wheel trencher.			
	a) 150 mm depth	200	m	\$ 13,200
C3	Supply & install a 450 mm thickness of OPSS R50 quarry stone riprap with geotextile underlay	80	m ²	\$ 7,680
C4	19 mm (3/4") clear crushed stone delivered on-site	90	tonne	\$ 2,160
C5	OPSS Granular 'B' material delivered on-site	90	tonne	\$ 2,160
C6	Supply and install a 600 mm thickness of rounded riverstone erosion protection.	50	m ²	\$ 3,300
C7	Supply and install 150 mm thickness of imported, screened topsoil.	200	m ²	\$ 2,400
C8	Supply & install new outlet pipes for existing tile drainage systems, outletting into the drain (as approved by the Engineer) c/w erosion protection.			
	a) 100 mm dia. HDPE outlet pipe	4	ea.	\$ 1,080
	b) 150 mm dia. HDPE outlet pipe	4	ea.	\$ 1,200
	b) 200 mm dia. HDPE outlet pipe	4	ea.	\$ 1,440
C9	Weathered Bedrock (Loose) breaking and removal from trench. Based on ap. 0.5 m ³ /m.	250	m ³	\$ 15,000

Total Estimated Cost of Construction

Contingencies

\$ 52,620

Total Estimated Cost of Construction - Waite Municipal Drain

\$ 756,720

SUMMARY OF COSTS

Total Estimated Cost of Construction	\$ 756,720
Allowances to Owners (Sections 29 & 30)	\$ 39,470
On-Site Meeting	\$ 7,500
Initial Investigation, Preliminary Drawing Preparation, and Attendance at On-Site Meeting.	
Preparation of Report	\$ 110,000
Field Survey, Preparation of Preliminary Design and Drawing Set. Information Meetings, Drawing Set, and System Design. Report Preparation including Allowances, Cost Estimates, Construction and Maintenance Assessment Schedules.	
MTO Direct Report Costs (Includes Geotechnical Report)	\$ 155,000
Report Consideration and Procedure	\$ 3,500
Preparation of Report Copies for Distribution. Preparation and Attendance at the Consideration of the Report.	
Tendering	\$ 5,000
Preparation and Distribution of Electronic Tender. Attendance at Tender opening and preparation of letter of recommendation for Council.	
Contract Administration	\$ 90,000
Pre-construction meeting. Site Reviews During Construction (25 days con. const. incl.). Preparation and issue of 4 PCs (Initial, prog., and final). MTO Geotechnical Monitoring	
Total Estimated Engineering	\$ 371,000
Other Project Costs	\$ 2,000
Agency Review, Geotechnical Investigation and Report	
Administration and Financing	\$ 130,810
Net HST (Construction and Engineering) and Interest Charges	
Total Estimated Cost	\$ 1,300,000

Note:

The above summary contains cost estimates only. It is emphasized that these estimates do NOT include costs to defend the Drainage Report and procedures if appeals are filed with the Court of Revision, Ontario Drainage Tribunal and/or the Ontario Drainage Referee. Unless otherwise directed, additional costs to defend the report are typically distributed in a pro rata fashion over the assessments contained in the Construction Assessment Schedule, excluding any Special Assessments. Also, in addition to the work included in the above estimate, should repairs, replacements, underpinning or other alterations be required for existing bridges, culverts, overflow culverts or any other structure necessary to conduct overflow water, or water in open channels under or across a road allowance, as affected by this drainage work, the work and cost thereof, including any necessary expenses incidental thereto, and if not determined otherwise, shall be the responsibility of and shall be assessed against the authority having control of such road or road allowance.



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Appendix C

Special Assessments

Appendix C — Special Assessments (Section 26)

Waite Municipal Drain

Pursuant to Section 26 of the Drainage Act the following Special Assessments are made:

1. Eastern Branch — Highway No. 35 (Ministry of Transportation) (Sta. E0+143 to E0+182)

The Special Assessment for this portion of the work is the increased cost to the proposed drain due to the presence and operation of the road/utility and is calculated as follows:

Construction Costs	-	Equivalent Drain	+	Engineering & Administration	=	Special Assessment
Consisting of Items:		Consisting of:		Consisting of:		
Pt. Items E9 – E10: -39m of 600mm dia. SWWSP installed by Micro-Tunnelling. -Part of 2 inline and 1 o/s CBs. -Erosion protection. -Pt. 143m of 450 mm HDPE pipe. -Pt. Bedrock investigation and removal.		-26m of 600mm dia. CDT -141 m of channel deepening and widening.		-Additional engineering for report. -Construction layout and inspection. -Geotechnical foundation report and construction monitoring.		
\$ 227,540	-	\$ 4,370	+	\$ 200,000	=	\$ 423,170

Whether or not the Ministry of Transportation elects to do work on their property (**Highway No. 35**), they shall be assessed the actual cost of the work incurred (**estimated as \$ 227,540**), minus the actual cost of an equivalent drain (**estimated as \$ 4,370**), plus engineering/administration (**estimated as \$ 200,000**) as a Special Assessment.

2. Eastern Branch — Rail Trail (City of Kawartha Lakes) (Sta. -E0+064 to E0+002)

The Special Assessment for this portion of the work is the increased cost to the proposed drain due to the presence and operation of the road/utility and is calculated as follows:

Construction Costs	-	Equivalent Drain	+	Engineering & Administration	=	Special Assessment
Consisting of Items:		Consisting of:		Consisting of:		
Pt. Items E6 – E8: -Sediment cleanout of ex. Culvert. -Permanent sediment basins. -Erosion protection. -Deepening and widening of existing channel. -Part of permanent stilling basin. -Grassed swale construction.		-62 m of channel deepening and widening.		Construction layout and inspection.		
\$ 24,940	-	\$ 620	+	\$ 2,500	=	\$ 26,820

Whether or not the City of Kawartha Lakes elects to do work on their property (**Rail Trail**), they shall be assessed the actual cost of the work incurred (**estimated as \$ 24,940**), minus the actual cost of an equivalent drain (**estimated as \$ 620**), plus engineering/administration (**estimated as \$ 2,500**) as a Special Assessment.

3. Western Branch — Cameron Road (City of Kawartha Lakes) (Sta. W0+160 to W0+227)

The Special Assessment for this portion of the work is the increased cost to the proposed drain due to the presence and operation of the road/utility and is calculated as follows:

Construction Costs	-	Equivalent Drain	+	Engineering & Administration	=	Special Assessment
Consisting of Items:		Consisting of:		Consisting of:		
Pt. Item W3: -23m of 600mm dia. SWWSP. -Pts. of inline DICB, CB, and D.Berms. -44m of 450mm HDPE pipe.		-23 m of 2 lengths of 375mm dia. PDT.		-Construction layout and inspection.		
\$ 51,000	-	\$ 3,450	+	\$ 5,000	=	\$ 52,550

Whether or not the City of Kawartha Lakes elects to do work on their property (**Cameron Road**), they shall be assessed the actual cost of the work incurred (**estimated as \$ 51,000**), minus the actual cost of an equivalent drain (**estimated as \$ 3,450**), plus engineering/administration (**estimated as \$ 5,000**) as a Special Assessment.

4. Western Branch — Chambers Road (City of Kawartha Lakes) (Sta. W0+670)

The Special Assessment for this portion of the work is the increased cost to the proposed drain due to the presence and operation of the road/utility and is calculated as follows:

Construction Costs	-	Equivalent Drain	+	Engineering & Administration	=	Special Assessment
Consisting of Items:		Consisting of:		Consisting of:		
Item W4: -Pt. Inline DICB and D.Berm.				-Additional engineering for report. -Construction layout and inspection.		
\$ 2,700	-	\$ 0	+	\$ 7,500	=	\$ 10,200

Whether or not the City of Kawartha Lakes elects to do work on their property (**Chambers Road**), they shall be assessed the actual cost of the work incurred (**estimated as \$ 2,700**), minus the actual cost of an equivalent drain (**estimated as \$ 0**), plus engineering/administration (**estimated as \$ 7,500**) as a Special Assessment.



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Appendix D

Schedules of Assessment

(Western Branch) — For Construction	D1A
(Southern Branch) — For Construction	D1B
(Eastern Branch) — For Construction	D1C
NET ASSESSMENT — For Construction	D1D
(Western Branch) — For Maintenance	D2A
(Southern Branch) — For Maintenance	D2B
(Eastern Branch) — For Maintenance	D2C

Appendix D

Schedules of Assessment for Construction & Maintenance

1.0 General

In accordance with Section 8(1)(c) of the Drainage Act, R.S.O. 1990, these Appendices show the distribution of the total estimated cost over the lands and roads involved and are in accordance with the following sections of the Act:

- Section 21 – Engineer to distinguish assessments.
- Section 22 – Assessment for benefit.
- Section 23 – Assessment for outlet.
- Section 24 – Special benefit.
- Section 26 – Special assessment.

More information on assessment and the Drainage Act can be found on the OMAFRA drainage website. Several relevant OMAFRA Factsheets and the AgMaps geographic information portal are also available (<http://www.omafra.gov.on.ca/english/landuse/drainage.htm>).

2.0 Section 21 – Engineer to distinguish assessments

Section 21 of the Act states:

“The engineer in the report shall assess for benefit, outlet liability and injuring liability, and shall insert in an assessment schedule, in separate columns, the sums assessed for each opposite each parcel of land and road liable therefor. R.S.O. 1990, c. D.17, s. 21.”

3.0 Sections 22 and 23 – Assessment for Benefit

“Benefit” is defined in Section 1 of the Act as:

“the advantages to any lands, roads, buildings or other structures from the construction, improvement, repair or maintenance of a drainage works such as will result in a higher market value or increased crop production or improved appearance or better control of surface or subsurface water, or any other advantages relating to the betterment of lands, roads, buildings or other structures”

“Assessment for benefit” - Section 22 of the Act states:

“Lands, roads, buildings, utilities or other structures that are increased in value or are more easily maintained as a result of the construction, improvement, maintenance or repair of a drainage works may be assessed for benefit. R.S.O. 1990, c. D.17, s.22”

4.0 Section 23 – Assessment for Outlet

“**Outlet liability**” is defined in Section 1 of the Act as:

“the part of the cost of the construction, improvement or maintenance of a drainage works that is required to provide such outlet or improved outlet”

Section 23 of the Act is made up of four subsections.

“**Outlet liability, lands assessed for**” - Section 23(1) states:

“Lands and roads that use a drainage works as an outlet, or for which, when the drainage works is constructed or improved, an improved outlet is provided either directly or indirectly through the medium of any other drainage works or of a swale, ravine, creek, or watercourse, may be assessed for outlet liability.”

“**Injuring liability, lands assessed for**” - Section 23(2) states:

“If, from any land or road, water is artificially caused by any means to flow upon and injure any other land or road, the land or road from which the water is caused to flow may be assessed for injuring liability with respect to a drainage works to relieve the injury so caused to such other land or road.”

“**Basis of assessment**” - Section 23(3) states:

“The assessment for outlet liability and injuring liability provided for in subsections (1) and (2) shall be based upon the volume and rate of flow of the water artificially caused to flow upon the injured land or road or into the drainage works from the lands and roads liable for such assessments.”

“**Certain owners not to count for or against petition**” - Section 23(4) states:

“The owners of the lands and roads made liable to assessment only under subsection (1) or (2) shall neither count for nor against the petition required by section 4 unless within the area therein described. R.S.O. 1990, c. D.17, s.23.”

5.0 Section 24 – Special Benefit

“**Special benefit**” is defined in Section 1 of the Act as:

“any additional work or feature included in the construction, repair or improvement of a drainage works that has no effect on the functioning of the drainage works”

“**Assessment for special benefit**” - Section 24 states:

“The engineer may assess for special benefit any lands for which special benefits have been provided by the drainage works. R.S.O. 1990, c. D.17, s. 24.”

A description and breakdown of the Section 24 - Special Benefit Assessments is shown in Appendix C (If applicable), and included in Appendix D.

6.0 Section 26 – Special Assessment

“Increased cost, how borne” - Section 26 states:

“In addition to all other sums lawfully assessed against the property of a public utility or road authority under this Act, and despite the fact that the public utility or road authority is not otherwise assessable under this Act, the public utility or road authority shall be assessed for and shall pay all the increase of cost of such drainage works caused by the existence of the works of the public utility or road authority. R.S.O. 1990, c. D.17, s. 26”

A description and breakdown of the Section 26 - Special Assessments is shown in Appendix C (If applicable), and included in Appendix D.

7.0 Assessments

The assessments have been calculated using the Modified Todgham Method to distribute the project costs throughout the watershed in a fair and equitable manner. **Detailed calculations of these assessments are available to affected landowners upon request.**

Throughout the course of the drain, specific costs were assigned to various landowners. Parts of the costs of items such as catchbasins, berms, etc., were assessed to the lands directly upstream and downstream of the item as a specific cost and/or the entire upstream watershed. The engineering and administration costs have been assessed out over the entire drain.

Affected private lands used for agricultural purposes may be eligible for grant under the Agricultural Drainage Infrastructure Program (ADIP) which is administered through the Ontario Ministry of Agriculture and Food and Rural Affairs (OMAFRA). Confirmation of eligibility for individual properties will be completed by OMAFRA following the grant application made by the Municipality on behalf of the affected landowners.

8.0 Schedules of Assessment for Maintenance

In accordance with Section 38 of the Drainage Act, assessment schedules for future maintenance of the proposed drain have been included as the basis on how to divide such costs. Affected lands located upstream of the maintenance shall be determined by the Drainage Superintendent and assessed according to this schedule.



APPENDIX D1A - ASSESSMENTS for CONSTRUCTION
WESTERN BRANCH

FINAL REPORT

PROJECT: Waite Municipal Drain
DATE: February-24

MUNICIPALITY: Kawartha Lakes
PROJECT #: 300041611

Conc. or Plan	Lot or Part	Tax	Owner	Roll No.	Plan No.	Affected Area (Ha.)	Benefit Assess't (\$22)	Outlet Assess't (\$23)	Special Benefit (Sect.24)	Special Assess't (\$26)	Totals	Less 1/3 Grant	Less Allowances	Net Assessment
Lands														
6	Pt.11	*	R. & J. Peel	(010-371-01)		0.18	\$ -	\$ 3,040	\$ -	\$ -	\$ 3,040	\$ -	\$ -	\$ 3,040
6	Pt.11	F	Nanda Properties Inc.	(010-372-00)		5.21	\$ -	\$ 44,050	\$ -	\$ -	\$ 44,050	\$ 14,683	\$ -	\$ 29,367
5	Pt.10	*	B. & K. Johnston	(010-214-02)		2.19	\$ 10,820	\$ 280	\$ -	\$ -	\$ 11,100	\$ -	\$ 3,850	\$ 7,250
5	Pt.10	*	C. Malcolm	(010-213-00)		5.62	\$ 24,740	\$ 5,350	\$ -	\$ -	\$ 30,090	\$ -	\$ 2,680	\$ 27,410
6	Pt.10	F	J. Waite & A. Williamson	(010-368-00)		14.89	\$ 126,950	\$ 53,990	\$ -	\$ -	\$ 180,940	\$ 60,313	\$ 7,820	\$ 112,807
5	Pt.9	F	2324784 Ontario Inc.	(010-210-02)		1.65	\$ -	\$ 640	\$ -	\$ -	\$ 640	\$ 213	\$ -	\$ 427
5	Pt.9	*	W. & F. Moore	(010-325-84)	17	0.27	\$ -	\$ 210	\$ -	\$ -	\$ 210	\$ -	\$ -	\$ 210
5	Pt.9	*	J. & P. Cadden	(010-325-03)	16	0.78	\$ -	\$ 610	\$ -	\$ -	\$ 610	\$ -	\$ -	\$ 610
5	Pt.9	*	A. & K. Welch	(010-325-02)	15	0.88	\$ -	\$ 690	\$ -	\$ -	\$ 690	\$ -	\$ -	\$ 690
5	Pt.9	*	F. & A. Hack	(010-325-01)	14	0.76	\$ -	\$ 590	\$ -	\$ -	\$ 590	\$ -	\$ -	\$ 590
5	Pt.9	*	D. MacDonald and L. King	(010-209-05)	13	0.22	\$ -	\$ 170	\$ -	\$ -	\$ 170	\$ -	\$ -	\$ 170
5	Pt.9	*	T. & D. McConnell	(010-209-04)	12	0.22	\$ -	\$ 170	\$ -	\$ -	\$ 170	\$ -	\$ -	\$ 170
5	Pt.9	*	R. & M. Watson	(010-209-03)	11	0.21	\$ -	\$ 160	\$ -	\$ -	\$ 160	\$ -	\$ -	\$ 160
5	Pt.9	*	K. McQuade & C. Carter	(010-209-02)	10	0.21	\$ -	\$ 160	\$ -	\$ -	\$ 160	\$ -	\$ -	\$ 160
5	Pt.9	*	M. Kelso	(010-209-01)	9	0.20	\$ -	\$ 160	\$ -	\$ -	\$ 160	\$ -	\$ -	\$ 160
6	Pt.9	*	Board of Education Trillium Lakelands	(010-362-00)	18	1.40	\$ -	\$ 1,200	\$ -	\$ -	\$ 1,200	\$ -	\$ -	\$ 1,200
6	Pt.9	*	E. Conner	(010-361-00)	8	0.13	\$ -	\$ 100	\$ -	\$ -	\$ 100	\$ -	\$ -	\$ 100
6	Pt.9	F	G. & M. Bryans	(010-363-00)		0.27	\$ -	\$ 110	\$ -	\$ -	\$ 110	\$ 37	\$ -	\$ 73
TOTAL ON LANDS						35.29	\$ 162,510	\$ 111,680	\$ -	\$ -	\$ 274,190	\$ 75,247	\$ 14,350	\$ 184,593
Roads														
	Cameron Road	*	City of Kawartha Lakes	ROAD		1.88	\$ 51,080	\$ 18,800	\$ -	\$ 52,550	\$ 122,430	\$ -	\$ -	\$ 122,430
	Chambers Road	*	City of Kawartha Lakes	ROAD		0.94	\$ 62,770	\$ 30,380	\$ -	\$ 10,200	\$ 103,350	\$ -	\$ -	\$ 103,350
TOTAL ON ROADS						2.82	\$ 113,850	\$ 49,180	\$ -	\$ 62,750	\$ 225,780	\$ -	\$ -	\$ 225,780
ALL LANDS AND ROADS						38.11	\$ 276,360	\$ 160,860	\$ -	\$ 62,750	\$ 499,970	\$ 75,247	\$ 14,350	\$ 410,373

Notes: (1) At the time of preparation for this report, properties were grouped based on those with agricultural farm tax class (F) and those without (*), based on ADIP grant eligibility.
(2) It is the responsibility of the landowner to confirm whether their property is eligible for an OMAFRA grant, under ADIP policies as eligibility has not been confirmed as part of the preparation of this report.



**APPENDIX D1B - ASSESSMENTS for CONSTRUCTION
SOUTHERN BRANCH**

FINAL REPORT

PROJECT: Waite Municipal Drain
DATE: February-24

MUNICIPALITY: Kawartha Lakes
PROJECT #: 300041611

Conc. or Plan	Lot or Part	Tax	Owner	Roll No.	Plan No.	Affected Area (Ha.)	Benefit Assess't (\$22)	Outlet Assess't (\$23)	Special Benefit (\$24)	Special Assess't (\$26)	Totals
Lands											
5	Pt.10	*	B. & K. Johnston	(010-214-02)		0.86	\$ 2,440	\$ -	\$ -	\$ -	\$ 2,440
5	Pt.10	*	C. Malcolm	(010-213-00)		1.26	\$ 3,580	\$ 1,510	\$ -	\$ -	\$ 5,090
5	Pt.9	F	2324784 Ontario Inc.	(010-210-02)		1.65	\$ -	\$ 3,380	\$ -	\$ -	\$ 3,380
5	Pt.9	*	W. & F. Moore	(010-325-84)	17	0.27	\$ -	\$ 1,200	\$ -	\$ -	\$ 1,200
5	Pt.9	*	J. & P. Cadden	(010-325-03)	16	0.78	\$ -	\$ 3,440	\$ -	\$ -	\$ 3,440
5	Pt.9	*	A. & K. Welch	(010-325-02)	15	0.88	\$ 1,190	\$ 3,720	\$ -	\$ -	\$ 4,910
5	Pt.9	*	F. & A. Hack	(010-325-01)	14	0.76	\$ 760	\$ 3,140	\$ -	\$ -	\$ 3,900
5	Pt.9	*	D. MacDonald and L. King	(010-209-05)	13	0.22	\$ 980	\$ 970	\$ -	\$ -	\$ 1,950
5	Pt.9	*	T. & D. McConnell	(010-209-04)	12	0.22	\$ 980	\$ 970	\$ -	\$ -	\$ 1,950
5	Pt.9	*	R. & M. Watson	(010-209-03)	11	0.21	\$ -	\$ 970	\$ -	\$ -	\$ 970
5	Pt.9	*	K. McQuade & C. Carter	(010-209-02)	10	0.21	\$ -	\$ 970	\$ -	\$ -	\$ 970
5	Pt.9	*	M. Kelso	(010-209-01)	9	0.20	\$ -	\$ 930	\$ -	\$ -	\$ 930
6	Pt.9	*	Board of Education Trillium Lakelands	(010-362-00)	18	1.40	\$ 910	\$ 7,250	\$ -	\$ -	\$ 8,160
6	Pt.9	*	E. Conner	(010-361-00)	8	0.13	\$ -	\$ 610	\$ -	\$ -	\$ 610
6	Pt.9	F	G. & M. Bryans	(010-363-00)		0.27	\$ -	\$ 640	\$ -	\$ -	\$ 640
TOTAL ON LANDS						9.32	\$ 10,840	\$ 29,700	\$ -	\$ -	\$ 40,540
Roads											
	Cameron Road	*	City of Kawartha Lakes	ROAD		0.60	\$ 6,930	\$ 5,500	\$ -	\$ -	\$ 12,430
TOTAL ON ROADS						0.60	\$ 6,930	\$ 5,500	\$ -	\$ -	\$ 12,430
ALL LANDS AND ROADS						9.92	\$ 17,770	\$ 35,200	\$ -	\$ -	\$ 52,970

Less 1/3 Grant	Less Allowances	Net Assessment
\$ -	\$ 2,630	\$ (190)
\$ -	\$ 3,190	\$ 1,900
\$ 1,127	\$ -	\$ 2,253
\$ -	\$ -	\$ 1,200
\$ -	\$ -	\$ 3,440
\$ -	\$ 1,700	\$ 3,210
\$ -	\$ 1,230	\$ 2,670
\$ -	\$ 1,160	\$ 790
\$ -	\$ 1,160	\$ 790
\$ -	\$ -	\$ 970
\$ -	\$ -	\$ 970
\$ -	\$ -	\$ 930
\$ -	\$ -	\$ 8,160
\$ -	\$ -	\$ 610
\$ 213	\$ -	\$ 427
\$ 1,340	\$ 11,070	\$ 28,130
\$ -	\$ -	\$ 12,430
\$ -	\$ -	\$ 12,430
\$ 1,340	\$ 11,070	\$ 40,560

Notes: (1) At the time of preparation for this report, properties were grouped based on those with agricultural farm tax class (F) and those without (*), based on ADIP grant eligibility.
(2) It is the responsibility of the landowner to confirm whether their property is eligible for an OMAFRA grant, under ADIP policies as eligibility has not been confirmed as part of the preparation of this report.



APPENDIX D1C - ASSESSMENTS for CONSTRUCTION
EASTERN BRANCH

FINAL REPORT

PROJECT: Waite Municipal Drain
DATE: February-24

MUNICIPALITY: Kawartha Lakes
PROJECT #: 300041611

Conc. or Plan	Lot or Part	Tax	Owner	Roll No.	Plan No.	Affected Area (Ha.)	Benefit Assess't (S.22)	Outlet Assess't (S.23)	Special Benefit (S.24)	Special Assess't (S.24/26)	Totals
Lands											
6	Pt.10	F	J. Waite & A. Williamson	(010-368-00)		23.06	\$ 11,520	\$ 39,520	\$ -	\$ -	\$ 51,040
6	Pt.10	*	D. Gardner	(010-369-01)		5.23	\$ 9,970	\$ 6,630	\$ -	\$ -	\$ 16,600
6	Pt.10	*	L. Cowen	(010-369-10)		0.24	\$ -	\$ 830	\$ -	\$ -	\$ 830
6	Pt.10	*	D. Wallace	(010-367-00)		0.79	\$ -	\$ 2,710	\$ -	\$ -	\$ 2,710
6	Pt.10	F	B. Clive	(010-369-00)		3.89	\$ 19,060	\$ 1,560	\$ -	\$ -	\$ 20,620
6	Pt.10	*	T. & K. Peck	(010-370-00)		0.10	\$ -	\$ 240	\$ -	\$ -	\$ 240
6	Pt.9 & Pt.10	*	G. Stewart	(010-365-00)		0.70	\$ 2,670	\$ -	\$ -	\$ -	\$ 2,670
6	Pt.9	*	Board of Education Trillium Lakelands	(010-362-00)	18	1.81	\$ -	\$ 5,500	\$ -	\$ -	\$ 5,500
6	Pt.9	F	G. & M. Bryans	(010-363-00)		12.37	\$ -	\$ 21,210	\$ -	\$ -	\$ 21,210
6	Pt.9	*	C. Parson & J. Eagan	(010-352-00)	1	0.64	\$ -	\$ 2,190	\$ -	\$ -	\$ 2,190
6	Pt.9	*	R. & B. Whyte	(010-353-00)	2	0.16	\$ -	\$ 550	\$ -	\$ -	\$ 550
6	Pt.9	*	I. & C. Young & S. Van Ek	(010-354-00)	3	0.07	\$ -	\$ 240	\$ -	\$ -	\$ 240
6	Pt.9	*	J. Cunha	(010-355-00)	4	0.18	\$ -	\$ 630	\$ -	\$ -	\$ 630
6	Pt.9	*	R. White & T. Thiele	(010-355-01)	5	0.18	\$ -	\$ 630	\$ -	\$ -	\$ 630
6	Pt.9	*	D. Fisher	(010-356-00)	6	0.26	\$ -	\$ 890	\$ -	\$ -	\$ 890
6	Pt.9	*	R. & D. Kimberley	(010-356-01)	7	0.17	\$ -	\$ 580	\$ -	\$ -	\$ 580
6	Pt.9	*	P. & J. McLean	(010-364-02)		0.35	\$ -	\$ 860	\$ -	\$ -	\$ 860
6	Pt.9 & Pt.10	*	City of Kawartha Lakes (Rail Trail)	(060-630-00)		0.55	\$ 11,280	\$ 390	\$ -	\$ 26,820	\$ 38,490
TOTAL ON LANDS						50.75	\$ 54,500	\$ 85,160	\$ -	\$ 26,820	\$ 166,480
Roads											
Highway 35		*	Ministry of Transportation	ROAD		1.48	\$ 148,360	\$ 9,050	\$ -	\$ 423,170	\$ 580,580
TOTAL ON ROADS						1.48	\$ 148,360	\$ 9,050	\$ -	\$ 423,170	\$ 580,580
ALL LANDS AND ROADS						52.23	\$ 202,860	\$ 94,210	\$ -	\$ 449,990	\$ 747,060

Less 1/3 Grant	Less Allowances	Net Assessment
\$ 17,013	\$ 1,000	\$ 33,027
\$ -	\$ 1,340	\$ 15,260
\$ -	\$ -	\$ 830
\$ -	\$ -	\$ 2,710
\$ 6,873	\$ 8,080	\$ 5,667
\$ -	\$ -	\$ 240
\$ -	\$ 3,630	\$ (960)
\$ -	\$ -	\$ 5,500
\$ 7,070	\$ -	\$ 14,140
\$ -	\$ -	\$ 2,190
\$ -	\$ -	\$ 550
\$ -	\$ -	\$ 240
\$ -	\$ -	\$ 630
\$ -	\$ -	\$ 630
\$ -	\$ -	\$ 890
\$ -	\$ -	\$ 580
\$ -	\$ -	\$ 860
\$ -	\$ -	\$ 38,490
\$ 30,957	\$ 14,050	\$ 121,473
\$ -	\$ -	\$ 580,580
\$ -	\$ -	\$ 580,580
\$ 30,957	\$ 14,050	\$ 702,053

Notes: (1) At the time of preparation for this report, properties were grouped based on those with agricultural farm tax class (F) and those without (*), based on ADIP grant eligibility.
(2) It is the responsibility of the landowner to confirm whether their property is eligible for an OMAFRA grant, under ADIP policies as eligibility has not been confirmed as part of the preparation of this report.



APPENDIX D1D - ASSESSMENTS for CONSTRUCTION
NET ASSESSMENT

FINAL REPORT

PROJECT: Waite Municipal Crain
DATE: February-24

MUNICIPALITY: Kawartha Lakes
PROJECT #: 300041611

Conc. or Plan	Lot or Part	Tax	Owner	Roll No.	Plan No.	Affected Area (Ha.)	Western Branch	Southern Branch	Eastern Branch	Totals	Less 1/3 Grant	Less Allowances	Net Assessment
			Lands										
6	Pt.11	*	R. & J. Peel	(010-371-01)		0.18	\$ 3,040	\$ -	\$ -	\$ 3,040	\$ -	\$ -	\$ 3,040
6	Pt.11	F	Nanda Properties Inc.	(010-372-00)		5.21	\$ 44,050	\$ -	\$ -	\$ 44,050	\$ 14,683	\$ -	\$ 29,367
5	Pt.10	*	B. & K. Johnston	(010-214-02)		2.19	\$ 11,100	\$ 2,440	\$ -	\$ 13,540	\$ -	\$ 6,480	\$ 7,060
5	Pt.10	*	C. Malcolm	(010-213-00)		5.62	\$ 30,090	\$ 5,090	\$ -	\$ 35,180	\$ -	\$ 5,870	\$ 29,310
6	Pt.10	F	J. Waite & A. Williamson	(010-368-00)		37.95	\$ 180,940	\$ -	\$ 51,040	\$ 231,980	\$ 77,327	\$ 8,820	\$ 145,833
6	Pt.10	*	D. Gardner	(010-369-01)		5.23	\$ -	\$ -	\$ 16,600	\$ 16,600	\$ -	\$ 1,340	\$ 15,260
6	Pt.10	*	L. Cowen	(010-369-10)		0.24	\$ -	\$ -	\$ 830	\$ 830	\$ -	\$ -	\$ 830
6	Pt.10	*	D. Wallace	(010-367-00)		0.79	\$ -	\$ -	\$ 2,710	\$ 2,710	\$ -	\$ -	\$ 2,710
6	Pt.10	F	B. Clive	(010-369-00)		3.89	\$ -	\$ -	\$ 20,620	\$ 20,620	\$ 6,873	\$ 8,080	\$ 5,667
6	Pt.10	*	T. & K. Peck	(010-370-00)		0.10	\$ -	\$ -	\$ 240	\$ 240	\$ -	\$ -	\$ 240
6	Pt.9 & Pt.10	*	G. Stewart	(010-365-00)		0.70	\$ -	\$ -	\$ 2,670	\$ 2,670	\$ -	\$ 3,630	\$ (960)
5	Pt.9	F	2324784 Ontario Inc.	(010-210-02)		1.65	\$ 640	\$ 3,380	\$ -	\$ 4,020	\$ 1,340	\$ -	\$ 2,580
5	Pt.9	*	W. & F. Moore	(010-325-84)	17	0.27	\$ 210	\$ 1,200	\$ -	\$ 1,410	\$ -	\$ -	\$ 1,410
5	Pt.9	*	J. & P. Cadden	(010-325-03)	16	0.78	\$ 610	\$ 3,440	\$ -	\$ 4,050	\$ -	\$ -	\$ 4,050
5	Pt.9	*	A. & K. Welch	(010-325-02)	15	0.88	\$ 690	\$ 4,910	\$ -	\$ 5,600	\$ -	\$ 1,700	\$ 3,900
5	Pt.9	*	F. & A. Hack	(010-325-01)	14	0.76	\$ 590	\$ 3,900	\$ -	\$ 4,490	\$ -	\$ 1,230	\$ 3,260
5	Pt.9	*	D. MacDonald and L. King	(010-209-05)	13	0.22	\$ 170	\$ 1,950	\$ -	\$ 2,120	\$ -	\$ 1,160	\$ 960
5	Pt.9	*	T. & D. McConnell	(010-209-04)	12	0.22	\$ 170	\$ 1,950	\$ -	\$ 2,120	\$ -	\$ 1,160	\$ 960
5	Pt.9	*	R. & M. Watson	(010-209-03)	11	0.21	\$ 160	\$ 970	\$ -	\$ 1,130	\$ -	\$ -	\$ 1,130
5	Pt.9	*	K. McQuade & C. Carter	(010-209-02)	10	0.21	\$ 160	\$ 970	\$ -	\$ 1,130	\$ -	\$ -	\$ 1,130
5	Pt.9	*	M. Kelso	(010-209-01)	9	0.20	\$ 160	\$ 930	\$ -	\$ 1,090	\$ -	\$ -	\$ 1,090
6	Pt.9	*	Board of Education Trillium Lakelands	(010-362-00)	18	3.21	\$ 1,200	\$ 8,160	\$ 5,500	\$ 14,860	\$ -	\$ -	\$ 14,860



APPENDIX D1D - ASSESSMENTS for CONSTRUCTION
NET ASSESSMENT

FINAL REPORT

PROJECT: Waite Municipal Drain
DATE : February-24

MUNICIPALITY: Kawartha Lakes
PROJECT #: 300041611

Conc. or Plan	Lot or Part	Tax	Owner	Roll No.	Plan No.	Affected Area (Ha.)	Western Branch	Southern Branch	Eastern Branch	Totals	Less 1/3 Grant	Less Allowances	Net Assessment
6	Pt.9	F	G. & M. Bryans	(010-363-00)		12.64	\$ 110	\$ 640	\$ 21,210	\$ 21,960	\$ 7,320	\$ -	\$ 14,640
6	Pt.9	*	E. Conner	(010-361-00)	8	0.13	\$ 100	\$ 610	\$ -	\$ 710	\$ -	\$ -	\$ 710
6	Pt.9	*	C. Parson & J. Eagan	(010-352-00)	1	0.64	\$ -	\$ -	\$ 2,190	\$ 2,190	\$ -	\$ -	\$ 2,190
6	Pt.9	*	R. & B. Whyte	(010-353-00)	2	0.16	\$ -	\$ -	\$ 550	\$ 550	\$ -	\$ -	\$ 550
6	Pt.9	*	I. & C. Young & S. Van Ek	(010-354-00)	3	0.07	\$ -	\$ -	\$ 240	\$ 240	\$ -	\$ -	\$ 240
6	Pt.9	*	J. Cunha	(010-355-00)	4	0.18	\$ -	\$ -	\$ 630	\$ 630	\$ -	\$ -	\$ 630
6	Pt.9	*	R. White & T. Thiele	(010-355-01)	5	0.18	\$ -	\$ -	\$ 630	\$ 630	\$ -	\$ -	\$ 630
6	Pt.9	*	D. Fisher	(010-356-00)	6	0.26	\$ -	\$ -	\$ 890	\$ 890	\$ -	\$ -	\$ 890
6	Pt.9	*	R. & D. Kimberley	(010-356-01)	7	0.17	\$ -	\$ -	\$ 580	\$ 580	\$ -	\$ -	\$ 580
6	Pt.9	*	P. & J. McLean	(010-364-02)		0.35	\$ -	\$ -	\$ 860	\$ 860	\$ -	\$ -	\$ 860
6	Pt.9 & Pt.10	*	City of Kawartha Lakes (Rail Trail)	(060-630-00)		0.55	\$ -	\$ -	\$ 38,490	\$ 38,490	\$ -	\$ -	\$ 38,490
TOTAL ON LANDS						86.04	\$ 274,190	\$ 40,540	\$ 166,480	\$ 481,210	\$ 107,543	\$ 39,470	\$ 334,197
Roads													
Cameron Road		*	City of Kawartha Lakes	ROAD		1.88	\$ 122,430	\$ 12,430	\$ -	\$ 134,860			\$ 134,860
Chambers Road		*	City of Kawartha Lakes	ROAD		0.94	\$ 103,350	\$ -	\$ -	\$ 103,350			\$ 103,350
Highway 35		*	Ministry of Transportation	ROAD		1.48	\$ -	\$ -	\$ 580,580	\$ 580,580			\$ 580,580
TOTAL ON ROADS						4.30	\$ 225,780	\$ 12,430	\$ 580,580	\$ 818,790	\$ -	\$ -	\$ 818,790
ALL LANDS AND ROADS						90.34	\$ 499,970	\$ 52,970	\$ 747,060	\$ 1,300,000	\$ 107,543	\$ 39,470	\$ 1,152,987

- Notes:**
- (1) At the time of preparation for this report, properties were grouped based on those with agricultural farm tax class (F) and those without (*), based on ADIP grant eligibility.
 - (2) It is the responsibility of the landowner to confirm whether their property is eligible for an OMAFRA grant, under ADIP policies as eligibility has not been confirmed as part of the preparation of this report.



**APPENDIX D2(A) - ASSESSMENTS for MAINTENANCE
WESTERN BRANCH
(Sta. -W0+138 to W0+670)**

PROJECT: Waite Municipal Drain
DATE : February-24

MUNICIPALITY: Kawartha Lakes
PROJECT #: 300041611

Conc. or Plan	Lot or Part	Tax	Owner	Roll No.	Plan No.	Affected Area (Ha.)	Equivalent Area (Ha.)	Totals
Lands								
6	Pt.11	*	R. & J. Peel	(010-371-01)		0.18	0.36	0.70%
6	Pt.11	F	Nanda Properties Inc.	(010-372-00)		5.21	5.21	10.17%
5	Pt.10	*	B. & K. Johnston	(010-214-02)		2.19	1.10	2.14%
5	Pt.10	*	C. Malcolm	(010-213-00)		5.62	5.62	10.97%
6	Pt.10	F	J. Waite & A. Williamson	(010-368-00)		14.89	14.89	29.07%
5	Pt.9	F	2324784 Ontario Inc.	(010-210-02)		1.65	1.65	3.22%
5	Pt.9	*	W. & F. Moore	(010-325-84)	17	0.27	0.54	1.05%
5	Pt.9	*	J. & P. Cadden	(010-325-03)	16	0.78	1.56	3.05%
5	Pt.9	*	A. & K. Welch	(010-325-02)	15	0.88	1.76	3.44%
5	Pt.9	*	F. & A. Hack	(010-325-01)	14	0.76	1.52	2.97%
5	Pt.9	*	D. MacDonald and L. King	(010-209-05)	13	0.22	0.44	0.86%
5	Pt.9	*	T. & D. McConnell	(010-209-04)	12	0.22	0.44	0.86%
5	Pt.9	*	R. & M. Watson	(010-209-03)	11	0.21	0.42	0.82%
5	Pt.9	*	K. McQuade & C. Carter	(010-209-02)	10	0.21	0.42	0.82%
5	Pt.9	*	M. Kelso	(010-209-01)	9	0.20	0.40	0.78%
6	Pt.9	*	Board of Education Trillium Lakelands	(010-362-00)	18	1.40	3.08	6.01%
6	Pt.9	*	E. Conner	(010-361-00)	8	0.13	0.26	0.51%
6	Pt.9	F	G. & M. Bryans	(010-363-00)		0.27	0.27	0.54%
TOTAL ON LANDS						35.29	39.94	77.98%
Roads								
Cameron Road		*	City of Kawartha Lakes	ROAD		1.88	7.52	14.68%
Chambers Road		*	City of Kawartha Lakes	ROAD		0.94	3.76	7.34%
TOTAL ON ROADS						2.82	11.28	22.02%
ALL LANDS AND ROADS						38.11	51.22	100.00%

Notes: (1) At the time of preparation for this report, properties were grouped based on those with agricultural farm tax class (F) and those without (*), based on ADIP grant eligibility.
(2) It is the responsibility of the landowner to confirm whether their property is eligible for an OMAFRA grant as eligibility has not been confirmed as part of the preparation of this report.



**APPENDIX D2(B) - ASSESSMENTS for MAINTENANCE
SOUTHERN BRANCH
(Sta. S0+000 to S0+452)**

PROJECT: Waite Municipal Drain
DATE: February-24

MUNICIPALITY: Kawartha Lakes
PROJECT #: 300041611

Conc. or Plan	Lot or Part	Tax	Owner	Roll No.	Plan No.	Affected Area (Ha.)	Equivalent Area (Ha.)	Totals
Lands								
5	Pt.10	*	B. & K. Johnston	(010-214-02)		0.86	0.43	2.55%
5	Pt.10	*	C. Malcolm	(010-213-00)		1.26	1.26	7.48%
5	Pt.9	F	2324784 Ontario Inc.	(010-210-02)		1.65	1.65	9.79%
5	Pt.9	*	W. & F. Moore	(010-325-84)	17	0.27	0.54	3.20%
5	Pt.9	*	J. & P. Cadden	(010-325-03)	16	0.78	1.56	9.26%
5	Pt.9	*	A. & K. Welch	(010-325-02)	15	0.88	1.76	10.45%
5	Pt.9	*	F. & A. Hack	(010-325-01)	14	0.76	1.52	9.02%
5	Pt.9	*	D. MacDonald and L. King	(010-209-05)	13	0.22	0.44	2.61%
5	Pt.9	*	T. & D. McConnell	(010-209-04)	12	0.22	0.44	2.61%
5	Pt.9	*	R. & M. Watson	(010-209-03)	11	0.21	0.42	2.49%
5	Pt.9	*	K. McQuade & C. Carter	(010-209-02)	10	0.21	0.42	2.49%
5	Pt.9	*	M. Kelso	(010-209-01)	9	0.20	0.40	2.37%
6	Pt.9	*	Board of Education Trillium Lakelands	(010-362-00)	18	1.40	3.08	18.28%
6	Pt.9	*	E. Conner	(010-361-00)	8	0.13	0.26	1.54%
6	Pt.9	F	G. & M. Bryans	(010-363-00)		0.27	0.27	1.62%
TOTAL ON LANDS						9.32	14.45	85.76%
Roads								
Cameron Road		*	City of Kawartha Lakes	ROAD		0.60	2.40	14.24%
TOTAL ON ROADS						0.60	2.40	14.24%
ALL LANDS AND ROADS						9.92	16.85	100.00%

- Notes:**
- (1) At the time of preparation for this report, properties were grouped based on those with agricultural farm tax class (F) and those without (*), based on ADIP grant eligibility.
 - (2) It is the responsibility of the landowner to confirm whether their property is eligible for an OMAFRA grant as eligibility has not been confirmed as part of the preparation of this report.



**APPENDIX D2(C) - ASSESSMENTS for MAINTENANCE
EASTERN BRANCH
(Sta. -E0+181 to E0+231) & (Sta. ES0+000 to ES0+167)**

PROJECT: Waite Municipal Drain
DATE: February-24

MUNICIPALITY: Kawartha Lakes
PROJECT #: 300041611

Conc. or Plan	Lot or Part	Tax	Owner	Roll No.	Plan No.	Affected Area (Ha.)	Equivalent Area (Ha.)	Totals
Lands								
6	Pt.10	F	J. Waite & A. Williamson	(010-368-00)		23.06	23.06	36.15%
6	Pt.10	*	D. Gardner	(010-369-01)		5.23	5.23	8.20%
6	Pt.10	*	L. Cowen	(010-369-10)		0.24	0.48	0.75%
6	Pt.10	*	D. Wallace	(010-367-00)		0.79	1.58	2.48%
6	Pt.10	F	B. Clive	(010-369-00)		3.89	3.89	6.10%
6	Pt.1U	*	T. & K. Peck	(010-370-00)		0.10	0.20	0.31%
6	Pt.9 & Pt.10	*	G. Stewart	(010-365-00)		0.70	0.70	1.10%
6	Pt.9	*	Board of Education Trillium Lakelands	(010-362-00)	18	1.81	3.21	5.03%
6	Pt.9	F	G. & M. Bryans	(010-363-00)		12.37	12.37	19.39%
6	Pt.9	*	C. Parson & J. Eagan	(010-352-00)	1	0.64	1.28	2.01%
6	Pt.9	*	R. & B. Whyte	(010-353-00)	2	0.16	0.32	0.50%
6	Pt.9	*	I. & C. Young & S. Van Ek	(010-354-00)	3	0.07	0.14	0.22%
6	Pt.9	*	J. Cunha	(010-355-00)	4	0.18	0.36	0.56%
6	Pt.9	*	R. White & T. Thiele	(010-355-01)	5	0.18	0.36	0.56%
6	Pt.9	*	D. Fisher	(010-356-00)	6	0.26	0.52	0.82%
6	Pt.9	*	R. & D. Kimberley	(010-356-01)	7	0.17	0.34	0.53%
6	Pt.9	*	P. & J. McLean	(010-364-02)		0.35	0.70	1.10%
6	Pt.9 & Pt.10	*	City of Kawartha Lakes (Rail Trail)	(060-630-00)		0.55	1.65	2.59%
TOTAL ON LANDS						50.75	56.39	88.40%
Roads								
Highway 35		*	Ministry of Transportation	ROAD		1.48	7.40	11.60%
TOTAL ON ROADS						1.48	7.40	11.60%
ALL LANDS AND ROADS						52.23	63.79	100.00%

- Notes:**
- (1) At the time of preparation for this report, properties were grouped based on those with agricultural farm tax class (F) and those without (*), based on ADIP grant eligibility.
 - (2) It is the responsibility of the landowner to confirm whether their property is eligible for an OMAFRA grant as eligibility has not been confirmed as part of the preparation of this report.



BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix E

Standard Drain Specifications

General Drain Specifications	E.2.1
Specifications for Open Drains	E.2.2
Specifications for Closed Drains	E.2.3
Specifications for Road Crossing (Open Cut Method)	E.2.4
Specifications for Road Crossing (Jack and Bore Method)	E.2.5

E.2.1 GENERAL DRAIN SPECIFICATIONS

E.2.1.1 SCOPE OF SPECIFICATIONS

This specification covers the general conditions governing the construction of a Municipal Drain under the most recent revision of The Drainage Act and amendments. All work shall be done in accordance with current and applicable Ontario Provincial Standard Specifications and Drawings (OPSS and OPSD).

E.2.1.2 BENCHMARKS

Benchmarks shall be set at intervals along the course of the work at locations shown on the accompanying plan and/or profile. The Contractor or landowner shall be held liable for the cost of re-establishing benchmarks destroyed. Attention is drawn to Section 13 of The Drainage Act.

E.2.1.3 STAKES/FLAGS/MARKERS

Stakes, flags or markers are typically set at intervals throughout the course of the work, at all fences and property lines. The Contractor or landowner shall be held liable for the cost of replacing any stakes removed or destroyed.

E.2.1.4 PROFILE

The drain is to be excavated or installed to regular gradient lines as shown on the profile(s). These gradients show the bottom of the finished drain (open or closed) and are governed entirely by the benchmarks. In the case of closed drains, the gradient is that of the invert of the tile. The profile(s) shows the approximate depth from the surface of the ground to the invert of the tile or ditch bottom at the point where the stations are set and from the average bottom of the open drain as taken at the time of survey. Open drains shall be brought to an even gradient in the bottom to prevent standing water. For closed drains, a variation of 25 mm (unless specified otherwise) from the gradient may be deemed sufficient reason for the work to be rejected and required to be rebuilt.

E.2.1.5 CLEARING

Clearing means the cutting of all standing trees, brush, bushes and other vegetation to a maximum height of 300 mm above original ground level as well as the removal of felled materials and windfalls. Trees measuring 150 mm or more in diameter shall be felled, delimbed, cut into lengths no longer than 4 m and stacked to the designated side of the working space. The work shall not damage or disturb the area outside the areas specified in the Contract Documents.

The work shall consist of clearing all areas of earth excavation, earth surfaces to be covered by embankments up to and including 1.2 m in height, and any other areas specified in the Contract Documents.

No trees, brush or bushes are to be left inside the slopes of the drain, whether they are located within the limits of the excavation or not. Brush cleared in accordance with the above shall be piled in a location and in a manner satisfactory to the Engineer for burning by the Owner. Unless otherwise specified or directed, these piles shall be a minimum of 100 m apart and shall contain only cleared material. All work shall be done in accordance with OPSS 201.

E.2.1.6 CLOSE CUT CLEARING

Close Cut Clearing means the cutting of all standing trees, stumps, brush, bushes and other vegetation at original ground level and the removal of felled materials and windfalls. Grubbing means the removal of all stumps, roots, embedded logs, debris and secondary growth. Trees measuring 150 mm or more in diameter shall be felled, delimbed, cut into lengths no longer than 4 m and stacked to the designated side of the working space. The work shall not damage or disturb the area outside the areas specified in the Contract Documents.

The work shall consist of close cut clearing all earth surfaces to be covered by embankments greater than 1.2 m in height, and any other areas specified in the Contract Documents.

No trees, stumps, brush or bushes are to be left inside the slopes of the drain whether they are located within the limits of the excavation or not. Brush cleared in accordance with the above shall be piled in a location and in a manner satisfactory to the Engineer for burning by the Owner. Unless otherwise specified or directed, these piles shall be a minimum of 100 m apart and shall contain only cleared material. All work shall be done in accordance with OPSS 201.

E.2.1.7 BRUSHING

Brushing means the grinding or chipping to ground level of vegetation in the working space under 150 mm in diameter by means of a hydraulic brushing attachment used with an excavator or approved equivalent. This includes grinding or chipping all standing trees, stumps, brush, bushes and other vegetation to original ground level.

Trees measuring 150 mm or more in diameter shall be felled, delimbed, cut into lengths no longer than 4 m and stacked to the designated side of the working space. The work shall not damage or disturb the area outside the areas specified in the Contract Documents. All work shall be done in accordance with OPSS 201.

E.2.1.8 GRUBBING

Grubbing means the removal of all stumps, roots, embedded logs, debris and secondary growth.

The work shall consist of grubbing all areas of earth excavation, earth surfaces to be covered by embankments up to and including 1.2 m in height and any other areas specified in the Contract Documents.

Grubbing is not required in swamps. Mechanical stump cutters are permitted, provided the entire root structure is removed. Depressions remaining after grubbing shall be backfilled with suitable earth material and compacted to avoid settlement. When clearing has been previously completed by others, all secondary growth, brush and debris shall be removed.

Piled boulders and surface boulders that are not specified in the Contract Documents for removal and lie within areas to be grubbed shall be removed. The work shall not damage or disturb the area outside the areas specified in the Contract Documents. All work shall be done in accordance with OPSS 201.

E.2.1.9 REMOVAL OF SURFACE BOULDERS & REMOVAL OF PILED BOULDERS

Piled Boulders means any cobbles, boulders or rock fragments that have been placed in fence rows or piles.

Rock means rock as defined in OPSS 206.

Surface Boulder means any boulder or rock fragment that measures 200 mm or greater in any one dimension, extends a minimum of 200 mm above original ground and can be removed without excavation.

The work shall consist of the removal of surface boulders and removal of piled boulders within the areas specified in the Contract Documents. Depressions remaining after removal shall be backfilled with suitable earth material and compacted to avoid settlement. The work shall not damage or disturb the area outside the areas specified in the Contract Documents. All work shall be done in accordance with OPSS 201.

E.2.1.10 FENCES

The Contractor will be permitted to remove fences to the extent necessary to allow the construction of the drain and to dispose of any excess material according to specifications. Any such fences shall be carefully handled so as to cause no unnecessary damage. Such fences shall be replaced by the Contractor in as good a condition as found. The Contractor shall supply all material necessary to properly reconstruct any fences. The Contractor shall not leave any fence open when he is not at work in the immediate area and shall replace the fence in a timely manner, all to the satisfaction of the Engineer.

E.2.1.11 STANDING CROPS AND LIVESTOCK

Should a property owner wish to harvest any crop along an access route or within the construction working space as set out in the Engineer's Report, then it shall be the responsibility of the property owner to do so prior to construction. Provisions for the loss of, or damage to, crops along the access route or in the construction area ("Working Space") have been made in the Report and such loss or damage shall not be the liability of the Contractor.

The Contractor shall contain construction operations to the working space and width specified. As long as the construction operations are contained within the specified working space, the Contractor shall not be responsible for damages to crops along the course of the drain.

It shall be the responsibility of the property owners to keep their livestock clear of the construction area upon receiving 24 hours advance notice by the Contractor. After receiving proper notice, the Owner of the property upon which a drain is being constructed shall be liable for any loss or damage to livestock, the drain, drain materials or the Contractor's equipment caused by their livestock.

E.2.1.12 NOTIFICATION OF AGENCIES

The Contractor shall notify the appropriate agency before performing any work affecting the land or property of the MTO, railway, telephone, pipeline or public utility or regulatory agency. The Contractor shall further agree to perform the work affecting such lands or property in accordance with the specifications and approval/permit of the applicable agency.

E.2.1.13 FINAL INSPECTIONS

After substantial completion of the work, but prior to demobilization and final removal of all equipment and materials from the site, the Contractor MUST arrange an on-site FINAL Inspection of the work with the engineer to ensure all aspects of the work have been satisfactorily completed and/or that arrangements have been made to expedite the completion of any outstanding "minor" items or deficiencies. All the work included in the contract, at the time of the Final Inspection, must have the full dimensions and cross-sections called for in the plans and specifications. Notification to the Engineer of this Final Inspection shall be provided at least 5 days prior and it shall be completed as soon as possible or as soon thereafter as weather conditions permit.

E.2.2 SPECIFICATIONS FOR OPEN DRAINS

E.2.2.1 GEOMETRY

The drain shall have the full bottom width, at the gradient, specified or shown on the accompanying plan(s), profile(s) and detail sheet(s).

E.2.2.2 ALIGNMENT

The drain shall run in straight lines throughout each course except at intersections, where it shall run on a minimum curve of 15 m radius unless otherwise specified. If the work consists of the improvement of an existing open drain, then the centre line of the existing drain may be the centre line of the finished work unless otherwise specified.

E.2.2.3 EXCAVATED MATERIAL

A clear buffer of at least 3 m shall be left between the top edge of the open drain and the excavated material. Excavated material shall be placed on the side specified or, if not specified, on the lower side of the drain or on the side opposite trees or fences. No excavated material is to be left in any low runs intended to conduct water into the open drain. It shall be deposited, spread and leveled to a maximum depth of 150 mm, unless specified otherwise and left in a manner such that the lands on which it is spread may be cultivated with adjacent lands by use of ordinary farm machinery. Material excavated in land that is timbered, may be spread to the depth specified or to a maximum depth of 300 mm. In cultivated areas, the Contractor shall remove stones and boulders on the surface greater than 100 mm diameter from the excavated material and dispose of in an approved location. Treatment of excavated material shall be to the satisfaction of the Engineer. After the excavated material has been spread and leveled, it shall be seeded as specified.

E.2.2.4 SURFACE WATER INLETS

Surface water inlets to the drain shall be provided through the leveled spoil on each property at obvious natural low runs or at other locations as specified by the Engineer on site at the time of construction. No excavated material shall be left in, or any damage done to a ditch, furrow, pipe, tile or depression that is intended to conduct water into an open drain. The ditch bank at all such inlets shall be ripped as directed by the Engineer and reimbursed under the appropriate contract item.

E.2.2.5 OUTLETS

During the construction of an open drain, the Contractor shall guard against damaging the outlet of any tributary drain or pipes encountered. The Contractor will be reimbursed for damage to unmarked outlet pipes under the appropriate contract item.

E.2.2.6 ACCESS CULVERTS

All culverts shall be installed with the invert a minimum of 10% of its diameter or as specified below the gradient and the firm bottom of the drain.

All pipes installed under these specifications shall be carefully bedded so as to ensure uniform bearing throughout its entire length.

Except where requiring concrete cradle or encasement, all pipes shall be bedded on granular fill as specified or as shown on the contract drawings. Bedding shall be hand placed, tamped and consolidated throughout. Granular fill and bedding shall be gravel or crushed stone having no particles over 20 mm in size, except where otherwise specified.

Concrete cradle and concrete encasement shall be placed as shown on the drawings, and the concrete shall be minimum 25 MPa.

From the top of the bedding material to a point 150 mm below the existing grade of the laneway, backfill material shall be clean pit run gravel meeting O.P.S.S. Granular "B" or approved equivalent. The material shall be placed in lifts not to exceed 300 mm in depth and all granular materials shall be compacted to 100 % SPMDD and all subsoil or previously excavated material to 95 % SPMDD.

The final 150 mm of the excavation shall be filled with clean crushed gravel conforming to O.P.S.S. Granular "A" specifications. The material shall be placed in lifts not exceeding 150 mm in depth and shall be thoroughly compacted to 100 % SPMDD.

E.2.2.7 EXCAVATION AT BRIDGE SITES

The excavation at bridge sites shall be to the full depth of the drain and as nearly as possible the full width of the drain as specified for the bridge location. The excavation at a bridge site shall be made in a manner to protect the structural integrity of any permanent bridge. A temporary bridge may be carefully removed to allow excavation. The removal of a bridge is to be done in such a manner so as to cause no damage to the bridge components. Temporary bridges removed to allow excavation shall be replaced in as good a condition as found, so far as material allows. Replacing of such bridges shall be to the satisfaction of the Engineer. The Contractor shall immediately notify the Engineer if it becomes apparent that excavating to a specified gradient will endanger or underpin any culvert or bridge. The Contractor shall cease excavation at the bridge or culvert site until the Engineer instructs the Contractor to proceed.

E.2.2.8 SEEDING

Unless indicated otherwise in the Special Provisions, the Contractor shall seed all disturbed areas which includes newly excavated ditch banks and leveled spoil (where

specified) with the OPSS (MTO) Standard Roadside Seed Mix, consisting of 55% Creeping Red Fescue, 27% Kentucky Bluegrass, 15% Perennial Ryegrass and 3% White Clover, at an application rate of 100 kg/10,000 m², plus a nurse crop of Fall Rye Grain or Winter Wheat Grain at an application rate of 60 kg/10,000 m², at the end of each working day.

E.2.2.9 TEMPORARY SEDIMENT CONTROLS

Unless indicated otherwise in the Special Provisions, the Contractor shall install an approved sediment control measure at the downstream end of the open drain excavation and at any other locations specified. The Contractor shall remove any accumulated sediment at regular intervals or as directed by the Engineer. The Contractor shall then remove these temporary measures, and any accumulated sediment therein, after the new open drain has stabilized and only after authorized by the Engineer or the Drainage Superintendent.

E.2.2.10 PERMANENT SEDIMENT/STILLING BASINS

The Contractor shall construct and maintain sediment control or stilling basins as specified in the Special Provisions.

E.2.2.11 RIP RAP & NON-WOVEN GEOTEXTILE

Rip Rap – The Contractor shall supply and install a 500 mm thickness of 150 mm to 300 mm (R50) diameter quarry stone rip rap with filter cloth underlayment for culvert and pipe outlets. This will include areas of the existing bank where erosion or bank slumping has occurred, as directed on-site by the Engineer. For the area surrounding catchbasins, unless noted otherwise, the contractor shall supply and install a 300 mm thickness of 100 to 150 mm (R10) diameter quarry stone rip rap with filter cloth underlayment.

Non-Woven Geotextile - All geotextile used for tile wrapping under these specifications shall be non-woven Terrafix 200R (or equivalent). All geotextile used under these specifications for heavy duty applications such as under rip-rap surrounding catchbasins, and at tile outlets in channels shall be non-woven Terrafix 270R (or equivalent).

E.2.3 SPECIFICATIONS FOR CLOSED DRAINS

E.2.3.1 MATERIALS

Tile, tubing and pipe materials supplied by the Contractor shall be approved by the Engineer prior to being incorporated in the work. The Contractor shall be responsible for the unloading and placement of all materials required for the Municipal Drain construction. Such unloading and placement shall be undertaken in a manner acceptable to the Engineer using only the specified and approved access routes and working space.

Concrete Drain Tile (CDT) - All CDT installed under these specifications shall have a circular cross section with a minimum 2000D, meeting the latest revision of CSA A257.1-14 and ASTM C412. The manufacturer shall provide the Engineer with a copy of all available test results for the materials being shipped to the project site. The Engineer shall have the right to order any additional tests he deems necessary to be performed on the tile taken from inventory prior to shipment from the manufacturer's plant. The cost of such additional tests shall be borne by the Contractor.

Plastic Drainage Tubing (PDT) - All PDT installed under these specifications shall be manufactured in accordance with the latest revision of the Drainage Guide for Ontario, as published by the Ministry of Agriculture and Food.

Corrugated Steel Pipe (CSP) - All CSP installed under these specifications shall be galvanized spiral wound corrugated steel pipe. All corrugated steel pipe installed under these specifications shall conform to CSA G401.

- CSP tile outlet pipes shall be up to 1,200 mm in diameter and 2.0 mm in thickness and shall have 68 mm x 13 mm corrugations unless specified otherwise.
- CSP culverts shall up to 1,000 mm in diameter and 2.8 mm in thickness and shall have 68 mm x 13 mm corrugations unless specified otherwise. CSP culverts equal to and larger than 1,200 mm in diameter shall be 3.5 mm in thickness and shall have 125 mm x 25 mm corrugations unless specified otherwise.

High Density Polyethylene(HDPE) Pipe - All corrugated or dual wall smooth walled HDPE pipe (Armtex BOSS 2000 or equivalent) installed under these specifications as culverts or as part of a new closed drain shall be manufactured in accordance with the latest revision of Ontario Provincial Standard Specification 1840 and shall have a pipe stiffness of 320 kPa.

- All perforated dual-wall smoothwalled HDPE pipe joining systems shall be soil-tight split coupler unless specified otherwise, conforming to CSA B182.8. As

specified, perforated pipe shall include a knitted sock or non-woven geotextile covering (Terrafix 200R or equivalent).

- All solid dual-wall smoothwalled HDPE pipe shall be soil-tight split coupler, unless specified otherwise, conforming to CSA B182.8.
- All watertight solid dual-wall HDPE pipe joining systems shall be water-tight bell and spigot, complete with gasketed connections unless specified otherwise, conforming to CSA B182.6.

Steel Reinforced Polyethylene (SRPE) Pipe - All smooth walled SRPE pipe (Armtec DuroMaxx or equivalent) installed under these specifications as culverts or as part of a new closed drain shall be manufactured in accordance with the latest revision of Ontario Provincial Standard Specification 1840. All SRPE pipe shall conform to AASHTO M294.

- All solid SRPE pipe shall be soil-tight split coupler, unless specified otherwise, conforming to CSA B182.14.
- All watertight solid SRPE pipe joining systems shall be water-tight bell and spigot, complete with gasketed connections unless specified otherwise, conforming to CSA B182.15.

Polypropylene (PP) Pipe - All triple-wall smooth walled PP pipe (ADS HP Sanitite or equivalent) installed under these specifications as culverts or as part of a new closed drain shall be manufactured in accordance with the latest revision of Ontario Provincial Standard Specification 1843 and shall have a pipe stiffness of 320 kPa.

- All watertight solid triple-wall PP pipe joining systems shall be water-tight bell and spigot, complete with gasketed connections unless specified otherwise, conforming to CSA B182.13.

Non-Woven Geotextile - All geotextile under these specifications shall conform to OPSS 1860. All geotextile used for tile wrapping under these specifications shall be non-woven Terrafix 200R (or equivalent). All geotextile used under these specifications for heavy duty applications such as under rip-rap surrounding catchbasins, and at tile outlets in channels shall be non-woven Terrafix 270R (or equivalent).

E.2.3.2 DRAIN GRADIENT AND VERIFICATION

The proposed gradient shall be established using laser grade control equipment, cross-head boning rods together with horizontal sight-bars at stations above and below the point where the tile is being laid or other method acceptable to the Engineer.

If the Engineer has not checked the tile, inspection points shall be left at intervals of not greater than 50 m for sections with gradients less than 0.5 % and at intervals of not greater than 30 m for sections with gradients above 0.5 %. Inspection points shall also

be left at all structures and all changes in gradient. Other inspections points may be required from time to time as requested by the Engineer.

E.2.3.3 TILE LAYING INCLUDING TOPSOIL STRIPPING

In the case of the installation of CDT, and unless specified otherwise in the Special Provisions, the Contractor shall strip the topsoil a full width of the trenching machine plus 0.3 m on each side prior to installing the new tile with the trencher as part of the work under the appropriate item and no extra payment will be made for this stripping. After installation, confirming gradient, blinding, and back filling of the trench, the topsoil shall be replaced throughout the entire length of the Drain. The Contractor shall take into consideration the settlement of the backfill material over the trench prior to replacing the topsoil.

All CDT shall be installed with a wheel-type trencher and each tile shall be laid firmly and carefully in a smooth bottomed trench so that successive tiles align both vertically and horizontally as tightly as possible; the maximum allowable space between successive tiles shall be 6 mm.

ALL joints of the CDT MUST be completely wrapped with geotextile (Terrafix 200R or equivalent) as part of the work under the appropriate item and no extra payment will be made for this wrapping. The wrap on each joint shall be a minimum of:

- 300 mm wide for tile sizes smaller than 450 mm diameter
- 600 mm wide for tile sizes 450 mm diameter and above

The Contractor is reminded that the widths of the tile trenches are to be kept to a minimum. It is recommended that the minimum trench width be 300 mm greater than the outside diameter of the tile or 150 mm on each side of the tile being installed. It is recommended that the maximum trench width be 600 mm greater than the outside diameter of the tile or 300 mm on each side of the tile being installed.

All PDT shall be installed with a self-propelled drainage plow.

All obstructions, dirt or foreign material shall be removed from the inside of the tile prior to laying.

Tile drains shall be constructed at an offset from, and parallel to, any existing ditch, defined watercourse or low run. The Contractor shall exercise care not to disturb any existing private or municipal tile drains which follow the same course as the new drain.

E.2.3.4 RECONNECTION OF EXISTING PRIVATE TILE

Any subsurface drain encountered by the Contractor when constructing a Municipal Drain under these specifications shall be reconnected to itself and not connected to the

new Municipal Drain, unless approved otherwise by the Engineer. The accepted practice for reconnecting existing tile drains will be to compact sub-base material from the new trench bottom to the underside of the existing tile. Rigid pipe, HDPE (320 kPa) or approved equivalent, with a diameter equal or larger than the existing tile with a minimum length of 0.6 m beyond the trench width to the existing tile. This connection shall be made only where the existing tile is operable and in good condition. When completing backfilling of the Municipal Drain trench at such a location, the Contractor shall take sufficient care to ensure that the new connecting pipe is not damaged.

The Contractor shall provide a unit price per connection and the unit price shall include the supply of all material, labour and equipment necessary to make the connection. Further, the Contractor shall keep a written record of all sub-surface drains encountered. All connections completed shall be reviewed with the Engineer on a daily basis and a summary of all subdrains shall be provided to the landowner.

E.2.3.5 CONNECTION OF EXISTING PRIVATE TILES TO MUNICIPAL DRAIN

A subsurface drain encountered during construction can be connected to the Municipal Drain if requested by the landowner and approved by the Engineer prior to commencement of the connection. The drain shall be connected to the Municipal Drain either by core drilling through the CDT or a prefabricated fitting for HDPE. The core shall be drilled on-site and backfilled as per the specified detail included within the drawings. Any tile drains connected to the Municipal Drain shall have the downstream end of the tile plugged to prevent entry of foreign material into the tile.

E.2.3.6 TRENCH BACKFILLING

As the laying of the tile progresses, partial filling or blinding shall be made at the sides of the trench sufficient to hold the tiles securely in place. The Contractor shall place the remainder of the excavated material carefully when backfilling the trench. Any excess backfill material shall be mounded over the trench such that future settlement and compaction around the new tile can occur without creating a depression over the width of the trench. The Contractor shall not operate construction equipment over any backfilled trench, except as specified in Trench Crossings. Care shall be exercised in backfilling the trench to see that no stone or boulder capable of damaging the tile is used in the backfill material adjacent to the tile. In no case shall stones having a diameter greater than 150 mm be used in backfill material within 300 mm of the tile. The Contractor shall backfill any open tile trenches at the end of each working day except for inspection points as specified. The Contractor shall be entirely responsible for any damage to the new tile throughout the warranty period.

E.2.3.7 TRENCH CROSSINGS

The Contractor shall not cross any backfilled trench with any construction equipment or vehicles, except at only **ONE** designated crossing location on each property which shall be marked in an acceptable manner. The Contractor shall ensure that the bedding and backfill material at this designated crossing location is properly placed and compacted so as to adequately support the equipment and vehicles that may cross the trench. The Contractor may undertake any other approved work to ensure the integrity of the tile at the crossing location. The Contractor shall insure that no equipment or vehicles are allowed to travel along the length of any trench. The Contractor shall be entirely responsible for any damage to the new tile throughout the warranty period.

E.2.3.8 OUTLET PROTECTION

The outlet end of a tile drain shall normally consist of a 6 m length of CSP or HDPE fitted with a rodent proof grating which is hinged at the top to allow the exit of foreign material from the tile. An outlet marker shall be supplied and installed.

Unless otherwise specified, the end of the CSP or HDPE shall be protected with the type of riprap on geotextile as specified by the Engineer from a point 500 mm above the ditch bottom on the opposite side of the ditch, across the ditch bottom, and for the full height of the ditch sideslope where the pipe is located. The minimum width of this riprap shall be equal to the outside diameter of the outlet pipe plus 2 m.

E.2.3.9 PRECAST CONCRETE STRUCTURES

Junction Box (JB) means an acceptable precast concrete structure installed and buried below the surface of the ground to facilitate two or more tiles meet and connect.

Catchbasin (CB) or **Ditch Inlet Catchbasin (DICB)** means an acceptable precast concrete structure installed at or slightly below the surface of the ground where two or more tiles meet and connect and that is intended to accommodate surface water.

Observation Box (OB) means an acceptable precast concrete structure installed above the surface of the ground where two or more tiles meet and connect and that is intended to only inspect the tile connected thereto.

Unless specified otherwise, JBs, CBs, DICBs and OBs shall be supplied by a precast manufacturer meeting the Engineer's approval. An "approximate elevation of top" of each structure has been indicated on the "Structures Table"; however, each structure shall be placed onsite such that the exact horizontal and vertical location in the field is as directed by the Engineer. All structures shall have a knock out, set at a minimum of 100 mm above the elevation of the outlet or as specified, placed in **all** sides not used by the municipal drain. Knock outs must be of a size capable of connecting a HDPE pipe with

a minimum inside diameter of 250 mm. All structures shall have a minimum 300 mm deep sump, unless specified otherwise.

Non-shrink grouting material, unless specified otherwise, shall be placed around all pipes connected to the structure. In addition, the exterior of all grouted connections shall be completely wrapped with geotextile (similar to a wrapped joint). Geotextile shall also be placed in the joints between all sections of the box and around the full perimeter of the box at these joints. For the area surrounding catchbasins, unless noted otherwise, the contractor shall supply and install a 300 mm thickness of 100 to 150 mm (R10) diameter quarry stone rip rap with filter cloth underlayment.

Hot dipped galvanized, heavy duty, three-sided protruding type bird cage grates, shall be supplied for all CBs, DICBs or OBs, unless specified otherwise. All DICBs shall have a slope of 2H:1V, unless specified otherwise. Grates shall be fastened to the structure using non-corrosive fasteners as recommended by the Ontario Farm Safety Association. JB's shall have no sump and shall have a minimum 150 mm thick solid reinforced concrete tops.

Post and sign type markers shall be supplied and installed at each at or above ground structure.

E.2.3.10 STRIPPING FOR DEEP TILE INSTALLATION

Where the tile installation depth exceeds the digging or plowing depth of the Contractor's equipment, the Contractor shall undertake any stripping that may be necessary in a manner such that when restored, the topsoil returns uncontaminated to the top of the stripped area. This would normally mean that the topsoil would be stripped and piled separately from the subsoil. The Contractor shall have regard for the working space provided for such stripping operations. Unless approved otherwise by the Engineer prior to work being undertaken, stripping shall be done using a hydraulic excavator. The cost of any stripping shall be included in the price provided for the tile installation.

E.2.3.11 STONE REMOVAL

The Contractor shall remove and dispose of any stones larger than 100 mm that remain on the surface of the working space after completion of construction.

E.2.4 SPECIFICATIONS FOR ROAD CROSSING (OPEN CUT METHOD)

E.2.4.1 GENERAL

When a drainage works crossing of a Road is to be carried out by the open cut method, the following specifications shall apply as well as OPSS 401 and 410. Under these specifications, the Contractor shall supply all labour, equipment and material unless specified otherwise in the Special Provisions.

E.2.4.2 EXCAVATED MATERIAL

All excavated material removed from the traveled portion of the road and 1.3 m or the full width of the gravel shoulder, whichever is greater, on each side of the traveled portion shall be disposed of off the site by the Contractor in a location approved by the Engineer or the Municipality. No excavated material shall be spread on the right-of-way without the written consent of the Engineer or the Municipality. The excavated material from a trench beyond a point 1.3 m from the traveled portion or beyond the outside edge of the gravel shoulder may be placed in the trench in the case of covered drains.

E.2.4.3 BEDDING

All pipes installed under these specifications shall be carefully bedded so as to ensure uniform bearing throughout its entire length.

Except where requiring concrete cradle or encasement, all pipes shall be bedded on granular fill as specified or as shown on the contract drawings. Bedding shall be hand placed, tamped and consolidated throughout. Granular fill and bedding shall be gravel or crushed stone having no particles over 20 mm in size, except where otherwise specified.

Concrete cradle and concrete encasement shall be placed as shown on the drawings, and the concrete shall be minimum 25 MPa.

E.2.4.4 BACKFILLING

The material and the method for backfilling the excavated area on the traveled portion of the right-of-way and for 1.3 m or the full shoulder width on each side shall conform to the following specifications, or as directed by the Engineer or Municipality.

From the top of the bedding material to a point 300 mm below the existing grade of the road, backfill material shall be clean pit run gravel meeting O.P.S.S. Granular "B" or approved equivalent. The material shall be placed in lifts not to exceed 300 mm in depth and all granular materials shall be compacted to 100 % SPMDD and all subsoil or previously excavated material to 95 % SPMDD.

The final 300 mm of the excavation shall be filled with clean crushed gravel conforming to O.P.S.S. Granular "A" specifications. The material shall be placed in lifts not exceeding 150 mm in depth and shall be thoroughly compacted to 100 % SPMDD.

E.2.4.5 PRECAST CONCRETE STRUCTURES

The type, location and the elevation of all structures in the right-of-way shall be as specified by the Engineer, and as indicated on the "Structures Table".

E.2.4.6 NOTICE

Before commencing work on any right-of-way, the Contractor shall furnish at least 7 days notice in writing to the Engineer and Road Authority having jurisdiction over said right-of-way. A copy of this notice shall also be sent to the Municipality's Drainage Engineer.

E.2.4.7 MAINTENANCE

The Contractor shall maintain the road surface at the road crossing until the Engineer or Road Authority has approved the work. Such maintenance shall include keeping the road surface free from pot-holes and the application of calcium chloride at the rate of two pounds per square meter to the finished surface for the entire width of the excavation.

The Contractor shall give the Engineer or Road Authority four days notice in writing that the work has been completed, and if the work has approved, the Contractor will no longer be responsible for maintenance of the said portion of the right-of-way.

E.2.4.8 PERMITS & TRAFFIC

The Contractor shall be responsible for providing the Road Authority at least 7 days notice in writing before commencing any work on any right-of-way. If the crossing is on a right-of-way that requires a Municipal or Provincial Permit, the Contractor shall ensure that the Permit is obtained before any work commences.

The Contractor shall be responsible for providing, erecting, maintaining and removing all signage and traffic control in accordance with the Ontario Traffic Manual (OTM) and the OTM Book 7 Temporary Conditions - Field Edition as noted in Document D of the Tender/Contract.

E.2.5 SPECIFICATIONS FOR ROAD CROSSING (BORING OR DIRECTIONALLY DRILLED METHOD)

E.2.5.1 GENERAL

When a drainage works crossing of a Road is to be carried out by the jacking and boring method, the following specifications shall apply as well as OPSS 416. The Contractor shall supply all labour, equipment and material unless specified otherwise in the Special Provisions.

E.2.5.2 PIPE MATERIAL

The pipe or casing used in the crossing shall be smoothwall welded steel pipe (SWWSP) with a minimum wall thickness as specified in the Special Provisions as per OPSS 1802. The pipe shall be of a sufficient length so that during placement no part of any excavation shall be closer to the edge of the gravel shoulder than 2 m and the slope of the excavation from the top to the bottom shall be 1 m vertical to 1 m horizontal (1:1).

E.2.5.3 EXTENSIONS

All extensions of the SWWSP installed via the jacking and boring shall be completed with SWWSP of identical diameter and wall thickness (either from structure to structure or to the limits of the right-of-way). Extensions of any other pipe material will not be acceptable. Pipe shall be placed on undisturbed native material with a minimum of 150 mm drainage stone bedding. Excavated material will not be permitted for use as bedding material.

E.2.5.4 INSTALLATION METHOD

The pipe or casing shall be placed by means of continuous flight augering inside the casing and simultaneous jacking to advance the casing immediately behind the tip of the auger. Complete augering of a tunnel slightly larger than the pipe and placing the entire length by pulling or jacking after completion of the tunnel WILL NOT BE ACCEPTABLE. Once a crossing is completed, the area around the outer annulus and any other openings from the jack and bore shall be grouted at the time of construction.

The Auger pit excavated to accommodate the boring machine shall be constructed such that the edge of the pit shall not be closer than 2 m to the edge of the gravel shoulder. The slope of the pit from the top edge at the shoulder to the bottom of the pit shall not be steeper than 1 m vertical to 1 m horizontal (1:1). Shoring, sheeting, etc. shall be in accordance with all governing regulations and Acts. The pit shall be left open for an absolute minimum length of time and if at all possible work should be so scheduled so that the excavation, placement of pipe and backfilling takes place in one working day.

During excavation, the existing topsoil shall be stripped and placed in a separate pile for replacement on top upon completion of the backfilling operation; a minimum of 150 mm of topsoil is required and if necessary, the Contractor shall and place imported topsoil. In either case, the topsoil area over the excavation shall be seeded with the specified grass seed mixture to the requirements of the Road Authority. The finished work shall be left in a clean and orderly condition slightly higher than the adjacent ground so that after settlement it will conform to the surrounding ground. Excess material shall NOT be spread on the road allowance or within the right-of-way without the express written consent of the Road Authority but shall be hauled away and disposed of at the expense of the Contractor.

E.2.5.5 PERMITS & TRAFFIC

The Contractor shall be responsible for providing the Road Authority at least 7 days notice in writing before commencing any work on any right-of-way. If the crossing is on a right-of-way that requires a Municipal or Provincial Permit, the Contractor shall ensure that the Permit is obtained before any work commences.

The Contractor shall be responsible for providing, erecting, maintaining and removing all signage and traffic control in accordance with the Ontario Traffic Manual (OTM) and the OTM Book 7 Temporary Conditions - Field Edition, as noted in Document D of the Tender/Contract.



Appendix F

Special Provisions

Appendix F – Special Provisions

Waite Municipal Drain

These ***Special Provisions*** are specific directions for this project and detail requirements not encompassed by the ***Appendix E Standard Drain Specifications***.

Special Provisions shall take precedence over the ***Standard Drain Specifications*** where a conflict between them may exist.

All work items do not necessarily have an associated Special Provision (SP); accordingly, for those items of the work that do NOT have a SP, please refer to the appropriate **Standard Drain Specification in Appendix E**.

1.0 Standard Drain Specifications

All work for this project shall also be governed by ***Appendix E - Standard Drain Specifications***. The Contractor is fully responsible for a reasonable and prudent review of these Standards to have a complete and clear understanding of the scope and character of the work.

2.0 Description & Location

The proposed drain is located in the City of Kawartha Lakes and services Lots 9 to 11, Concessions 5 & 6 in the geographic Township of Fenelon.

The Waite Municipal Drain has 3 proposed branches and includes channel construction and deepening, closed drain work, and includes road crossings. The location of the work is shown in the enclosed plan.

3.0 Agency Project Requirements

Regulatory agencies have provided best management practices and requirements towards the construction of this project which are summarized in Appendix G. These best management practices and requirements form part of this report and the subsequent contract for construction.

4.0 Instructions & Process

4.1 Pre-Construction Meeting

The Contractor **MUST** arrange an on-site Pre-Construction Meeting with the Engineer, Drainage Superintendent and affected landowners before any equipment or materials are moved onto the site and before any work is commenced on this project.

4.2 Notification of Work

The Contractor shall provide notification of the commencement or re-commencement of construction work to Burnside. Notification shall be a minimum ten (10) working days prior to the initiation of the work or a minimum five (5) working days prior to the re-commencement of the work.

Furthermore, the Contractor shall also provide notification of the commencement of in-water work to the DFO, Kawartha Region Conservation Authority (KRCA), or any other applicable agency(s) at least ten (10) working days prior to the initiation of the work.

The Contractor shall also provide notification to Enbridge Gas Distribution of the commencement of works near the high pressure pipeline within the Highway No. 35 right-of-way. This notice shall be given in accordance with the document entitled "*Third Party Requirements in the Vicinity of Natural Gas Facilities V3.1 2018*" (Enbridge Gas Distribution).

4.3 Working Space

The area being provided to the Contractor to undertake the work is described herein and on the drawing set. The location and maximum width of the working space is specified on the following table entitled '*Working Space*'.

Notes:

- All access shall be following the access route and/or drain alignment as shown on the accompanying drawing set.
- Where the swale and pipe alignment vary, a separate working space is given for each (ex. 20 m for the swale and another 20 m for the pipe, to be confirmed with the Contract Administrator).
- Excavation material shall be spread within the working space and excess shall be used on-site as possible or removed from the site by the Contractor.
- Additional width has been given in some locations to accommodate topsoil stripping and spoil leveling.
- Stockpiling of materials required for construction shall be limited to the working space provided. This width may be increased if warranted, by the Contract Administrator and at their sole discretion.
- Excess excavation material shall be spread a minimum 2 m away from the proposed channel or be disposed of at an offsite location arranged by the Contractor (if applicable) as directed by the Contract Administrator.
- Channel construction shall be along the specified channel bank or centered on the drain alignment unless otherwise noted.

<u>WORKING SPACE</u>					
Station	Drain Feature	Section Property	WS Width (m)	Access Route	Working Side
<u>Eastern Branch</u>					
-E0+181 to E0+002	CHANNEL & SWALE	<ul style="list-style-type: none"> G. Stewart property (Roll No. 010-365-00) COKL Rail Trail (Roll No. 63-000) 	10 m	<ul style="list-style-type: none"> AR#6 COKL Rail Trail 	<ul style="list-style-type: none"> Northern and western bank of channel.
E0+002 to E0+143	TILE & SWALE	<ul style="list-style-type: none"> B. Clive property (Roll No. 010-369-00) 	20 m (tile) 10 m (swale)	<ul style="list-style-type: none"> AR#7 	<ul style="list-style-type: none"> Tile: Centered on drain alignment. Swale: Northern and western bank.
E0+182 to E0+231	TILE	<ul style="list-style-type: none"> D. Gardner property (Roll No. 010-369-01) J. Waite property (Roll No. 010-368-00) 	20 m	<ul style="list-style-type: none"> AR#8 	<ul style="list-style-type: none"> Centered on drain alignment.
<u>Western Branch</u>					
-W0+138 to W0+000	CHANNEL	<ul style="list-style-type: none"> B. & K. Johnston property (Roll No. 010-214-02) 	10 m	<ul style="list-style-type: none"> AR#1 	<ul style="list-style-type: none"> Southern bank of channel.
W0+000 to W0+010	TILE	<ul style="list-style-type: none"> B. & K. Johnston property (Roll No. 010-214-02) 	20 m	<ul style="list-style-type: none"> AR#1 	<ul style="list-style-type: none"> Centered on drain alignment.
W0+010 to W0+160	TILE	<ul style="list-style-type: none"> C. Malcolm property (Roll No. 010-213-00) 	20 m	<ul style="list-style-type: none"> AR#1 	<ul style="list-style-type: none"> Centered on drain alignment.
W0+183 to W0+670	TILE	<ul style="list-style-type: none"> J. Waite property (Roll No. 010-368-00) 	20 m	<ul style="list-style-type: none"> AR#2 AR#3 	<ul style="list-style-type: none"> Centered on drain alignment.

<u>WORKING SPACE</u>					
<u>Southern Branch</u>					
S0+000 to S0+119	SWALE	<ul style="list-style-type: none"> B. & K. Johnston property (Roll No. 010-214-02) 	10 m (one bank)	<ul style="list-style-type: none"> AR#1 AR#5 	<ul style="list-style-type: none"> Northern and eastern bank of swale.
S0+119 to S0+239	SWALE	<ul style="list-style-type: none"> C. Malcolm property (Roll No. 010-213-00) 	10 m (one bank)	<ul style="list-style-type: none"> AR#1 AR#5 	<ul style="list-style-type: none"> Northern and eastern bank of swale.
S0+239 to S0+362	SWALE	<ul style="list-style-type: none"> F. Hack property (Roll No. 010-325-01, Property No. 14,) A. & K. Welch property (Roll No. 010-325-02, Property No. 15) 	10 m (one bank)	<ul style="list-style-type: none"> AR#1 AR#5 	<ul style="list-style-type: none"> Northern and eastern bank of swale.
S0+362 to S0+429	SWALE	<ul style="list-style-type: none"> T. & M. McConnell property (Roll No. 010-209-04, Property No. 12) D. MacDonald & L. King property (Roll No. 010-209-05, Property No. 13) 	10 m (both banks)	<ul style="list-style-type: none"> AR#5 	<ul style="list-style-type: none"> Northern and southern bank of swale.
Notes:					
<p>(1) The Contractor shall contain their construction operations to as narrow a width as possible, so as to prevent damage to lands, crops, bush, etcetera, and shall not exceed the widths indicated.</p>					
<p>(2) The Contractor shall be entirely responsible for any damage to lands, crops, etcetera, beyond the widths and locations of both the access routes and the working spaces specified, caused by the Contractor, their Subcontractors or their employees while undertaking the work.</p>					
<p>(3) The Engineer's approval MUST BE OBTAINED BEFORE exceeding the maximum widths indicated.</p>					

<u>WORKING SPACE</u>
(4) Access to the working space shall be public roads or as specified. All routes must be approved by the Engineer and Drainage Superintendent prior to construction.
(5) Allowances for the working space and access routes have been provided to the affected properties.
(6) The working space shall also be available for future maintenance of the drain.
(7) Although access has been provided on all properties along the drain, the Contractor shall limit their access to where it is required.

4.4 Access Routes

The access routes for construction shall be from public roads to the drain, as specified in the Table '*Working Space*' and on the accompanying drawing set. The Contractor shall confirm these access routes with the Contract Administrator, Drainage Superintendent, and affected landowners prior to commencing any work. The width of the access route(s) on each property shall be a maximum 6 m and any increase of this width shall be at the discretion of the Engineer.

Alternate access routes which may be the preference of the landowner and/or Contractor at the time of construction must be approved by the Contract Administrator prior to use.

4.5 Staging of Construction

This project must be staged in the following order of importance to comply with various requirements of the reviewing agencies and the Contract Administrator:

1. **Species at Risk (SAR)** – See summary in **Appendix G**
2. **Fisheries & Oceans Canada (DFO)** – See summary in **Appendix G**
3. The temporary sediment control structures, permanent sediment basins, and stilling basin shall be installed prior to any other drain construction.
4. All channel excavation and erosion protection shall be completed prior to any pipe construction at the discretion of the Contract Administrator.
5. Special attention shall be given by the Contractor to the seeding of all disturbed areas within the construction right-of-way. These areas shall have topsoil replaced

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and seeding provided as soon as possible following construction to encourage vegetation growth and avoid erosion and invasive species growth.

6. **Every effort shall be made by the Contractor to ensure hydroseeding application & timing is completed to maximize growth potential and minimize erosion on all surfaces to be seeded.**
7. All sections of the existing private drainage systems to be connected or destroyed shall be located by the Contractor at approx. 25 m spacing for the length of the existing drain prior to any other pipe construction.
8. Topsoil stripping shall be completed for the larger of the width of the excavator or excavation prior to pipe installation.

Additional Notes:

- The Contractor shall stage the construction to ensure that the site is left each day with appropriate controls to avoid erosion.
- Any excavated spoil areas shall be protected with silt fence or other measures to avoid erosion during construction, as directed by the Contract Administrator.
- All channel works shall be completed during periods of low or no flow.
- Additional erosion measures shall be paid for as extra items on an as directed basis and shall be considered deficient if not completed immediately.

4.6 Construction of the Work

Any issues during construction with respect to errors or omissions with the design drawings or documents, the constructability of the system, etc., must be brought to the attention of the Contract Administrator immediately. It is expected that a clear communication channel will exist between the Contractor and the Contract Administrator and that any discrepancies relating to the construction of the work will be remedied immediately. Work resulting from failure to seek clarification with the Contract Administrator by the Contractor will be the responsibility of the Contractor to remedy at no extra charge to the project and must be completed to the satisfaction of the Engineer prior to demobilization.

4.7 Liquidated Damages

In addition to GC 8.02.09.01 and supplemental general specifications C.2.3.27 of the Contract documents, any breach of the Contract terms by the Contractor may be subject to daily liquidated damages of \$500 at the discretion of the Contract Administrator.

Pertinent examples may include but are not limited to:

- Work outside of the timing windows stated in the Contract.

- Failure to install and/or maintain applicable erosion and sediment controls. This will apply at all times, including prior to and/or while completing other construction activities.
- Failure to reach substantial performance of the construction by the specified and agreed upon (contracted) date without just cause at the discretion of the Contract Administrator.

4.8 Final Inspection

After substantial completion of the work and prior to demobilization and removal of equipment and materials from the site, the Contractor MUST arrange an on-site FINAL inspection of the work with the Engineer. This is to ensure all aspects of the work have been satisfactorily completed and/or that arrangements have been made to expedite the completion of any outstanding minor items or deficiencies. Notification to the Engineer of this Final Inspection shall be provided at least 2 days prior.

4.9 Deficiencies

Deficient items, such as catchbasin markers, grate tabs, rodent grates, tile connections/re-connections, additional rip-rap, etc., shall be remedied by the Contractor during the warranty period and paid at the Contract price. If the Contractor fails to complete the work within a reasonable timeframe in the opinion of the Engineer and/or the Owner, the work shall be completed by a Contractor of the Engineer and Owner's choosing and the cost of the work deducted from the Contract holdback.

4.10 Warranty Period

A one (1) year warranty period (unless otherwise specified) shall apply to this project following substantial completion. **During the warranty period, the Contractor shall repair/replace any failed/failing contract items as determined by the Contract Administrator at no cost.**

Typical items may include but are not limited to:

- Cleanout of any accumulated sediment within the channel and/or sediment basins;
- Seeding or fill seeding of disturbed areas;
- Replacement of failed pipe sections/ blowouts;
- Repair to settlement and eroded areas;
- Etc.

5.0 Project Requirements & General Construction

5.1 On-Site and Excess Soil Management

Ontario regulation 406/19 of the Environmental Protection Act shall apply to all excess soil from the project work site. Coordination between the Contractor and Contractor Administrator is encouraged, however, it is the sole responsibility of the Contractor to ensure this regulation is applied.

5.2 Topsoil Stripping

All excavated topsoil shall be stockpiled separately from native subsoil and subsequently replaced over the completed excavation. This shall be included as part of the work under the appropriate item. An extra payment will **not** be made for this stripping, stockpiling and replacing of topsoil.

Excavated topsoil may be moved to another location at the request of the Contract Administrator and paid as an extra or at the request of the Contractor (subject to approval by the Contract Administrator) at no charge.

Channel Work: Unless specified otherwise, prior to completing work in the channel, the Contractor shall strip the existing topsoil from the proposed spoil levelling and channel area within the right-of-way.

Tile Installation: Unless specified otherwise, prior to installing the new tile, the Contractor shall strip the topsoil from the area of the proposed tile trench for the entire width of the wheel trencher/excavation (whichever is larger, typ. Average width of 6 m).

5.3 Soils

5.3.1 Soils Summary

The Ontario Soil Survey information found on OMAFRA's AgMaps website indicates that the predominant soil types within the watershed area are as follows:

- Otonabee Loam - A slightly stony soil with poor drainage and gently sloping topography.

Otonabee Loam is classified as HSG 'B':

- Located primarily in the Eastern Branch watershed.
- Soil types classified under HSG 'B' soils, typically sandier, have moderate infiltration rates with good drainage.

Solmesville Clay Loam as HSG 'C':

- Located primarily in the Western & Southern Branch watersheds.

- Soil types classified under HSG 'C' soils, typically more clays, have slow infiltration rates with imperfect drainage.

The drainage properties of the soil are discussed in **Appendix H**.

5.3.2 Subsoil Investigation

Adverse subsoil conditions were not indicated in the area near the proposed drain installation by the affected landowners; therefore, **no on-site soils investigation was undertaken as part of this project**. The Contractor shall tender all work described herein on the basis of typical soil conditions as described above.

An item for bedrock investigation prior to construction has been included in the cost estimate.

5.4 Pipe Installation

5.4.1 Pipe Material

All pipe material shall be as per **Section 2.3.1 of the General Specifications**, unless otherwise specified.

Plastic Drainage Tubing (PDT) (Section E.2.3.1)

All PDT installed under these specifications shall be manufactured in accordance with the latest revision of the Drainage Guide for Ontario, as published by the Ministry of Agriculture, Food, and Rural Affairs.

All PDT shall be single wall drainage tubing (Ideal Pipe - HDPE drainage tubing or approved equal) and have a minimum pipe stiffness of 210 kPa and shall be solid pipe.

5.4.2 Primary Method

The installation of all new pipe shall be by wheel trencher unless specified otherwise. Installation by excavator on stone bedding is also acceptable and detailed below.

5.4.3 Alternative Method

Alternatively, and only if specified in the Bid by the Contractor, pipe specified to be installed by wheel trencher may be installed by excavator with a minimum depth of 150 mm of 19 mm dia. clear crushed stone (or approved equal). This stone shall be used to achieve pipe gradient and be used as backfill up to the springline of the pipe. Select native material shall be used for backfilling of the pipe trench to grade unless specified otherwise. No extra payment shall be made per item when the Contractor specifies this method at the time of bidding.

5.5 Stone Removal and Machine Downtime

Applies to the following:

- Bids to install CDT or HDPE (320 kPa) (or approved equal) with a **wheel trencher** only.
- Bids to install PDT (or approved equal) with a **drainage plow** only.
- Bids for other installation methods (applies at the discretion of the Contract Administrator).

General: When large boulders or stony areas force the removal of the specified install method(s) (**for example: wheel trencher**) from the trench for cleanout and stone removal prior to recommencing with the wheel trencher, the Contractor shall be paid a fixed sum as a contingency for each time this takes place between periods of **continuous** wheel trenching.

For the unit bid price per occurrence, the Contractor shall specify the cost for the removal of the wheel trencher as a result of large stones and/or poor soil conditions, as required for continued pipe installation with the wheel trencher. This cost shall include the time to complete the transition and the downtime for the working crew during the transition.

The Contractor **shall** keep a detailed list and time of each instance and review each pullout of the trencher with the Contract Administrator at the end of each working day, followed by a weekly email summary. Stones or obstructions causing the wheel trencher removal shall be kept to the side of the trench as evidence for the Contract Administrator for the wheel removal.

Pullouts of the trencher without sufficient evidence from the Contractor **shall not** be paid under this item at the discretion of the Contract Administrator.

Note: In cases where the wheel trencher is removed to immediately switch to a special installation technique, the contingency for stone removal will not apply. Under this scenario, the additional contingency payment for the applicable alternate installation method will be applicable only.

5.6 Special Installation Techniques (Poor Installation Conditions)

Applies to the following:

- Bids to install CDT or HDPE (320 kPa) (or approved equal) with a **wheel trencher** only.
- Bids to install PDT (or approved equal) with a **drainage plow** only.
- Bids for other installation methods (applies at the discretion of the Contract Administrator).

General: If stony conditions (Option 'A') or high water table (Option 'B') are encountered during construction where, in the opinion of the Contractor, it is not feasible to use the specified install method(s), the Contractor shall immediately inform the Contract Administrator to obtain approval to switch to:

- A) Stony Conditions:** Installation on a minimum depth of 150 mm of 19 mm dia. clear crushed stone (or approved equal) **(to be installed by excavator)**.
- B) High Water Table:** Installation on a minimum depth of 300 mm of geotextile wrapped 19 mm dia. clear crushed stone (or approved equal) **(to be installed by excavator)**.

For the **additional** unit price bid per linear metre of trench, the Contractor shall install the pipe with a hydraulic excavator instead of a wheel trencher, and as called for in the Schedule of Unit Prices from the options listed above and per the details in the accompanying drawings.

The Contractor shall then be paid the line item associated with this section (i.e., S&I of pipe by wheel trencher) and the additional installation cost specified under this associated contingency item.

The Contractor shall note that the wrapping of tile joints still applies under original items. The installation shall be in accordance with the details provided in the accompanying drawings unless alternatively directed by the Contract Administrator.

The cost to supply all associated materials (i.e., 19 mm dia. clear crushed stone, geotextile, etc.) shall be included as part of the Contractors bid in this line item.

Installation: The Contractor must receive approval from the Contract Administrator prior to using this technique. The Contractor shall keep a list of stations where these installation techniques were used, to be confirmed with the Contract Administrator daily and shall submit a weekly summary via email to the Contract Administrator.

This item shall be used only when the soil conditions encountered are such that a wheel trencher cannot, in the opinion of the Contract Administrator, be used effectively to install the pipe. When soil conditions are again favourable in the opinion of the Contractor and the Contract Administrator, the specified install method(s) must again be used for tile installation as soon as possible. Failure to use the specified install method(s) for installation when soil conditions are favourable in the opinion of the Contract Administrator may result in non-payment of this contingency item.

In instances where the installation method specified on-site by the Contract Administrator exceeds the cost of the contingency methods bid, the Contractor shall

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provide unit pricing for the additional cost to the Contract Administrator within one (1) working day.

Note: All costs associated with the removal of the specified install method(s) (for example: wheel trencher) due to large stones, stony and/or poor soil conditions, as required for continued pipe installation with the wheel trencher or as required for pipe installation with an excavator shall be included in the associated bid or contingency items. All costs are to be included in the associated contingency costs as bid and no extra payment will be made for the removal of the specified install method(s) (for example: wheel trencher), crew downtime, or other costs for this transition.

5.7 Existing Drainage Systems

5.7.1 Existing Municipal Drain

There are no known municipal drains within the project watershed.

5.7.2 Private Drainage Systems

The Contractor is advised that at the time of submission of this report, random drainage systems were located in the area of installation for the proposed drainage system.

The location of existing private drainage systems shall be discussed at the Pre-Construction meeting and existing systems affected by the proposed drainage system shall be located by the Contractor and reviewed with the Contract Administrator and affected landowners prior to construction.

5.8 Utilities Investigation

A utilities investigation was undertaken during the design stage. The following utilities were located near the area of the proposed drain:

Highway 35 R.O.W.:

- The Contractor shall coordinate the location of the high-pressure natural gas pipeline within the Hwy. 35 right-of-way in accordance with the document entitled Third Party Requirements in the Vicinity of Natural Gas Facilities V3.1 2018 (Enbridge Gas Distribution).

All utilities shall be located by the Contractor prior to the construction of the proposed drain and utilities may require staff on-site during construction.

All costs shall be included in the associated item for accommodation of utility requests or requirements. Specific equipment, such as daylighting with a hydro-vacuum, shall be paid for as an extra item or contingency as contracted, unless previously included in the item.

5.9 Appurtenances

The following general conditions and requirements apply to this project:

5.9.1 General

- Install, maintain and remove any **temporary sediment control measures** as specified and/or directed by the Contract Administrator, Drainage Superintendent or the Conservation Authority.
- Spreading and levelling of **excavated material**, or disposal of all waste material off-site as directed by the Contract Administrator.
- **Restoration** and rehabilitation of all areas disturbed by the contractor to pre-construction conditions or better.
- Supply and place a minimum of 1.0 m width of **rip-rap** and geotextile on all sides of all catchbasins.
- All catchbasin and structure connections shall be **parged** with non-shrink hydraulic grout on both the interior and exterior of the structure.
- The cost of any **structure connection** shall be included in the bid price, including existing and proposed connections as detailed for existing and proposed municipal drains. Existing private drainage connections to structures shall also be connected to the new structure and included in this price.

5.9.2 Channel Work:

- **A maximum of 300 mm depth of spoil shall be allowed in the ROW**, in addition to topsoil stripping and replacement, except where low-runs enter the channel and these areas must be maintained to the satisfaction of the Contract Administrator.
- Excess excavated subsoil from the channel excavation shall be loaded and trucked to the designated fill areas (per landowner requests and within the watershed), subject to the approval of the Contract Administrator at the time of construction and paid for as an extra item. Any material required to be removed from the watershed shall be approved by the Contract Administrator and paid as an extra item.
- All in-water work for structure installations shall be in accordance with the accompanying DFO best management practice for culvert installations.

5.10 Rehabilitation and Seeding

All disturbed areas shall be restored to their prior condition or better in the opinion of the Owner and the Contract Administrator unless detailed under another section of these specifications. All work shall be in accordance with OPSS 804 – Construction Specification for Seed and Cover.

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Hydroseeding is required on all disturbed surfaces following construction unless specified otherwise. Hand seeding for small areas is at the discretion of the Contract Administrator.

Rehabilitation of disturbed areas shall typically include seeding with the following OPSS (MTO) Standard Roadside Seed Mix, consisting of:

- 55% Creeping Red Fescue.
- 27% Kentucky Bluegrass.
- 15% Perennial Ryegrass.
- 3% White Clover, at an application rate of 100 kg/10,000 m².

In addition:

- A nurse crop of Fall Rye Grain or Winter Wheat Grain at an application rate of 60 kg/10,000 m².

The Contractor shall place a minimum 150 mm of native topsoil (or screened topsoil as directed where native topsoil is not available) to seed all disturbed areas.

Sufficient growth must be approved by the Contract Administrator prior to payment of the associated item.

5.11 Erosion Protection

All erosion protection shall be as described below unless specified otherwise.

All quarry stone rip-rap (angular) shall be OPSS R-50 quarry stone rip-rap (OPSS MUNI 1004):

- **D₅₀ = 210 mm dia.**
- **D₁₀₀ = 305 mm dia.**
- **450 mm depth c/w geotextile underlay.**

All rounded riverstone:

- **D₅₀ = 300 mm dia.**
- **D₁₀₀ = 600 mm dia.**
- **750 mm depth.**

Riverstone shall be used for the in-water portion of the work and rip-rap shall be used as bank protection. The larger rocks shall be keyed in as anchor stones at the base of the channel for protection of the structure, as directed by the Engineer.

5.12 Damaged Private Tiles

5.12.1 Open Drains

The replacement of damaged or poorly functioning tile outlets encountered during the installation of the drain **will be included as part of the construction costs and paid as a contingency item**, and protected against erosion with rip-rap, as approved by the Contract Administrator.

In addition, if erosion is noted on channel banks due to water entering from adjacent fields, the bank shall be protected with the installation of rip-rap as part of the proposed work as directed by the Contract Administrator. These repairs shall be completed at the time of construction of the proposed drain and shall be completed as specified for replacement outlet pipes and paid for as a contingency or extra item as contracted.

5.12.2 Closed Drains

The connection and reconnection of existing tiles encountered during the installation of the drain will be included as part of the construction costs and paid as a contingency item.

Where feasible, all tiles shall be reconnected over top of the drain. However, direct connections may be allowed due to the elevation of the existing tile, as approved by the engineer. These direct connections will be completed at the time of the construction of the proposed drain and shall be completed as specified for future connections in this report.

5.13 Directional Berms

Directional Berms shall be installed with all catchbasins where specified. Typical directional berm height shall be 500 mm, top width of 300 mm, sideslopes of 1.5H:1V and length of 10 m, to the satisfaction of the Contract Administrator.

The catchbasin rip-rap shall extend to form a small spillway over the directional berm (per the accompanying detail). Directional berms shall be constructed of material containing suitable clay content to allow for direction of overland flow to catchbasins and are intended for minor ponding only.

5.14 Parging of Structure Connections

In addition to Section E.2.3.9 of the General Specifications, all structure connections shall be parged with non-shrink grout on the interior and exterior of the structure to the satisfaction of the Contract Administrator.

6.0 Description of Work

The specifications for items as listed here are in addition to and supplement those described in the Estimate of the Cost of Work (Appendix B) and the Standard Drain Specifications (Appendix E).

The numbering of each item may reference the corresponding item in the Estimate of the Cost of Work, however some items apply generally and/or to specific stationing listed with the item.

Items referenced in these Special Provisions typically require unique instructions in addition to the Standard Drain Specifications and will not necessarily cover each item listed in the Estimate of the Costs of Work. Each Item shall be bid as a lump sum price unless otherwise noted.

The staging of construction activities has been outlined above in Section 4.5 and must be followed by the Contractor.

Additional information for the items below may be found above of in the general specifications.

The quantities provided are approximate values intended to aid the Contractor during bidding and for reference only. The Contractor is required to determine final quantities prior to bidding. No extra payment will be made for discrepancies at the discretion of the Contract Administrator.

These specifications apply to (not necessarily limited to) the following sections:

SECTION W – Western Branch

SECTION S – Southern Branch

SECTION E – Eastern Branch

For the lump sum price bid, unless otherwise noted, the Contractor shall provide the following items:

SP00. Mobilization and De-Mobilization

This item covers the Contractor costs associated with the transportation and/or accommodation (meals and lodging) of labour, equipment, offices, conveniences, temporary facilities, construction plant and other items not required to form part of the permanent works and not covered by other items in the Schedule of Unit Prices. This line item shall only apply to the primary mobilization and demobilization (one mobilization and one de-mobilization) required to fulfill the Contract.

Payment at the Lump Sum price set out in the schedule of unit prices for mobilization and demobilization will be made as follows:

- 50% payable on first Payment Certificate
- 50% payable on Substantial performance Payment Certificate.

Additional mobilization costs will not be paid if the Contractor chooses to leave the site on their own accord following the initial mobilization. However, if at the discretion of the Contract Administrator a situation warrants the Contractor to demobilize from site to complete the remainder of the work at a later date, the costs associated with this may be negotiated with the Contract Administrator and paid as an extra item.

SP0. Seeding

All work shall be per Section 5.9 – Rehabilitation and Seeding and in accordance with OPSS.MUNI.804 – Construction Specification for Seed and Cover to the satisfaction of the Contract Administrator.

Location: Hydroseeding is required on all disturbed channel banks and the engineered berm. Hand seeding may be used in all other areas.

Channel Banks: All excavated channel banks may be hydroseeded without topsoil for ease of application.

Buffers: All buffers disturbed by construction works shall have topsoil spread over disturbed areas prior to seeding

Application: Hydroseeding shall be applied to all disturbed areas on the excavated channel banks, including a minimum 1 m width at grade on the channel bank.

Seed Mixture: All seeding work shall include an approved grass mix and matrix, including a nurse crop of annual rye grass as specified. These areas shall be seeded with OPSS (MTO) Standard Roadside Mix and a certificate of seed analysis shall be provided to and approved by the Contract Administrator prior to being applied.

SP1. Clearing and Grubbing

Location: Clearing and grubbing shall only be completed as required to facilitate the construction of the drainage system. Work shall also be completed in accordance with the General Specifications in Appendix E.

Any trees within the provided working space ROW which the Contractor requires shall be cleared and grubbed to allow for the construction of the proposed drain. In location where the width of the working ROW shall be minimized as possible, the brushing width shall also be minimized.

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SAR Timing Windows: As described above, all work must be in accordance with the agency requirements as decided in this appendix.

Clearing/Brushing: Trees measuring 150 mm dia. or more shall be felled, delimbed, cut into lengths no longer than 4 m, and stacked within the working space ROW to the satisfaction of the Contract Administrator.

Vegetation under 150 mm dia. shall be finished by the Contractor using one of the following three methods:

- Chipped in place by an excavator equipped with a hydraulic brushing attachment.
- Chipped using a woodchipper and piled or spread within the bush ROW.
- Piled and burned in accordance with the Municipality's burning regulations and by-law(s).

The method preferred by the Contractor shall be discussed at the preconstruction meeting and shall be at the discretion of and completed to the satisfaction of the Owner and Contract Administrator.

Grubbing: Tree stumps, boulders, and other vegetative debris shall be grubbed and removed from site to the satisfaction of the Contract Administrator. Burying of grubbed materials shall not be permitted unless permission is given to the Contract Administrator by the landowner.

SP2. Supply and Install T-Bars and Buffer Signage

Steel T-bars (or approved equal) shall be installed approximately every 200 m and/or on property lines as directed by the Contract Administrator along the length of the open drain, delineating the 3 m buffer offset from the top of the channel bank. The bars shall each be painted in fluorescent orange (or approved equal) and shall extend a minimum of 1.2 m vertically when installed.

Additionally, aluminum signage approximately 300 mm x 300 mm indicating the buffer limit shall be attached to the t-bar (or approved equal) as detailed.

SP3. Sediment Control Structures

Location: Temporary sediment control structures shall be constructed at the downstream end of the proposed work and the pipe outlet stilling basin as detailed.

Sediment Control Structure: The sediment control structure shall be constructed using three (3) lengths of 300 mm dia. woodchip sediment control socks (FILTREXX SILTSOXX treated for Phosphorus and Nitrogen removal or approved equal) and anchored into each side bank and the channel bottom to control channel baseflows. The socks shall be spaced **approximately 4.0 m** apart from one another, to allow for accumulated sediment cleanout with an excavator.

OPSS R-50 rip-rap shall be used to create check dams at each sock and to additionally anchor the socks (see accompanying drawing detail). Construction shall be to the satisfaction of the Contract Administrator and the Drainage Superintendent.

The sediment control structure shall be left in place for a period of one (1) year following the construction of the drain and after that time, the bio-filters and accumulated sediment shall be removed, and the rip-rap formed into a shallow riffle structure by the Contractor.

In addition to the warranty holdback, an additional \$500 shall be held for the structure until it has been removed. If removal does not occur in an acceptable timeframe, as determined by the Engineer, another Contractor shall be retained to complete the work using this holdback.

SP4. Permanent Sediment Basins

Location: Permanent sediment basins (approximately 600 mm bottom width, and 600 mm deep) shall be constructed as detailed within the proposed channel. The length of the sediment basins shall be as per the drawing set.

Erosion Protection: Rounded riverstone shall be installed at each end of the sediment basin as detailed in the drawing set to mark the basin location for future maintenance.

Maintenance: When necessary, during and at the completion of the project and/or when instructed by the Contract Administrator, the Contractor shall remove and spread any accumulated sediment within the working ROW.

The dug sediment basin shall be left in place permanently following the construction of the drain and thereafter shall be maintained by the Drainage Superintendent.

SP5. Channel Deepening & Widening

Location: All required work for the channel construction shall take place within the specified working space.

Channel Dimensions: The channel dimensions shall match those provided in the drawing set for bottom width, minimum depth, and side slopes to the satisfaction of the Contract Administrator and to match the proposed design grades.

Excavation and Spoil Levelling: Where possible and as directed by the Contract Administrator, channel deepening shall commence at the toe of the slope of the far channel bank where the bank slope is carried to the channel bottom elevation. Excavation will be completed in the channel bottom, (the shelf of the two-stage channel will be excavated on the near channel bank, where required) and vegetation on the far channel bank shall remain in place.

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The topsoil from the spoil placement area shall first be stripped and spread back over the spoil within the working ROW.

Spreading and levelling of spoil shall be completed within the working ROW to a maximum depth of 150 mm in cropped agricultural areas and 300 mm in bush areas, however the spoil shall not be spread within 2 m from the top of the ditch bank.

The spoil shall then be seeded with an approved grass seed mixture (or approved equal). Spoil may be moved from one section of the ROW to another for spreading subject to approval by the Contract Administrator.

If during construction there is excavated subsoil material deemed unsuitable by the Contract Administrator for spreading in the ROW, it shall be loaded and trucked off-site by the Contractor for disposal (other options may also be approved by the Contract Administrator) and paid for at an additional cost or contingency as contracted.

SP6. Swale Construction

Location: All required work for the channel construction shall take place within the specified working space.

Swale Dimensions: The channel dimensions shall be as required to meet the minimum depth, and side slopes to the satisfaction of the Contract Administrator and to match the proposed design grades.

In areas where berming of the swale banks is required, the berm dimensions shall be listed and detailed in the drawing set.

Excavation and Spoil Levelling: The topsoil from the spoil placement area shall first be stripped and spread back over the spoil within the working ROW.

Spreading and levelling of subsoil shall be completed within the working ROW to a maximum depth of 300 mm in bush areas and 150 mm in all other areas.

The reset topsoil shall then be hydroseeded with an approved grass seed mixture (or approved equal). Spoil may be moved from one section of the ROW to another for spreading subject to approval by the Contract Administrator.

If during construction there is excavated subsoil material deemed unsuitable by the Contract Administrator for spreading in the ROW, it shall be loaded and trucked off-site by the Contractor for disposal (other options are subject to approval by the Contract Administrator) and paid for at an additional cost or contingency as contracted.

SP7. Permanent Stilling Basin

Location: A permanent stilling basin (as detailed) shall be constructed as detailed within the existing channel at the outlet of the proposed municipal tile.

Riverstone shall be used for the in-water portion of the work and rip-rap shall be used as bank protection. The larger rocks shall be keyed in as anchor stones at the base of the channel for protection of the structure, as directed by the Engineer.

Maintenance: When necessary, during and at the completion of the project and/or when instructed by the Contract Administrator, the Contractor shall remove and spread any accumulated sediment within the working ROW.

SP8. HDPE Outlet Pipes

(Sta. E0+002), (Sta. W0+115)

Location: The HDPE pipes shall outlet to the stilling basin.

Material: All HDPE pipe shall be solid, bell & spigot, dual-wall pipe (320 kPa stiffness) per section E.2.3.1 of the general specifications.

Installation: The pipes shall be installed by excavator on a minimum 150 mm depth of 19 mm (3/4 inch) dia. clear crushed stone bedding. In addition, 19 mm (3/4 inch) dia. clear crushed stone shall be used to backfill the installation trench up to the pipe springline to the satisfaction of the Contract Administrator as per the accompanying details. A rodent grate shall be installed on the outlet pipes.

Existing Outlet(s): Approximately 6 m of the existing outlet pipe(s) will be excavated, removed, and disposed of. The existing tile shall be installed into the bell end of the new outlet pipe, and shall be wrapped with a minimum 0.6 m width of geotextile (Terrafix 200R or equivalent).

New Outlet: The new outlet pipe will be joined with the HDPE pipe, and the joint with the two pipes shall be wrapped with a minimum 0.6 m width of geotextile (Terrafix 200R or equivalent).

SP9. Additional Soil Stripping

(Sta. E0+213 to E0+000)

Additional native subsoil stripping shall be completed as required to allow for tile installation with the wheel trencher (Where applicable). The subsoil stripping work is in addition to the topsoil stripping completed per section 5.1 of these specifications. Stripping shall be completed for the width of the wheel trencher, with side slopes

appropriate to local soil conditions. All excavated subsoil shall be stockpiled within the working area and shall be replaced over the trench prior to spreading of topsoil. The excavated subsoil shall be stockpiled separately from stripped topsoil.

SP10. Highway No. 35 Crossing

Sta. E0+143 to E0+182

All work shall be in accordance with OPSS.PROV 415 – Construction Specification for Pipeline Installation by Tunnelling. Additional requirements by MTO shall form part of this contract.

The Highway 35 crossing shall be completed by the boring (microtunnelling) method. The road crossing shall be completed within one (1) working day. All work shall be in accordance with the Encroachment Permit issued by the Ministry of Transportation for any works associated with the road crossing. All work within the right-of-way shall be done in accordance with the Encroachment Permit.

The location of the bore pit shall be discussed with the Contractor at the pre-construction meeting. Topsoil shall be stripped for the entire area of the bore pit, including a 1 m setback and stockpiled. The topsoil shall be redistributed over the backfilled pit following construction. Also, any existing tile connections in the bore pit shall be reconnected or connected to the new drain at the discretion of the Contract Administrator and shall be installed on a base of 19 mm (3/4 inch) dia. crushed clear stone on native ground along the entire length of the connection.

The Contractor shall review the associated geotechnical report which has been included as part of the tender package.

Note: Any settlement or impact caused to the road shall be the sole responsibility of the Contractor, per the Standard Drain Specifications (Appendix E). Any voids surrounding the pipe shall be filled with grout by the Contractor during construction and/or within a reasonable timeframe of notification by the Owner and shall be included with the cost of this line item. The Owner of the Road right-of-way shall be contacted by the Contractor regarding any issues pertaining to the pipe installation on their property, prior to leaving the site. Issues shall be remedied to the satisfaction of the Engineer and the Owner.

MTO contact information to be added when confirmed at tendering.

SP11. Offset Catchbasin

(Sta. E0+143)

Location: The location of the inlets shall be near the road toe of slopes at the designated stations, as detailed in the drawing set.

Material: 600 mm X 600 mm offset concrete ditch inlet catchbasins as detailed in the drawing set.

Installation: A DICB shall be installed at the specified low point and elevation, as per the accompanying details, approximately 6 m offset from the proposed catchbasin as directed by the Contract Administrator. OPSS R-50 quarry stone rip-rap shall be installed around the DICB to act as an inlet filter to the satisfaction of the Contract Administrator.

The slope of the catchbasin lead pipe shall be a minimum of 0.1%.

SP12. Location and Excavation of Gas Main

(Sta. E0+175)

All construction activities in the vicinity of the 150 mm diameter gas pipeline within the Hwy. 35 right-of-way shall be completed with a representative from Enbridge Gas Distribution present on-site. All construction shall be done in accordance with document entitled Third Party Requirements in the Vicinity of Natural Gas Facilities V3.1 2018 (Enbridge Gas Distribution).

Prior to the commencement of any construction works within 3 m of the 150 mm dia. natural gas main, the main shall be exposed in the location of the work to ensure no contact is made with the gas main.

One (1) location and daylighting is required at the location of the proposed crossing. Additional exposures of the main may be required by the Enbridge representative, and these shall be paid as an extra.

According to the current geotechnical foundation report for this crossing, the depth of the gas main was drilled in bedrock. All exposed locations of the gas main shall be backfilled with a 300 mm envelope of sand to the satisfaction of the Enbridge representative.

In addition to section 8 of the third party requirements, Enbridge staff also require a peak particle velocity vibration level of 50 mm/s during microtunnelling.

Additional requirements by Enbridge Staff shall form part of this contract.

Enbridge contact information to be added when confirmed at tendering.

SP13. Cameron Road Crossing

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The Cameron Road crossing shall be completed by the boring (Jack and Bore) method. The road crossing shall be completed within one (1) working day. An approved traffic management plan shall be prepared and submitted to the City of Kawartha Lakes by the Contractor with respect to the road crossing activity.

The location of the bore pit shall be discussed with the Contractor at the pre-construction meeting. Topsoil shall be stripped for the entire area of the bore pit, including a 1 m setback and stockpiled. The topsoil shall be redistributed over the backfilled pit following construction. Also, any existing tile connections in the bore pit shall be reconnected or connected to the new drain at the discretion of the Contract Administrator and shall be installed on a base of 19 mm (3/4 inch) dia. crushed clear stone on native ground along the entire length of the connection.

Note: Any settlement or impact caused to the road shall be the sole responsibility of the Contractor, per the Standard Drain Specifications (Appendix E). Any voids surrounding the pipe shall be filled with grout by the Contractor during construction and/or within a reasonable timeframe of notification by the Owner and shall be included with the cost of this line item. The Owner of the Road right-of-way shall be contacted by the Contractor regarding any issues pertaining to the pipe installation on their property, prior to leaving the site. Issues shall be remedied to the satisfaction of the Engineer and the Owner.

Road Authority contact information to be added when confirmed at tendering.

SP14. Grouting of Existing Road Crossings

Existing subsurface crossings that cannot be destroyed shall be completely filled with grout at the noted locations to the satisfaction of the Contract Administrator. As per OPSS.MUNI 510 concrete used to fill abandoned pipe shall be as per OPSS 1350 with a minimum specified 28-day compressive strength of 15 MPa.

Note: Any settlement or impact caused to the road as a result of deficiencies with the grouting of the existing crossings shall be the sole responsibility of the Contractor.

SECTION C – Contingency Items

This section covers work that may be required for this project. These items shall apply only as and when approved by the Contract Administrator.

C1. Reconnection and/or Connection of Existing Tiles

(Standard Drain Specifications - Sections E.2.3.4 and E.2.3.5)

General: The unit price bid for these items shall include all labour, equipment, and material required to reconnect/connect existing private tile drains encountered during construction to the drain.

Missed connections and/or reconnections during construction shall be completed by the Contractor during the warranty period and paid at the contract price. If the Contractor fails to complete the connection and/or reconnection within a reasonable timeframe in the opinion of the Engineer and/or the Municipality, the work shall be completed by a Contractor of the Owner's choosing and the cost of the work deducted from the contract holdback.

Please refer to the Standard Drain Specifications (Sections E.2.3.4 and E.2.3.5) for additional information.

Reconnections: For the unit price bid the Contractor shall reconnect existing private tile drains encountered during construction across the trench to themselves, above the new tile. Included in this price shall be all labour, equipment, and material required to support the tile connection above the new drain.

Supporting material shall be either compacted granular backfill and/or 19 mm dia. clear crush stone bedding under the reconnection to native ground and a minimum of 150 mm backfill over top of the reconnection. Connection of the tile using appropriately sized solid HDPE dual-wall (320 kPa) pipe (or approved equal) across the trench as per the detail in the accompanying drawings.

Connections: Typically, existing private tiles encountered during construction will be connected to themselves per the detail in the accompanying drawings. In circumstances where, in the opinion of the Engineer, reconnection is not possible, private tiles may be connected to the new drain as noted and with the downstream side of the existing tile capped.

Installation shall include appropriately sized solid PDT or solid HDPE dual-wall (320 kPa) pipe (or approved equal), connected to the new pipe using a core drilled hole and manufactured HDPE coupler fitting, including pipe bedding under the connection to native ground and a minimum of 150 mm backfill over top of the connection with 19 mm dia. clear crushed stone per the accompanying detail. Connections directly into the new drain without the use of a coupler will not be permitted.

C2. a) Special Installation Techniques (Poor Installation Conditions)

Please see **Section 5.5** – Special Installation Techniques (Poor Trenching Conditions) for more information.

b) Stone Removal and Wheel Trencher Downtime

Please see **Section 5.4** – Stone Removal and Wheel Trencher Downtime for more information.

C3. R-50 Rip-Rap Erosion Protection (OPSS.MUNI.1004)

For the unit price bid per square metre, the Contractor shall supply and install a 450 mm thickness of R-50 quarry stone rip-rap with geotextile underlay.

These unit prices shall be used for payment for any OPSS R-50 rip-rap installed in addition to those quantities already specified in other items and for credit for any quantities of rip-rap deleted from other items. Additionally, this will include areas of existing channel bank where erosion or bank slumping has occurred, as directed on-site by the Contract Administrator.

C4. 19 mm dia. Clear Crushed Stone (OPSS MUNI 1004)

For the unit price bid per tonne, the Contractor shall supply 19 mm (3/4 inch) dia. clear crushed stone. These unit prices shall be used for payment for any 19 mm clear crushed stone installed in addition to those quantities already specified in other items and for credit for any quantities of 19 mm clear crushed stone deleted from other items. **The Contractor shall install the material to the satisfaction of the Contract Administrator.**

C5. Granular 'B' Material (OPSS MUNI 1010)

For the unit price bid per tonne, the Contractor shall supply OPSS Granular 'B' material. These unit prices shall be used for payment for any Granular 'B' material installed in addition to those quantities already specified in other items and for credit for any quantities of Granular 'B' deleted from other items. **The Contractor shall install the material to the satisfaction of the Contract Administrator.**

C6. Rounded Riverstone

For the unit price bid per m², the Contractor shall supply and install a 600 mm thickness of rounded riverstone.

- D₁₀₀ = 600 mm dia.
- D₅₀ = 300 mm dia.

These unit prices shall be used for payment for any riverstone installed in addition to those quantities already specified in other items and for credit for any quantities of riverstone deleted from other items.

C7. Imported Screened Topsoil

For the unit price bid per m², the Contractor shall supply and install a 150 mm depth of imported screened topsoil. This contingency shall be used for areas that are proposed to be hydroseeded where a 150 mm depth of topsoil cannot be salvaged from the native soils.

C8. Outlet Pipe Replacement

(Standard Drain Specifications - Sections E.2.2.5 and E.2.3.8)

For the unit price bid the Contractor shall replace the existing outlet pipe for private tile drains encountered during construction. Included in this price shall be all labour equipment and material required to support the replacement, consisting of compacted backfill or clear stone bedding and connection of the tile using a solid 4 m length of dual-wall HDPE pipe (320 kPa) (or approved equal) and including a rodent grate, as detailed.

The unit price bid for this item shall also include erosion protection on the banks and floor of the channel, with approximately 6 m² of OPSS R-50 quarry stone rip-rap (450 mm thickness complete with geotextile underlay) as detailed. The construction and installation of the outlet and erosion protection shall be to the satisfaction of the Contract Administrator.

Missed outlet pipes replacements during construction shall be completed by the Contractor during the warranty period and paid at the Contract price. If the Contractor fails to complete the replacement, connection and/or reconnection within a reasonable timeframe in the opinion of the Contract Administrator and/or the Owner, the work shall be completed by a Contractor of the Engineer's choosing and the cost of the work deducted from the Contract holdback.

Appendix G

Agency Correspondence

Appendix G

Agency Project Requirements and Documents

1.0 General

Regulatory agencies have provided best management practices and requirements towards the construction of this project which are summarized below. These best management practices and requirements form part of this report and the subsequent contract for construction.

2.0 Kawartha Region Conservation Authority (KRCA)

The KRCA has been apprised of the project throughout its progression including attendance at the on-site meeting, a site walkover, and follow up conference calls. During a phone call held on August 16, 2018 staff at KRCA indicated that their main concern pertained to sediment control during construction.

In response to the KRCA's comments, the following mitigation measures have been provided:

- In-water work shall be done under low flow or dry conditions;
- Installation of stilling basins at tile and closed drain outlets; and
- Installation and maintenance of sediment and erosion controls, i.e., silt-fence surrounding areas of loose excavated soil.

As indicated in the KRCA documents located in this Appendix, all work is to be in accordance with the terms of this permit.

3.0 Ministry of Environment, Conservation and Parks (MECP)

Species at Risk (SAR): A review of the Natural Heritage Information Centre (NHIC) mapping tool for species at risk in Ontario (SARO), under the Endangered Species Act (ESA) was conducted by Burnside.

An information request was submitted to the MNRF for review (see attached correspondence). MNRF indicated that their main concerns pertained to the historical presence of **snapping turtles (Special Concern)** within a 1 km radius of the area.

Several other species at risk were identified as being within a 5 km radius of the area. In response to these concerns the following general mitigation measures were suggested by the MNRF and will be incorporated:

- All existing culverts and structures will be checked for bird nests prior to the commencement of construction.
- All affected ponds and watercourses will be checked for turtles and snakes prior to construction.
- If the area of proposed works is determined to contain habitat for any affected Species at Risk, the appropriate timing windows as provided by the MNRF will be observed.

SAR Mitigation: Eastern Meadowlark

In response the following mitigation measures have been provided:

- Apply no work timing windows for all clearing and grubbing to avoid direct impacts to birds during the core bird breeding window (***Restricted from April 1 to September 15***).
- All disturbed soils within pasture areas are to be reinstated and seeded with Virginia Wild Rye (*Elymus virginicus*) post-construction.

The proposed works will occur primarily within active pastures and active agricultural fields that are primarily used for row crops.

- These agricultural fields will remain suitable for agricultural operation after the installation is complete, and therefore the proposed works should not impact potential breeding bird habitat, as vegetation will regenerate prior to the next breeding season. No temporary or permanent impacts to SAR are expected.

Tree Removal: All tree removal required for the work shall take place outside the applicable restricted timing window (***Restricted from April 1 to September 15***).

4.0 Fisheries & Oceans Canada (DFO)

A review of the DFO channel classification for the proposed municipal drain using the AgMaps mapping tool by OMAFRA was conducted by Burnside.

The proposed Fair Municipal Drain is currently unclassified by this mapping, meaning that it has not been classified recently and that DFO will likely require a site-specific review.

A request for review of the proposed works was submitted to DFO for review (DFO File Number 18-HCAA-01579) and comments were later received in a Letter of Advice. DFO indicated that their main concerns pertained to the potential release of sediment into watercourses that could disrupt fish habitat.

As indicated in the DFO Letter of Advice in this Appendix, all work is to be done in accordance with the terms in the Letter of Advice. Relevant mitigation measures are highlighted below and must be followed throughout the project:

- **All in-water work will be conducted outside the restricted timing window (no in-water work from March 15 to July 15);**
- All in-water work will be conducted in low or no flow conditions;
- Install stilling basins at tile outlets;
- Appropriate erosion and sediment control measures will be used during construction;

No Federal Species at Risk have been identified within this drainage area that would require special consideration under the Species at Risk Act (SARA).



Fisheries and Oceans
Canada

Pêches et Océans
Canada

Central and Arctic Region
Fisheries Protection Program
867 Lakeshore Road
Burlington, Ontario
L7S 1A1

Région centrale et de l'Arctique
Programme de protection des pêches
876 chemin Lakeshore
Burlington, Ontario
L7S 1A1

March 5, 2019

Your file *Votre référence*

Our file *Notre référence*
18-HCAA-01579

Mike Farquhar
City of Kawartha Lakes
26 Francis Street
Lindsay, ON K9V 5R8

Subject: Waite Municipal Drain Construction, Tributary to Sturgeon Lake, City of Kawartha Lakes– Implementation of Measures to Avoid and Mitigate Serious Harm to Fish

Dear Mike Farquhar:

The Fisheries Protection Program (the Program) of Fisheries and Oceans Canada (DFO) received your proposal on December 5, 2018. We understand that you propose to:

- Construct 3 new branches of municipal drain (Waite Municipal Drain);
- Install 681m of tile and excavate 125m of open channel in the Western Branch; and
- Install 94m of tile, excavate 93m of open channel, and deepen 88m of existing open channel in the Eastern Branch; and
- Excavate 237m of open channel in the Southern Branch.

Our review considered the following information:

- Request for Review form;
- Plan and Profiles document; and
- Photo Page document.

Your proposal has been reviewed to determine whether it is likely to result in serious harm to fish which is prohibited under subsection 35(1) of the *Fisheries Act* unless authorized. Your proposal has also been reviewed to determine whether it is likely to affect listed aquatic species at risk, any part of their critical habitat or the residences of their individuals in a manner which is prohibited under sections 32, 33 and subsection 58(1) of the *Species at Risk Act*, unless authorized.

To avoid and mitigate the potential for serious harm to fish as well as prohibited effects on listed aquatic species at risk, we recommend implementing the measures listed below:

- In-water work to occur outside of the restricted fisheries timing window (no in-water work March 15th to July 15th);

Canada

.../2

- Work under low flow or dry conditions;
- Install stilling basins at tile outlets; and
- Install and maintain sediment and erosion controls such that the release of sediment is avoided at the site.

Provided that you incorporate these measures into your plans, the Program is of the view that your proposal will not result in serious harm to fish or prohibited effects on listed aquatic species at risk. As such, an authorization under the *Fisheries Act* or a permit under the *Species at Risk Act* is not required.

Should your plans change or if you have omitted some information in your proposal, further review by the Program may be required. Consult our website (<http://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html>) or consult with a qualified environmental consultant to determine if further review may be necessary. It remains your responsibility to avoid causing serious harm to fish and avoid prohibited effects on listed aquatic species at risk, any part of their critical habitat or the residences of their individuals.

It is also your *Duty to Notify* DFO if you have caused, or are about to cause, serious harm to fish that are part of or support a commercial, recreational or Aboriginal fishery. Such notifications should be directed to <http://www.dfo-mpo.gc.ca/pnw-ppe/violation-infraction/index-eng.html>.

Please notify this office at least 10 days before starting your project. A copy of this letter should be kept on site while the work is in progress. It remains your responsibility to meet all other federal, territorial, provincial and municipal requirements that apply to your proposal.

If you have any questions with the content of this letter, please contact Amanda Conway at our Burlington office at 905-336-4588 or by email at Amanda.Conway@dfo-mpo.gc.ca. Please refer to the file number referenced above when corresponding with the Program.

Yours sincerely,



Sara Eddy
Team Leader Triage and Planning

CC: Amanda Conway – Fisheries and Oceans Canada

Paul Herlihey
City of Kawartha Lakes
12 Peel Street
Lindsay, ON K9V 3L8

**Regarding: Petition for Drainage Works – Waite Drain
 Lot 10, Concession 5 & 6 and Lot 9, Concession 5
 Geographic Township of Fenelon
 City of Kawartha Lakes**

Dear Mr. Herlihey:

On September 28, 2017, Kawartha Conservation received a Notice that the City of Kawartha Lakes Council had passed a resolution to proceed with the Petition for Drainage Works by Owner – Waite pursuant to Section 5(1)(b) of the Drainage Act, R.S.O. 1990 and that R. J. Burnside & Associates had been appointed to act as the Engineer of Record. Kawartha Conservation staff attended a meeting with the Engineer, applicant, and affected landowners on November 7th, 2017 and confirmed there are regulated areas within the project area. On December 10, 2017 Staff completed a site visit to the affected properties to review the regulated areas. Staff met again with the Engineer, the applicant, and City of Kawartha Lakes staff on December 14, 2017 at Westlake Court to review the location of the proposed outlet.

As noted in the November 7, 2017 meeting, Kawartha Conservation can confirm that portions of the project area are regulated under Ontario Regulation 182/06 (Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses), which is administered by Kawartha Conservation. This regulation incorporates areas such as river and stream valleys, unstable soil and bedrock, flooding and erosion hazards, watercourses, and wetlands plus an allowance associated with each feature.

A permit from this office is required prior to the commencement of any on-site works for any proposed development and/or site alteration within the regulated areas. Subsection 28(25) of the Conservation Authorities Act defines development as:

- (a) the construction, reconstruction, erection or placing of a building or structure of any kind,
- (b) any change to a building or structure that would have the effect of altering the use or potential use of the building or structure, increasing the size of the building or structure or increasing the number of dwelling units in the building or structure,
- (c) site grading, or
- (d) the temporary or permanent placing, dumping or removal of any material, originating on the site or elsewhere.

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The following regulated features/areas have been verified by staff within the overall project area (see Figure 1: Regulated Areas Map for a map of these areas):

A. Wetlands (#1, 3, 8, 9 on Figure 1)

- An unevaluated wetland greater than 2 hectares in size is present to the east of the rail trail (**#9 on Figure 1**). Development and/or site alteration proposed within this wetland or within 120 metres of this wetland and/or any activities that would interfere in any way with the wetland would be subject to Ontario Regulation 182/06 and a permit would be required.
- Several unevaluated wetlands less than 2 hectares in size are present within the project area, including:
 - One wetland area around a pond at 4196 Highway 35 (**#8 on Figure 1**)
 - One wetland at 9 & 10 Westlake Court and 65 Cameron Road along the drainage ditch that runs north-south (we recognize that at this point, this area is not proposed to be part of the drain but part of this area is a City-owned drainage easement that may request an outlet to the drain in the future) (**#3 on Figure 1**)
 - Wetlands are present along the west and north toe of the Cameron Rock Drumlin (also identified as a watercourse on our mapping) where the drain would likely outlet (**#1 on Figure 1**)

Development and/or site alteration proposed within these wetlands or within 30 metres of these wetlands and/or any activities that would interfere in any way with these wetlands would be subject to Ontario Regulation 182/06 and a permit would be required.

Applicable Wetland Policies

Municipal Drains and Drainage Ditches within Wetlands

Policy 4.6.2.1(11) New drainage works approved pursuant to the Drainage Act may be permitted within a wetland provided that it has or can be demonstrated to the satisfaction of KRCA through an Environmental Impact Study that appropriate best management practices and remedial measures will be employed to mitigate and/or compensate for wetland loss or interference with the natural features and hydrologic and ecological functions.

Ponds and Municipal Drains within the Area of Interference of a Wetland

Policy 4.6.2.2(13) New dug-out or isolated ponds* and new drainage works approved pursuant to the Drainage Act may be permitted within an area of interference provided that:

- it can be demonstrated through site review or an Environmental Impact Study that there will be no adverse impact on the hydrologic function of the wetland; and,
- best management practices will be employed to:
 - maintain water balance;



- control sediment and erosion; and,
- maintain or enhance a wetland buffer in accordance with **Policy 4.6.2(2)**.

B. Watercourses/Surface Water Features (#1, 2, 4, 7 on Figure 1)

- Staff have verified that several watercourses traverse through the project area, including:
 - Along the west side of the Cameron Rock Drumlin (#1 on Figure 1)
 - The watercourse/drainage ditch on 6 Westlake Court, 65 Cameron Road, and between 59 & 61 Cameron Road in the City's Drainage Easement (#2 on Figure 1)
 - The pond area at 95 Cameron Road (#4 on Figure 1)
 - 4175 Highway 35 before it drains into a culvert under Highway 35 (#7 on Figure 1)

Development and/or site alteration proposed within a watercourse valley as determined in accordance with Ontario Regulation 182/06 and/or any watercourse alterations (e.g. culvert installations, channel or bank modifications, bridge construction, etc.) would require a permit from this office prior to the commencement of any on-site works.

Applicable Watercourse Policies

Realignment, Channelization, or Straightening of Watercourses

Policy 4.7.2.4(1) Realignment, channelization and/or straightening of a river, creek, stream or watercourse is generally discouraged, but may be permitted in instances that: would improve hydraulic characteristics and fluvial processes including the facilitation of works approved pursuant to the Drainage Act; accommodate infill development; facilitate on-going operations associated with existing agricultural use; improve aquatic habitat or water quality; and/or facilitate public infrastructure projects (e.g., highway construction or reconstruction), provided that:

- all feasible alternative alignments have been considered through an approved Environmental Assessment, or through site-specific studies supported by KRCA, whichever is applicable based on the scale and scope of the project;
- watercourse functionality (e.g., water quality control, water conveyance, etc.) is maintained;
- there will be no adverse hydraulic or fluvial impacts on rivers, creeks, streams, watercourses or lakes. Engineered hydraulic analyses may be required, at the discretion of the Authority, to demonstrate that this condition has been met; and,
- natural channel design practices are followed to the maximum extent possible.

Enclosures of Watercourses

Policy 4.7.2.4(2) Enclosures of rivers, creeks, streams or watercourses are discouraged, but may be permitted where there is a risk to public safety and/or potential property damage and where a site specific study demonstrates that:

- all feasible options and methods have been explored to address the hazard(s);



- impacts on watercourse functionality (e.g., water quality control, water conveyance, etc.) are minimized and it can be demonstrated that best management practices including project design and appropriate remedial measures will mitigate and/or compensate for disturbance to features and functions; and,
- there is no negative impact on the downstream thermal regime.

C. Valley Lands (# 5, 6 on Figure 1)

- Staff completed site visits to the two valleys (#5 & 6 on Figure 1) during the winter months and concluded that these were valley lands. Kawartha Conservation regulates valley lands in accordance with the Conservation Authorities Act and O. Reg. 182/06. Due to the snow, staff would like to return in the spring months to review these two features to determine if they also meet the definition of watercourses and/or wetlands.

Development and/or site alteration proposed within a valley as determined in accordance with Ontario Regulation 182/06 would require a permit from this office prior to the commencement of any on-site works.

D. Permit Requirements

A permit is required from this office for any development and/or site alteration in verified regulated areas prior to the commencement of any on-site works. The following information requirements should be submitted to this office with any permit application:

- Completed and signed Standard Permit Application Form
- Copy of the Drainage Engineer's Report
- A Sediment and Erosion Control Plan that details all sediment/erosion control measure to be installed before and during construction as well as how the site will be stabilized after the works are complete
- Three hard copies of any drawings showing the proposed drainage works within the regulated areas
- Total volume of fill material (e.g. sand, soil, gravel, rock, etc.) required to be placed within the regulated areas and the source (company name, location)
- **Environmental Impact Study** – At this time, staff do not believe an Environmental Impact Study will be required as part of the permit application. The wetlands identified in the study area are not expected to be adversely affected by the proposed new Waite Drain (with the exception of #5 and 6 which have not yet been field verified to determine if they meet the definition of wetlands). However, we note that we have not yet reviewed any alternatives for the proposed new Waite Drain.
- **Potential Hearing Required** - For any proposed enclosures of existing watercourses, our policy only allows for enclosures where there is a demonstrated risk to public safety or the potential for property damage. At this early stage, we believe it unlikely that this can be demonstrated for any watercourses present in the project area. In the event that you cannot meet the current policy requirements, staff are unable to issue a permit. The applicant then has a right to request a Hearing in front of the Board of Directors. The Board would then make the decision whether or not to issue a permit. We will need to review the proposed

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alternatives before we can determine whether or not a Hearing will be required. At this early stage, we do not know which sections of existing watercourses will be enclosed or remain as open channels.

- We are working on updating our regulated areas based on our site visits. Once we have the updated regulated areas, we will provide this information electronically to the City and Drainage Engineer. We request that you include the regulated areas on any future drawings or designs submitted to our office for the purposes of obtaining a permit.
- Additional information may be requested as part of any permit application once we have received more information on the proposed alternatives for the drainage works.

The above comments reflect our understanding, at the time of writing, of the best available data, applicable policies and regulations. Should you have any questions, please do not hesitate to contact this office.

Yours truly,

Stacy Porter
Planning and Regulation Technician

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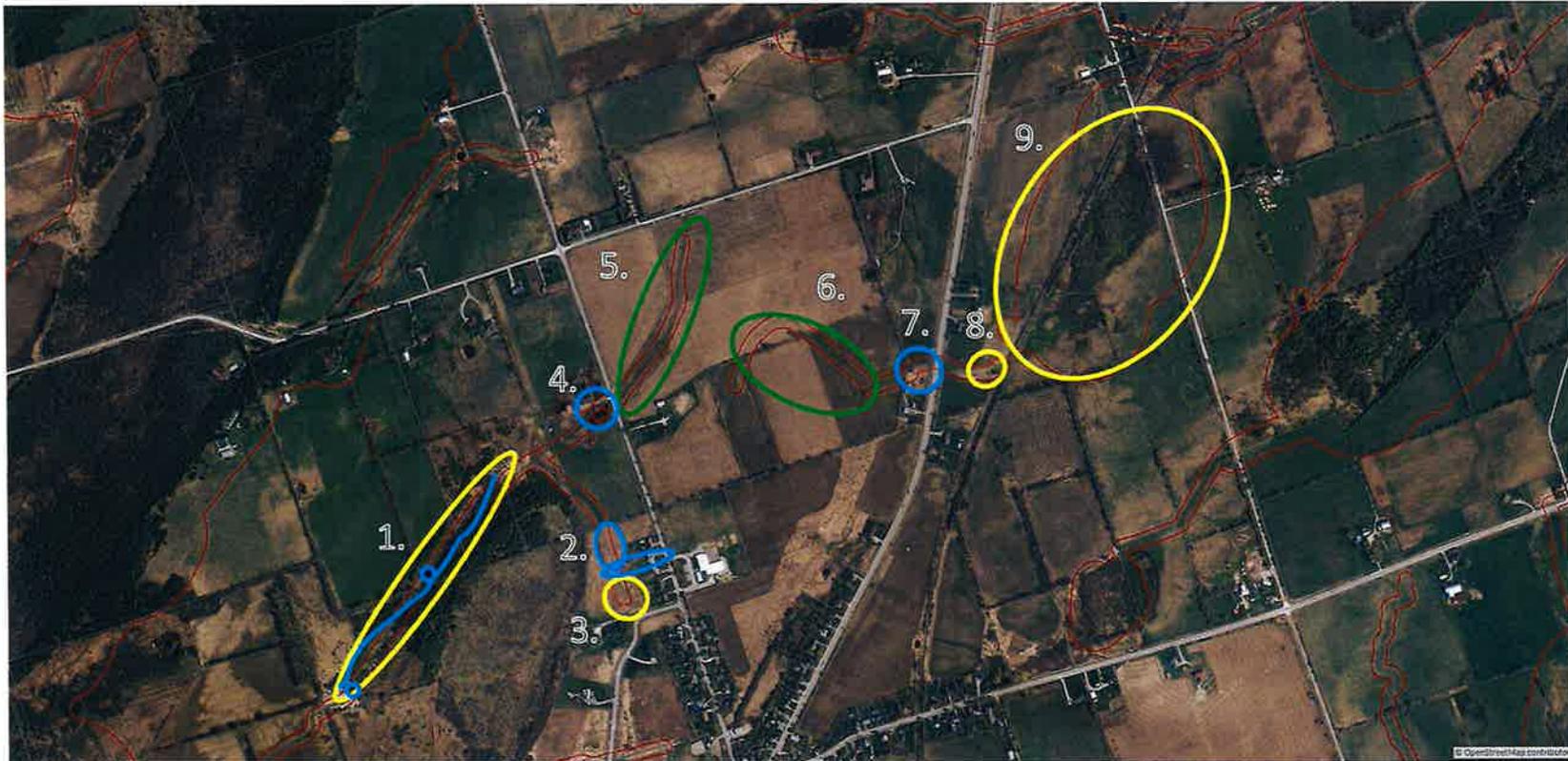


Figure 1: Regulated Areas Map

Legend:

Red: Regulated Areas (these have to be field-verified through site visits)

Confirmed Regulated Areas:

Yellow: Wetlands (#1, 3, 8, 9)

Blue: Watercourses/Surface Water (#4, 2, 7, 1)

Green: Valleys (#5, 6) – regulated as valleys

Unconfirmed Regulated Areas:

Green: (#5, 6) – require site visit in spring to determine if they meet definition of wetlands and watercourses



Technical Memorandum

Date: February 2, 2024 **Project No.:** 300041611.0000

Project Name: Waite Municipal Drain

Client Name: Municipality of Kawartha Lakes

Submitted To: Edward Delay, M. Eng, P.Eng.

Submitted By: Sarah Yoshida, B.Sc. (Env.), G. Cert. E.R.

Reviewed By: Hannah Maciver, B.E.S.

1.0 Introduction and Purpose

R.J. Burnside & Associates Limited (Burnside) was retained by the Municipality of Kawartha Lakes to investigate drainage issues on the properties of the petitioning landowner and road authority, within the geographic township of Fenelon, in accordance with Section 4 of the Drainage Act, R.S.O 1990. The watershed of the proposed Waite Municipal Drain is not currently assessed to an existing municipal drain. There are no systematic private drainage systems installed within the branch watersheds; however, several areas of random drainage were located. The watershed boundary can be found in Figure 1 below.

Under the *Endangered Species Act, 2007* (ESA), Endangered and Threatened species are afforded individual and habitat protection under section 9 and 10 of the Act. Where the construction of a new drain is proposed that may impact Species at Risk (SAR), measures should be taken to avoid contravening the Act. If impacts cannot be avoided, ESA authorization may be required.

The project limits are defined as the areas within 15 m of the proposed drain, this can be described as the limits of disturbance associated with the proposed drainage works. The Study Area consists of the areas within 30 m of the proposed drain.

Based on correspondence with Ministry of Natural Resources and Forestry (MNRF, 2018), a desktop screening of background natural heritage databases (i.e., Natural Heritage Information Centre, Ontario Breeding Bird Atlas) was completed. The following resources were reviewed:

- Aerial photography

- The Ministry of Natural Resources and Forestry (MNRF) Natural Heritage Information Centre (NHIC) database to identify records of rare wildlife species within and in the vicinity of the Project Area
- The Ontario Breeding Bird Atlas (OBBA) , 2001 – 2005 for records of birds breeding in the general project vicinity
- The Ontario Reptile and Amphibian Atlas (ORAA), for records of amphibians and reptiles in the general project vicinity
- MNRF Aquatic Resources Area (ARA) mapping (2015)
- Department of Fisheries and Oceans (DFO) Canada Species at Risk (SAR) mapping
- The Cornell Lab of Ornithology eBird website for records of species at risk birds in the general project vicinity
- iNaturalist

Based on the review of the above sources, the following SAR and/or their habitats protected under the ESA have the potential to occur in the vicinity of the Study Area:

- Eastern Meadowlark (*Sturnella magna*) – THR
- Little Brown Myotis (*Myotis lucifugus*) – END
- Northern Myotis (*Myotis septentrionalis*) – END
- Tri-colored Bat (*Perimyotis subflavus*) – END

Other species were identified from the background review but were screened as having low or no potential in the Study Area (see Table 2 attached). Only species listed as either Endangered or Threatened were considered at this time as species of Special Concern (SC) and their habitats are not afforded protection under the ESA.



<ul style="list-style-type: none"> Watershed Boundary Subwatershed Boundary Proposed Drain - Open Proposed Drain - Closed 															
<p>Sources:</p> <ol style="list-style-type: none"> Ministry of Natural Resources and Forestry, B. King's Printer for Ontario Natural Resources Canada, © His Majesty the King in Right of Canada 															
<p>Disclaimer:</p> <p>B.J. Burnside & Associates Limited and the above mentioned sources and agencies are not responsible for the accuracy of the spatial, temporal, or other aspects of the data represented on this map. It is recommended that users confirm the accuracy of the information represented.</p> <p>This map is the product of a Geographic Information System (GIS). As such, the data represented on this map may be subject to updates and future reproductions may not be identical.</p>															
<p>Datum: North American 1983 CRS Spheroid: NAD 1983 CRS UTM Zone 18N Projection: Transverse Mercator Central Meridian: 81°00'00"W False Easting: 500,000m False Northing: 0m Page Orientation: +7.64° Scale Factor: 0.9996</p>															
<p>Client</p> <p>CITY OF KAWARTHA LAKES</p>															
<p>Figure Title</p> <p>WAITE MUNICIPAL DRAIN</p> <p>WATERSHED PLAN</p>															
<table border="1"> <tr> <td>Drawn</td> <td>Checked</td> <td>Date</td> <td rowspan="2">Figure No.</td> </tr> <tr> <td>HN</td> <td>SY</td> <td>2024/01/05</td> </tr> <tr> <td>Scale</td> <td colspan="2">Project No.</td> <td rowspan="2">1</td> </tr> <tr> <td>H 1:6,500</td> <td colspan="2">300041611</td> </tr> </table>	Drawn	Checked	Date	Figure No.	HN	SY	2024/01/05	Scale	Project No.		1	H 1:6,500	300041611		
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2.0 Proposed Works

Works on the proposed Waite Municipal Drain will include the following:

Eastern Branch

- Ap. 192 m of HDPE (320 kPa) pipe (or approved equal)
- Four concrete structures including one directional berm
- One road crossing, comprised of ap. 39 m of SWWSP
- Ap. 174 m of grassed swale construction
- Ap. 90 m of channel deepening & widening, and riparian buffer construction
- One outlet stilling basin, and three permanent sediment basins

Western Branch

- Ap. 647 m of HDPE (320 kPa) pipe (or approved equal)
- Five concrete structures including two directional berms
- One road crossing comprised of approximately 23 m of SWWSP
- Ap. 102 m of channel deepening & widening, and riparian buffer construction
- One outlet stilling basin, and one permanent sediment basin

Southern Branch

- Ap. 239 m of grassed swale construction to provide an outlet for the existing drainage easement in Lot 9, Concession 5
- Incorporation of ap. 190 m of grassed swale, also given a design for future maintenance

The locations of the proposed open and closed drains can be found on Figure 1 above.

3.0 Field Methodologies

4.0 Vegetation Community Inventory

A site investigation was completed by two Burnside ecologists on October 2, 2023. The purpose of the survey was to address concerns for the potential presence of SAR and complete a high-level vegetation inventory with a focus on woody vegetation and density / relative cover within canopy, subcanopy, understory, and groundcover layers. All communities within the Study Area were characterized. Where access to a community was not possible, a community series classification was provided based on a review of aerial photography.

All communities within the Study Area were reviewed to characterize their composition and described using the Ecological Land Classification System for Southern Ontario (Lee et. al, 1998). The locations of these community are shown on Figure 2.

ELC Descriptions
 CVR 4: Rural Property
 FOC: Coniferous Forest
 FODM3: Dry - Fresh Poplar - White Birch Deciduous Forest
 MAMM1: Graminoid Mineral Meadow Marsh
 MAMM1-3: Reed-canary Grass Graminoid Mineral Meadow Marsh
 MEGM4: Fresh - Moist Graminoid Meadow
 OAG: Open Agriculture
 OAO: Open Aquatic
 SWTM3: Willow Mineral Deciduous Thicket Swamp



- Watershed Boundary
- Subwatershed Boundary
- Proposed Drain - Open
- Proposed Drain - Closed
- Study Area
- Ecological Land Classification
- Cameron Rock Drumlin-ANSI

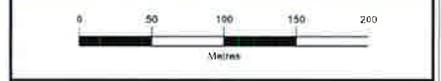


Sources:
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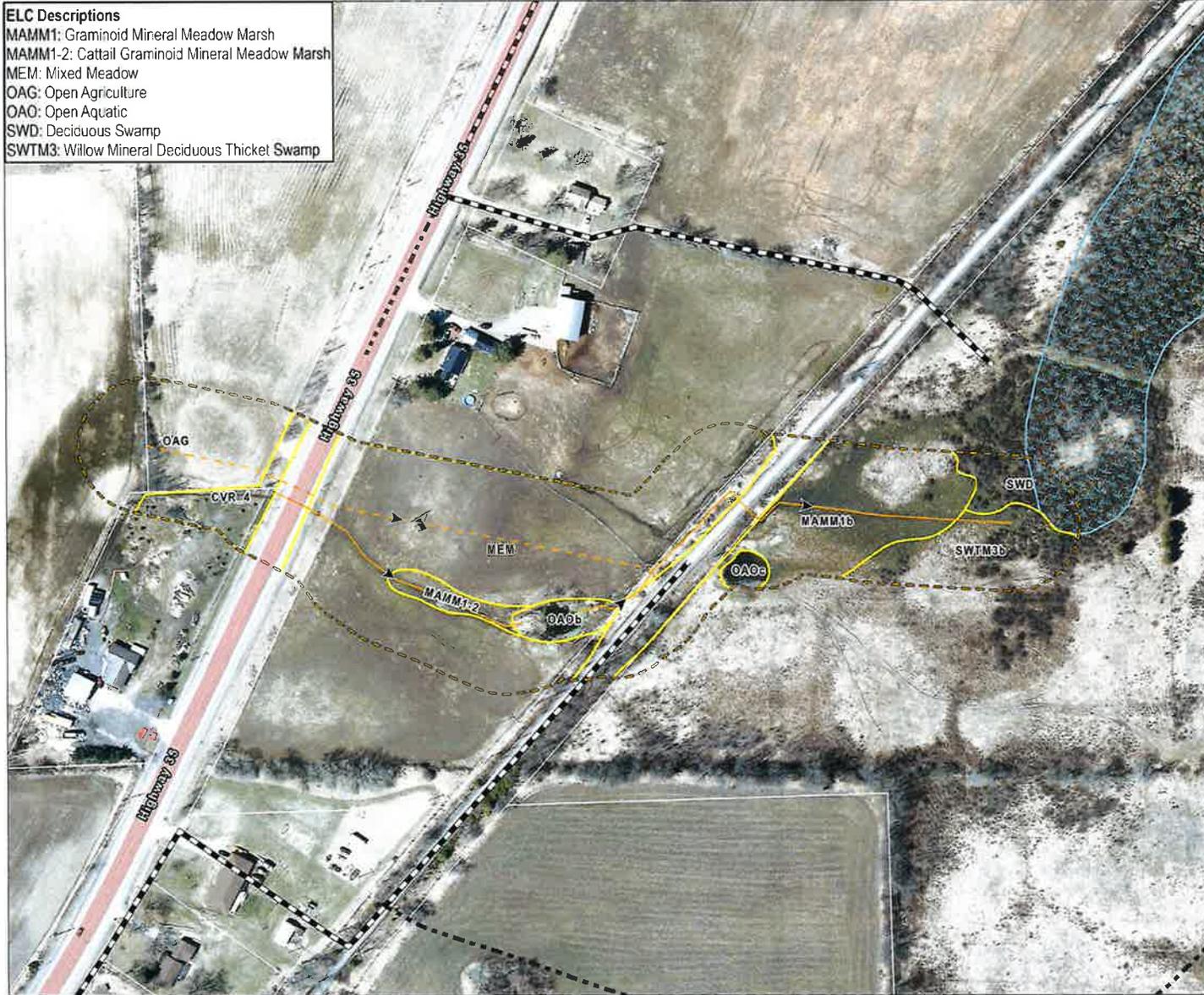


Client:
 CITY OF KAWARTHA LAKES

Figure Title:
 WAITE MUNICIPAL DRAIN
 ECOLOGICAL LAND CLASSIFICATION

Drawn	Checked	Date	Figure No.
HN	SY	2024/01/05	2A
Scale	Project: No.		
H 1:3,250	300041611		

- ELC Descriptions**
 MAMM1: Graminoid Mineral Meadow Marsh
 MAMM1-2: Cattail Graminoid Mineral Meadow Marsh
 MEM: Mixed Meadow
 OAG: Open Agriculture
 OAO: Open Aquatic
 SWD: Deciduous Swamp
 SWTM3: Willow Mineral Deciduous Thicket Swamp



- Watershed Boundary
- Subwatershed Boundary
- Proposed Drain - Open
- Proposed Drain - Closed
- Study Area
- Wetland (MNRF)
- Ecological Land Classification



Sources:
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Central Meridian: 81°00'00"N		
False Easting: 500,000m False Northing: 0m		
Page Orientation: +12.65° Scale Factor: 0.99960		



Client
CITY OF KAWARTHA LAKES

Figure Title
WAITE MUNICIPAL DRAIN
ECOLOGICAL LAND CLASSIFICATION

Drawn	Checked	Date	Figure No.
HN	SY	2024/01/05	2B
Scale	Project No.		
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4.1 Bat Maternity Habitat Surveys

A survey for high-quality bat maternity roost habitats was conducted within 15 m of the proposed drain rather than 30 m, as the probability for removals beyond 15 m is unlikely. All trees with a diameter at breast height (dbh) >10 cm were inspected for their potential to provide habitat for SAR bats.

5.0 Results and Discussion

5.1 Environmental Land Classification (ELC)

In total, 12 ELC communities are present within the Study Area

5.1.1 Agricultural (OAG)

Row cropping is present south of Chambers Road between Cameron Road and ON-35. Crops were not present at the time of the site investigation.

5.1.2 Rural Residential (CVR4)

This community consists of manicured turfgrass and open grown trees.

Photo 1: Representative photo of the CVR_4 community



5.1.3 Open Water (OAO)

Three OAO communities are present within the Study Area west of the proposed crossing at Cameron Road (OAOa), west of the City of Kawartha Lakes Rail Trail (OAOB), and east of the City of Kawartha Lakes Rail Trail.

The OAOa community near the proposed Cameron Road (Photo 2) is moderately deep and bordered by Cattails (*Typha spp.*) and Crack Willow (*Salix x fragilis*). New England Aster (*Symphyotrichum novae-angliae*) and Reed Canary Grass (*Phalaris arundinacea*) are also present along the margins. This pond is sufficiently deep to support overwintering turtles but is isolated from other wetland communities or watercourses by mown lawns, steep hills, roadways, and farm fields. The pond lacks distinctive basking structures.

The OAOB community immediately west of the Kawartha Rail trail is < 20 cm deep (Photo 3). Algae, Duckweed (*Lemna minor*), Softstem Bulrush (*Schoenoplectus tabernaemontani*), and *Chara spp.* are present within the pond. The margins of the pond are bordered by Narrow-leaf Cattail, Reed Canary Grass, and Tall Goldenrod (*Solidago altissima*). A small stand of young Manitoba Maple (*Acer negundo*) and regenerating Green Ash (*Fraxinus pennsylvanica*) are present. Horses graze in the adjacent meadow community and have access to the pond.

The OAOc community is located immediately east of the Kawartha Rail Trail. This pond is approximately 30 cm deep at its deepest and is accessible by grazing cattle (Photo 6). This community was not accessible to Burnside at the time of the site investigation. Northern Water Plantain (*Alisma triviale*) was visible and algae growth was abundant within the pond. Submergent vegetation was visible within the pond but was unidentifiable.

Photo 2: Open water pond west of Cameron Road (OAOa)



Photo 3: Open water pond west of the Rail Trail (OAOb)



5.1.4 Fresh-Moist Graminoid Meadow Ecoslte (MEGM4)

This community is present in association with the horse sanctuary west of Cameron Road. This area is currently being used as a pasture to graze horses and was accessible during Burnside's site visit. This community is dominated by short cool season grasses. Shrubs are absent within

this community. Based on discussions with the engineering team, the landowner also periodically mows the area. This area is subject to periodic flooding during the spring freshet.

Photo 4: Representative photo of the MEGM4 community. Note the height of the grasses



5.1.5 Mixed Meadow (MEM)

This community is present in association with the horse farm east of ON-35 near the easternmost extent of the proposed drain and OAOa. Horses are present within this community and have access. Trees and shrubs are absent from this community. The groundcover is dominated by short cool season grasses. Lesser associates include Queen Anne's Lace (*Daucus carota*), English Plantain (*Plantago lanceolata*), Field Thistle (*Cirsium discolor*), Red Clover (*Trifolium pratense*), Sweet White Clover (*Melilotus albus*), Heath Aster (*Symphotrichum ericoides*), Canada Goldenrod (*Solidago canadensis*), Late Goldenrod (*Solidago altissima*), and Crown Vetch (*Securigera varia*).

Photo 5: Representative photo of the MEM community



5.1.6 Graminoid Mineral Meadow Marsh (MAMM1)

Two MAMM1 communities are present within the Study Area. MAMM1a is present north of the FOC community. This community is mown, and as such the grass species are unidentifiable. Remnant Red Osier Dogwood (*Cornus sericea*) is also present as are hummocky soils, indicating soils are periodically saturated.

The MAMM1b community is present east of the Rail Trail in association with the OAOc community and SWTM3b community. This community was inaccessible and as such, habitat characterization was completed from the Rail Trail. This community is used for grazing cows. Hummocks are abundant throughout the community although standing water is absent from the community. Young trees including regenerating Green Ash, Black Ash (*Fraxinus nigra*), Silver Maple (*Acer saccharinum*), and Balsam Polar (*Populus balsamifera*) occur sporadically along the margins of the community but do not form a distinguishable canopy or subcanopy. Red Osier Dogwood and *Salix sp.* occurs occasionally within the understory layer but does not provide > 10% cover overall. The groundcover layer was largely unidentified but was dominated by cool season grasses including Reed Canary Grass.

Photo 6: Representative photo of the MAMM1b community



5.1.7 Cattail Graminoid Mineral Meadow Marsh (MAMM1-2)

This community is present in association with the horse farm west of the Rail Trail along the route of the proposed drain. Standing water was absent at the time of the site investigation. Narrow-leaf Cattail (*Typha angustifolia*) dominates this community with lesser associates of Reed Canary Grass and Tall Goldenrod. Other species present include cool season grasses such as Smooth Brome (*Bromus inermis*) and Orchard Grass (*Dactylis glomerata*) as well as Sedges (*Carex spp.*). Red Osier Dogwood occurs occasionally within this community.

Photo 7: Representative photo of the MAMM1-2 community



5.1.8 Reed Canary Grass Graminoid Mineral Meadow Marsh Type (MAMM1-3)

A Reed-canary Grass Graminoid Mineral Meadow Marsh Type (MAMM1-3a) community is present north of the SWTM3a community as well as at the most western extent of the proposed drain (MAMM1-3b). This community is dominated by Reed Canary Grass with lesser associates of Narrowleaf Cattail and Boneset. Standing water was not present at the time of the site investigation.

Photo 8: Representative photos of the MAMM1-3 community



5.1.9 Willow Mineral Deciduous Thicket Swamp Ecosite (SWTM3)

This community is present at the westernmost extent of the drain (SWTM3a) and at the easternmost extent of the drain (SWTM3b).

Standing water and saturated soils were absent within SWTM3a at the time of the site investigation within the SWTM3. This community is relatively narrow, spanning 0.67 ha along the proposed drain. A canopy and subcanopy are absent from this community, instead the understory is dominated by densely growing Meadow Willow (*Salix petiolaris*) and Bebb's Willow (*Salix x bebbiana*) with lesser associates of Red Osier Dogwood. Groundcover provides >80% cover and consists of a mix of graminoid and forb species including Reed Canary Grass, Spotted Joe Pye Weed (*Eutrochium maculatum*), Swamp Aster (*Symphotrichum puniceum*), New England Aster, Sensitive Fern (*Oncoclea sensibilis*), and Boneset (*Eupatorium perfoliatum*).

The SWTM3b community was not accessible and instead was assessed from a distance. Similar to SWTM3a, a canopy and subcanopy are absent from this community. Willow species appear to dominate the understory with lesser associates of Red Osier Dogwood. It is assumed that the ground cover layer is consistent with the adjacent MAMM1 community.

Photo 9: Representative photo of the SWTM3a community



Photo 10: The SWTM3b community is visible from a distance



5.1.10 Deciduous Swamp (SWD)

This community is present east of the Rail Trail and north of the easternmost extent of the proposed drain. The canopy and sub canopy of this community consists of young to mid-aged deciduous species including Trembling Aspen (*Populus tremuloides*), White Birch (*Betula papyrifera*), Green Ash, and Black Ash. The understory appeared dense, observable species include Ash regeneration, Willow, and Red Osier Dogwood. This community is located > 15 m from the drain and is unlikely to be impacted by the proposed drainage works.

Photo 11: Representative photo of the SWD community



5.1.11 Dry – Fresh Poplar – White Birch Deciduous Forest (FODM3)

This community is located along the westernmost extent of the proposed drain immediately west of the MEGM4 and CVR_4 communities. The portion of this community present within the Study Area consists of a moderately steep slope. Loose cobble and boulders are abundant along the slope. Young to mid-aged deciduous trees are the dominant source of cover.

Due to the age of this community, a distinct canopy is absent. Mature canopy trees comprise < 30% cover and include Basswood (*Tilia americana*) and White Ash (*Fraxinus americana*). The subcanopy provides approximately 70% cover and is dominated by Trembling Aspen with lesser

associates of White Cedar (*Thuja occidentalis*), Manitoba Maple, American Elm (*Ulmus americana*), and White Birch.

The understory within this community is dense and is dominated by European Buckthorn (*Rhamnus cathartica*) and Green Ash regeneration. Wild Grape (*Vitis riparia*) and Currants (*Ribes spp.*) are also present. Groundcover is sparse within this community. Identifiable species include Canada Goldenrod and Tall Goldenrod. Green Ash regeneration is also present.

This community will not be altered by the proposed drainage works.

Photo 12: Representative photo of the FOD community



5.1.12 Coniferous Forest (FOC)

This community was identified using air photos and was not accessible during the site investigation. Observable species include White Cedar. This community will not be altered by the proposed drainage works.

6.0 Species at Risk Habitat Suitability

6.1 SAR Bats

No candidate roost trees are present within 15 m of the proposed drain. One candidate SAR bat roost tree was incidentally observed within 30 m of the drain but is sufficiently far away that it will not be impacted by the proposed drainage works. The forest and treed swamp communities

are likely to provide high quality bat roosting habitat but will not be impacted by the proposed drainage improvement project.

6.2 Eastern Meadowlark

Candidate habitat is present for Eastern Meadowlark (EAME) within the MEGM4 and MEM communities. The viability of EAME breeding habitat within either of these communities is considered to be low. Both communities are subject to grazing pressure from the existing horse farms that prevent the establishment of tall grasses throughout most of the fields. EAME also prefer expansive grasslands interspersed with scattered shrubs which are absent from the Study Area. Despite the low-quality habitat observed, one record for EAME was reported through eBird adjacent to the MEM community as well as one record within the vicinity of the MEGM4 community. Therefore, potential impacts to this species cannot be ruled out.

The proposed works within the MEM community will include the installation of a closed drain (i.e., HDPE (320 kPa) pipe) that will be 192 m in length. Portions of the field will be temporarily disturbed but will be restored to existing or better conditions post-construction and therefore, no net loss of candidate habitat will occur. It is anticipated that the on-site soil will contain a suitable seedbank to allow for the regeneration of the existing plant community. Disturbed areas should be seeded with Virginia Wild Rye (*Elymus virginicus*) to aid in the establishment of erosion and weed control. The proposed open channel will be located within an existing low-lying area that is currently dominated by wetland vegetation (i.e., the MAMM1-2 community) that is not suitable breeding habitat for EAME.

The proposed open portions of drain within the southern branch associated with the MEGM4 community will remain as a grassed swale. Therefore, no net loss of candidate EAME will occur. The Burnside engineering team anticipates that water will be periodically present within the swale during periods of high flow. It is anticipated that the on-site soil will contain a suitable seedbank to allow for the regeneration of the existing plant community. Disturbed areas should be seeded with Virginia Wild Rye to aid in the establishment of erosion and weed control.

To avoid impacts to nesting EAME and other species of migratory bird protected under the *Migratory Birds Convention Act, 1994*, vegetation clearing and grading activities must be completed outside of the core nesting window (April 1 – September 15).

7.0 Conclusions

The proposed drain includes 569 m of channel works, 705 m of closed drain installation, and three SWWSP jack and bore road crossings.

12 ELC communities are present within the Study Area including five wetland communities, one open water community, two upland forest communities, two open upland communities, and two constructed communities. Based on an assessment of the ecological communities and SAR

records, suitable habitat is present for four SAR species including Little Brown Myotis, Northern Myotis, Tri-coloured Bat, and EAME.

In summary, the proposed new drainage works will not harm EAME provided all of the recommended mitigation measures are followed. No net loss of EAME habitat will occur as a result of the proposed drainage works within either the MEM or MEGM4 communities provided all disturbed soils are reinstated and seeded. In addition, impacts to Little Brown Myotis, Northern Myotis, and Tri-colored Bat or their habitat will not occur as tree clearing will not be required to facilitate the proposed drainage project.

R.J. Burnside & Associates Limited



Sarah Yoshida, B.Sc. (Env.), G. Cert. E.R.
Ecologist

SY:af

Enclosure(s) Table 1- 041611 Waite MD Background Data
 Table 2 – Waite MD_SAR Screening Table_041611

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NHIC Data

OGF ID	Element Type	Common Name	Scientific Name	SRank	SARO Status	COSEWIC Status	ATLAS NAD83 IDENT	COMMENTS
1046697	NATURAL AREA	Cameron Rock Drumlin					17PK7623	
1046697	SPECIES	Eastern Meadowlark	<i>Sturnella magna</i>		THR	THR	17PK7623	
1046707	SPECIES	Eastern Meadowlark	<i>Sturnella magna</i>		THR	THR	17PK7723	
1046698	NATURAL AREA	Sturgeon Lake No. 18					17PK7624	
1046698	SPECIES	Eastern Meadowlark	<i>Sturnella magna</i>		THR	THR	17PK7624	
1046698	SPECIES	Snapping Turtle	<i>Chelydra serpentina</i>		SC	SC	17PK7624	
1046708	SPECIES	Eastern Meadowlark	<i>Sturnella magna</i>		THR	THR	17PK7724	

Species #	Common Name	# of Records	Earliest Yr	Latest Yr
1	Blanding's Turtle	2	2013	2013
3	Midland Painted Turtle	28	1985	2019
6	Snapping Turtle	12	1983	2019
12	Eastern Gartersnake	3	2017	2019
19	Northern Watersnake	3	1992	2018
21	Red-bellied Snake	5	1932	2019
25	American Bullfrog	14	1985	2019
27	Gray Treefrog	3	2016	2019
28	Green Frog	30	1932	2019
29	Mink Frog	1	1994	1994
30	Northern Leopard Frog	28	1932	2019
31	Pickerel Frog	1	1985	1985
32	Spring Peeper	2	2018	2018
35	American Toad	29	1962	2019
38	Blue-spotted Salamander	3	2016	2018
41	Eastern Red-backed Salamander	5	2016	2019

Region	Square	Species	Breeding Evidence				Point Counts				
			Max BE	Categ	#Sq	Atlasser Name	#PC	%PC	Abun	#Sq	
	14 17PK72	Canada Goose	P	PROB	1	Kenneth F Abraham	2	7.41	0.1852	1	
	14 17PK72	Trumpeter Swan	H	POSS	1	Chris Ellingwood					
	14 17PK72	Wood Duck	FY	CONF	1	Leslie Dymont					
	14 17PK72	Mallard	NE	CONF	1	Leslie Dymont	2	7.41	0.1111	1	
	14 17PK72	Blue-winged Teal	T	PROB	1	Leslie Dymont	1	3.7	0.037	1	
	14 17PK72	Ruffed Grouse	D	PROB	1	Leslie Dymont					
	14 17PK72	Common Loon	T	PROB	1	Chris Ellingwood	2	7.41	0.0741	1	
	14 17PK72	Pied-billed Grebe	T	PROB	1	Chris Ellingwood					
	14 17PK72	American Bittern	T	PROB	1	Leslie Dymont					
	14 17PK72	Least Bittern	T	PROB	1	Chris Ellingwood					
	14 17PK72	Great Blue Heron	H	POSS	1	Chris Ellingwood	1	3.7	0.037	1	
	14 17PK72	Green Heron	H	POSS	1	Chris Ellingwood					
	14 17PK72	Turkey Vulture	P	PROB	1	Leslie Dymont	1	3.7	0.0741	1	
	14 17PK72	Osprey	AE	CONF	1	Leslie Dymont					
	14 17PK72	Northern Harrier	P	PROB	1	Leslie Dymont					
	14 17PK72	American Kestrel	AE	CONF	1	Leslie Dymont	1	3.7	0.037	1	
	14 17PK72	Virginia Rail	DD	CONF	1	Chris Ellingwood					
	14 17PK72	Sora	T	PROB	1	2 atlassers					
	14 17PK72	Common Gallinule	T	PROB	1	Chris Ellingwood					
	14 17PK72	Sandhill Crane	P	PROB	1	Leslie Dymont					
	14 17PK72	Killdeer	DD	CONF	1	Leslie Dymont	1	3.7	0.037	1	
	14 17PK72	Rock Pigeon	NE	CONF	1	Leslie Dymont	1	3.7	0.2963	1	
	14 17PK72	Spotted Sandpiper	S	POSS	1	Chris Ellingwood					
	14 17PK72	Upland Sandpiper	H	POSS	1	Leslie Dymont	2	7.41	0.0741	1	
	14 17PK72	Common Snipe	D	PROB	1	2 atlassers	2	7.41	0.0741	1	
	14 17PK72	American Woodcock	D	PROB	1	2 atlassers					
	14 17PK72	Herring Gull	H	POSS	1	Leslie Dymont					
	14 17PK72	Black Tern	T	PROB	1	Chris Ellingwood					
	14 17PK72	Mourning Dove	AE	CONF	1	Leslie Dymont	6	22.22	0.2593	1	
	14 17PK72	Black-billed Cuckoo	FY	CONF	1	Leslie Dymont					
	14 17PK72	Great Horned Owl	P	PROB	1	Chris Ellingwood					
	14 17PK72	Barred Owl	P	PROB	1	Chris Ellingwood					
	14 17PK72	Long-eared Owl	H	POSS	1	Chris Ellingwood					
	14 17PK72	Northern Saw-whet Owl	S	POSS	1	Chris Ellingwood					
	14 17PK72	Ruby-throated Hummingbird	AE	CONF	1	Leslie Dymont					
	14 17PK72	Belted Kingfisher	AE	CONF	1	Leslie Dymont					
	14 17PK72	Yellow-bellied Sapsucker	S	POSS	1	Leslie Dymont					

Region	Square	Species	Breeding Evidence			Point Counts				
			Max BE	Categ	#Sq	Atlasser Name	#PC	%PC	Abun	#Sq
14	17PK72	Hairy Woodpecker	P	PROB	1	Leslie Dymont	1	3.7	0.0741	1
14	17PK72	Pileated Woodpecker	P	PROB	1	Leslie Dymont				
14	17PK72	Olive-sided Flycatcher	S	POSS	1	Donald A Sutherland				
14	17PK72	Alder Flycatcher	T	PROB	1	Chris Ellingwood	2	7.41	0.0741	1
14	17PK72	Willow Flycatcher	T	PROB	1	Chris Ellingwood				
14	17PK72	Eastern Phoebe	NY	CONF	1	Leslie Dymont	5	18.52	0.1852	1
14	17PK72	Great Crested Flycatcher	S	POSS	1	Leslie Dymont	5	18.52	0.1852	1
14	17PK72	Eastern Kingbird	T	PROB	1	Chris Ellingwood	9	33.33	0.5556	1
14	17PK72	Warbling Vireo	CF	CONF	1	Leslie Dymont	3	11.11	0.1111	1
14	17PK72	Red-eyed Vireo	AE	CONF	1	Leslie Dymont	4	14.81	0.1852	1
14	17PK72	Blue Jay	NY	CONF	1	Leslie Dymont	11	40.74	0.7778	1
14	17PK72	American Crow	NY	CONF	1	Leslie Dymont	17	62.96	1.2222	1
14	17PK72	Horned Lark	P	PROB	1	Leslie Dymont				
14	17PK72	Purple Martin	AE	CONF	1	Leslie Dymont				
14	17PK72	Tree Swallow	NY	CONF	1	Leslie Dymont	12	44.44	1.4815	1
14	17PK72	Bank Swallow	T	PROB	1	Chris Ellingwood	5	18.52	0.6296	1
14	17PK72	Barn Swallow	NY	CONF	1	Leslie Dymont	4	14.81	0.2963	1
14	17PK72	Black-capped Chickadee	P	PROB	1	Leslie Dymont	6	22.22	0.5185	1
14	17PK72	White-breasted Nuthatch	FY	CONF	1	Leslie Dymont	1	3.7	0.0741	1
14	17PK72	House Wren	NY	CONF	1	Leslie Dymont	4	14.81	0.1852	1
14	17PK72	Winter Wren	T	PROB	1	Leslie Dymont	2	7.41	0.0741	1
14	17PK72	Marsh Wren	NY	CONF	1	Chris Ellingwood	2	7.41	0.3704	1
14	17PK72	Eastern Bluebird	FY	CONF	1	Leslie Dymont	1	3.7	0.037	1
14	17PK72	Veery	T	PROB	1	Leslie Dymont	3	11.11	0.1852	1
14	17PK72	Hermit Thrush	T	PROB	1	Leslie Dymont	1	3.7	0.0741	1
14	17PK72	Wood Thrush	S	POSS	1	Leslie Dymont	1	3.7	0.037	1
14	17PK72	American Robin	FY	CONF	1	Leslie Dymont	21	77.78	1.9259	1
14	17PK72	Gray Catbird	FY	CONF	1	Leslie Dymont	1	3.7	0.037	1
14	17PK72	Brown Thrasher	NY	CONF	1	Leslie Dymont	3	11.11	0.1111	1
14	17PK72	European Starling	AE	CONF	1	Leslie Dymont	10	37.04	2.1481	1
14	17PK72	Cedar Waxwing	FY	CONF	1	Leslie Dymont	8	29.63	0.8148	1
14	17PK72	Nashville Warbler	S	POSS	1	Donald A Sutherland	2	7.41	0.0741	1
14	17PK72	Yellow Warbler	FY	CONF	1	Leslie Dymont	6	22.22	0.4815	1
14	17PK72	Black-and-white Warbler	S	POSS	1	2 atlassers	8	29.63	0.3333	1
14	17PK72	American Redstart	S	POSS	1	Leslie Dymont	2	7.41	0.0741	1
14	17PK72	Ovenbird	S	POSS	1	Leslie Dymont	5	18.52	0.2222	1
14	17PK72	Northern Waterthrush	S	POSS	1	3 atlassers	2	7.41	0.0741	1

Region	Square	Species	Breeding Evidence				Point Counts				
			Max BE	Categ	#Sq	Atlasser Name	#PC	%PC	Abun	#Sq	
14	17PK72	Common Yellowthroat	NY	CONF	1	Leslie Dymont	8	29.63	0.6296	1	
14	17PK72	Chipping Sparrow	NY	CONF	1	Leslie Dymont	8	29.63	0.5556	1	
14	17PK72	Field Sparrow	H	POSS	1	Leslie Dymont	1	3.7	0.037	1	
14	17PK72	Vesper Sparrow	CF	CONF	1	Leslie Dymont	1	3.7	0.037	1	
14	17PK72	Savannah Sparrow	CF	CONF	1	David Geale	8	29.63	0.4815	1	
14	17PK72	Grasshopper Sparrow	H	POSS	1	Leslie Dymont	1	3.7	0.037	1	
14	17PK72	Song Sparrow	CF	CONF	1	Leslie Dymont	19	70.37	1.4815	1	
14	17PK72	Swamp Sparrow	NE	CONF	1	Chris Ellingwood	4	14.81	0.7037	1	
14	17PK72	White-throated Sparrow	T	PROB	1	Leslie Dymont	3	11.11	0.2593	1	
14	17PK72	Northern Cardinal	P	PROB	1	Leslie Dymont	2	7.41	0.0741	1	
14	17PK72	Rose-breasted Grosbeak	P	PROB	1	Leslie Dymont	1	3.7	0.037	1	
14	17PK72	Indigo Bunting	P	PROB	1	Leslie Dymont	1	3.7	0.037	1	
14	17PK72	Bobolink	P	PROB	1	Leslie Dymont	7	25.93	0.5556	1	
14	17PK72	Red-winged Blackbird	NY	CONF	1	Chris Ellingwood	17	62.96	4.2222	1	
14	17PK72	Eastern Meadowlark	P	PROB	1	Leslie Dymont	7	25.93	0.6296	1	
14	17PK72	Common Grackle	FY	CONF	1	Leslie Dymont	9	33.33	0.8148	1	
14	17PK72	Brown-headed Cowbird	P	PROB	1	Leslie Dymont	4	14.81	0.1852	1	
14	17PK72	Baltimore Oriole	FY	CONF	1	Leslie Dymont	5	18.52	0.2222	1	
14	17PK72	American Goldfinch	FY	CONF	1	Leslie Dymont	15	55.56	1.1852	1	
14	17PK72	House Sparrow	H	POSS	1	Leslie Dymont	2	7.41	0.4815	1	

COMMON NAME	SCIENTIFIC NAME	Provincial S-RANK ¹	Provincial SARA Status ²	COSEWIC ³	Federal SARA Status ³	Federal SARA Schedule ⁴	Habitat Description	Habitat Present in Study Area?	Species Observed?
Birds									
Bank Swallow	<i>Riparia riparia</i>	S4B	THR	THR	THR	1	Prefers open habitats including, farmland, lake/river shorelines, grasslands, and wetlands. Nests in exposed earthen banks along shorelines and in artificial sites such as gravel pits. ⁷	No potential. Suitable habitat absent from project limits.	N/A
Bobolink	<i>Dolichonyx oryzivorus</i>	S4B	THR	THR	THR	1	Generally prefers open grasslands and hay fields for nesting, typically featuring relatively tall vegetation. Sometimes uses large fields of winter wheat and rye in southwestern Ontario. Sensitive to vegetation structure and composition. Positively associated with high grass-to-forb ratios; moderate litter depth; tolerate wetter portions of fields compared to Eastern Meadowlark (EAME) and more likely to nest closer to field centres rather than field margins. Lower tolerance to presence of patches of bare ground. Appear to prefer larger fields than EAME. ⁹	No potential. Although graminoid meadow communities are present, grasses are not suitably tall to support bobolink. Potential habitat is present in the general vicinity of the proposed drain but will not be impacted by the proposed drainage works.	N/A
Cerulean Warbler	<i>Setophaga cerulea</i>	S3B	THR	END	END	1	Generally found in mature deciduous forests with an open understorey; also nests in older, second-growth deciduous forests. ⁷	No potential. Suitable habitat to support this species is absent from the proposed area of impact.	N/A
Eastern Meadowlark	<i>Sturnella magna</i>	S4B	THR	THR	THR	1	Generally prefers grassy pastures, meadows and hay fields. Prefers moderately tall grass with abundant litter cover, a high proportion of grass cover, moderate forb density, low proportions of shrub and woody vegetation cover, and low percent of bare ground. Prefers to nest in drier sites and frequently nests around field margins. ⁹	No potential. Although graminoid meadow communities are present, grasses are not suitably tall to support bobolink. Potential habitat is present in the general vicinity of the proposed drain but will not be impacted by the proposed drainage works.	N/A
Least Bittern	<i>Ixobrychus exilis</i>	S4B	THR	THR	THR	1	Most frequently found in marshes of at least 5 ha, although much smaller marshes, including sites such as cattail stands along creeks and farm ponds partially filled with cattail, may be used occasionally. Breeding sites typically dominated by cattail, but also sometimes	No potential. Suitable habitat to support this species is absent from the proposed area of impact.	N/A
Loggerhead Shrike (Eastern subspecies)	<i>Lanius ludovicianus</i>	S2B	END	END	No status	No schedule	Prefers early successional shrubland habitat, including unimproved pasture. This species prefers sites with isolated hawthorns and Red Cedar for building nests. ⁷	Overall, there very low probability that Eastern Loggerhead Shrike is supported within the Study Area due to a lack of suitable nesting habitat and food cache sites. It is more likely that the thicket community associated with the nearby Cameron Rock Drumin. Although unimproved pastures are present within the general vicinity of the drain although these pastures lack isolated shrub for nesting. Food cache sites such as thorny shrubs, barbed wire, or finely branched trees are absent within the Study Area. Furthermore, Hawthorn (<i>Crataegus</i> sp.) and Red Cedar (<i>Juniperus virginiana</i>), their preferred nesting site, are absent from the Study Area within the MEM or MEGM4 communities. Suitable foraging areas are present within the MEGM4 community, this community lacks bare ground. In addition, most remaining Eastern Loggerhead Shrike occur within the Carden Plain and Napanee Plain which are located well away from the project limits ¹ .	No.
Prothonotary Warbler	<i>Protonotaria citrea</i>	S1B	END	END	END	1	Generally found in the dead trees of flooded woodlands or deciduous swamp forests of the Carolinian Zone. ⁷	Unlikely. Forested areas are absent from the proposed impact limits. It is unlikely that the forested lands adjacent to the proposed drain support Prothonotary Warbler are absent based on Burnside's preliminary review. Forested lands are not mature forested / swamps that do not span > 40 ha. Thicket swamp communities are present	N/A

COMMON NAME	SCIENTIFIC NAME	Provincial S-RANK ¹	Provincial SARO Status ²	COSEWIC ³	Federal SARA Status ³	Federal SARA Schedule ⁴	Habitat Description	Habitat Present in Study Area?	Species Observed?
Yellow-breasted Chat Mammals	<i>Icteria virens</i>	S2B	END	END	END	1	Prefers scrubby, early successional habitats. In Ontario, the Yellow-breasted Chat uses regenerating old fields, forest edges, railway and hydro rights-of-way, young coniferous reforestations and occasionally wet willow-ash-elm thickets bordering wetlands. Tangles of grape and raspberry are also a habitat feature of most breeding sites. ⁷	Although suitable habitat to support Yellow-breasted Chat is present in association with the SWTM3 communities, it is unlikely that this species will be present due to the patch sizes. Per the Recovery Strategy for the Yellow-breasted Chat virens subspecies (2019), the minimum patch size capable of supporting Yellow-breasted Chat is 1.2 ha. Given the SWTM3a and SWTM3b communities span less than a 0.7 ha each, it is unlikely that this species will be supported. Furthermore, there are no records within the general vicinity of the site from either the Ontario Breeding Bird Atlas or Naturalist.	No.
Little Brown Myotis	<i>Myotis lucifugus</i>	S4	END	END	END	1	Overwintering habitat: Caves and mines that remain above 0 degrees Celsius. Maternal Roosts: Often associated with buildings (attics, barns etc.). Occasionally found in trees (25-44 cm dbh). ¹⁵	Low potential. High quality bat habitat including forest, treed swamp, or woodland communities are not present within the limits of disturbance. On-site habitat should not be considered high quality bat habitat. Only one candidate tree was observed within 15 meters of the proposed drain location but is located well away from the drain on off-site lands and is unlikely to be impacted by the proposed drainage works. Individual trees that may occur within the general vicinity may support SAR bats but were not identified as candidate roost trees due to a lack of cavities.	No.
Northern Myotis	<i>Myotis septentrionalis</i>	S3	END	END	END	1	Overwintering habitat: Deepest parts of caves and mines where temperature is the least variable. Maternal Roosts: Less is known about roosts of Tri-colored Bats. Most roost sites found within forested habitats. May roost in clumps of dead foliage and lichens. In more anthropogenically modified landscapes, maternity roosts may be barns or similar human-made structures. ¹⁵	Low potential. High quality bat habitat including forest, treed swamp, or woodland communities are not present within the limits of disturbance. On-site habitat should not be considered high quality bat habitat. Only one candidate tree was observed within 15 meters of the proposed drain location but is located well away from the drain on off-site lands and is unlikely to be impacted by the proposed drainage works. Individual trees that may occur within the general vicinity may support SAR bats but were not identified as candidate roost trees due to a lack of cavities.	No.
Tri-colored Bat Reptiles	<i>Perimyotis subflavus</i>	S37	END	END	END	1			No.

COMMON NAME	SCIENTIFIC NAME	Provincial S-RANK ¹	Provincial SARO Status ²	COSEWIC ³	Federal SARA Status ³	Federal SARA Schedule ⁴	Habitat Description	Habitat Present in Study Area?	Species Observed?
Blanding's Turtle	<i>Emydoidea blandingii</i>	S3	THR	END	END	1	Generally occur in freshwater lakes, permanent or temporary pools, slow-flowing streams, marshes and swamps. They prefer shallow water that is rich in nutrients, organic soil and dense vegetation. Adults are generally found in open or partially vegetated sites, and juveniles prefer areas that contain thick aquatic vegetation including sphagnum, water lilies and algae. They dig their nest in a variety of loose substrates, including sand, organic soil, gravel and cobblestone. Overwintering occurs in permanent pools that average about one metre in depth, or in slow-flowing streams. ²⁰	Unlikely. Suitable habitat to support Blanding's Turtles is absent from the Study Area. Wetland communities within the proposed limits of disturbance lack standing water. Suitable habitat may be present in the general vicinity of the proposed project limits. Farm ponds are present in the immediate vicinity of the proposed drain but do not have suitable characteristics to support Blanding's Turtles.	N/A
American Ginseng	<i>Panax quinquefolius</i>	S2	END	END	END		Grows in rich, moist, undisturbed and relatively mature deciduous woods in areas of neutral soil (such as over limestone or marble bedrock). ²⁰	No potential. Suitable habitat absent from project limits.	N/A
Butternut	<i>Juglans cinerea</i>	S2 ⁷	END	END	END	1	Butternut grows best in rich, moist and well-drained soils or limestone gravel sites. They are less commonly found in dry, rocky and sterile soils. They generally grow alone or in small groups in deciduous forests that are commonly comprised of Basswood, Black Cherry, Beech, Black Walnut, Elm, Hemlock, Hickory, Oak, Red Maple, Sugar Maple, Poplar, White Ash and Yellow Birch. In Ontario, they can be found throughout the southern Ontario, south of the Canadian Shield. ¹⁰	Low potential. May occur as a hedgerow tree. Forested lands capable of supporting this species are located outside of the area of impact.	No.
Eastern Prairie Fringed Orchid	<i>Platanthera leucophaea</i>	S2	END	END	END	1	Occurs within wet prairies and fens. Also known to occur within Tamarack Swamps along the Bruce Peninsula and Ottawa area. ²²	No potential. Suitable habitat absent from project limits.	N/A

¹S-Ranks (provincial)
 Provincial (or Subnational) ranks are used by the Natural Heritage Information Centre (NHIC) to set protection priorities for rare species and natural communities. These ranks are not legal designations. Provincial ranks are assigned in a manner similar to that described for global ranks, but consider only those factors within the political boundaries of Ontario. (Provincial Status from MNR Biodiversity Explorer September 2012)

S1 Critically Imperiled - Critically imperiled in the nation or state/province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state/province.
 S2 Imperiled - Imperiled in the nation or state/province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province.
 S3 Vulnerable - Vulnerable in the nation or state/province due to a restricted range, relatively few populations (often 60 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.

²SARO Endangered Species Act, 2007
 (provincial status from MNR December 2014)
 The provincial review process is implemented by the MNR's Committee on the Status of Species at Risk in Ontario (COSSARO).

EXT Extinct - A species that no longer exists anywhere.
 EXP Extirpated - A species that no longer exists in the wild in Ontario but still occurs elsewhere.
 END Endangered - A species facing imminent extinction or extirpation in Ontario which is a candidate for regulation under Ontario's Endangered Species Act (ESA) (END-R designations are no longer relevant as species are covered under new ESA April 2009)
 THR Threatened - A species that is at risk of becoming endangered in Ontario if limiting factors are not reversed.
 SC Special Concern (Formerly Vulnerable) - A species with characteristics that make it sensitive to human activities or natural events.
 NAR Not at Risk - A species that has been evaluated and found to be not at risk.
 DD Data Deficient (formerly Indeterminate) - A species for which there is insufficient information for a provincial status recommendation.

³SARA (Federal Species at Risk Act) Status and Schedule (Includes COSEWIC Status)
 The Act establishes Schedule 1, as the official list of wildlife species at risk. It classifies those species as being either: Extirpated, Endangered, Threatened, or a Special Concern. Once listed, the measures to protect and recover a listed wildlife species are implemented.
 EXT Extinct - A wildlife species that no longer exists.
 EXP Extirpated - A wildlife species that no longer exists in the wild in Canada, but exists elsewhere in the wild.
 END Endangered - A wildlife species that is facing imminent extirpation or extinction.
 THR Threatened - A wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.
 SC Special Concern - A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.

⁴SARA Schedule
 Schedule 1 is the official list of species that are classified as extirpated, endangered, threatened, and of special concern.
 Schedule 2: species listed in Schedule 2 are species that had been designated as endangered or threatened, and have yet to be re-assessed by COSEWIC using revised criteria. Once these species have been re-assessed, they may be considered for inclusion in Schedule 1.
 Schedule 3: species listed in Schedule 3 are species that had been designated as special concern, and have yet to be re-assessed by COSEWIC using revised criteria. Once these species have been re-assessed, they may be considered for inclusion in Schedule 1.

The Act establishes Schedule 1 as the official list of wildlife species at risk. However, please note that while Schedule 1 lists species that are extirpated, endangered, threatened and of special concern, the prohibitions do not apply to species of special concern.

Species that were designated at risk by COSEWIC prior to October 1999 (Schedule 2 & 3) must be reassessed using revised criteria before they can be considered for addition to Schedule 1 of SARA. After they have been assessed, the Governor in Council may on the recommendation of the Minister, decide on whether or not they should be added to the List of Wildlife Species at Risk.

⁵Habitat Present on Site
 Determination of suitability of the site to be support each species based on 'Key-Habitats Used By Species'.
 Yes - Specific habitat present and species and / or evidence observed.
 Likely - The whole study area or portions of it contain conditions that could support the species.
 Unlikely - Few similarities between study area conditions and preferred habitat exist.
 No - Specific habitat not present and species and / or evidence not observed.

Project Name: Waite Municipal Drain
 Project Number:300041611.0000

COMMON NAME	SCIENTIFIC NAME	Provincial S-RANK ¹	Provincial SARO Status ²	COSEWIC ³	Federal SARA Status ¹	Federal SARA Schedule ⁴	Habitat Description	Habitat Present in Study Area?	Species Observed?
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¹Species Observed
 Reported sighting of species during fall field investigations by P.B. biologists

Additional Sources:

Sources:
¹ Cadman, M.D., et al. (eds). 2007. *Atlas of the Breeding Birds of Ontario, 2001-2005*. Bird Studies Canada, Environment Canada, Ontario Field Ornithologists, Ontario Ministry of Natural Resources, and Ontario Nature, Toronto. xii + 706 pp.
² Species at Risk Public Registry <http://www.sararegistry.gc.ca>
³ McCracken, J.D. et al. 2013. *Recovery Strategy for the Bobolink (Dolichonyx oryzivorus) and Eastern Meadowlark (Sturnella magna) in Ontario*. Ontario Recovery Strategy Series, Prepared for the Ontario Ministry of Natural Resources and Forestry, Peterborough, Ontario. viii + 88 pp.
⁴ MNR SARO List Species Descriptions (http://www.mnr.gov.on.ca/nr/business/Species/Columns/SubPage/MNR_SARO_CSSR_SARO_LIST_EU.html)
⁵ COSEWIC Species Assessment Report
⁶ Naughton, Donna. 2012. *The Natural History of Canadian Mammals*. Canadian Museum of Nature and University of Toronto Press, Toronto. + 764 pp.
⁷ Farrar, John Laird. 2017. *Trees in Canada*. Natural Resources Canada | Canada Forest Services, and, Fitcheny & Whitehead Limited. pp.238 - 239
⁸ Ontario Nature Reptile and Amphibian Atlas (<https://ontariounature.org/programs/conservation-science/reptile-amphibian-atlas/index.html>)
⁹ Environment Canada. 2015. *Recovery Strategy for Little Brown Myotis (Myotis lucifugus), Northern Myotis (Myotis septentrionalis) and Tri-colored Bat (Perimyotis subflavus) in Canada* [Proposed]. Species at Risk Act Recovery Strategy Series, Environment Canada, Ottawa. ix + 110 pp.
¹⁰ Humphreys, C. 2017. *Recovery Strategy for the Eastern Small-footed Myotis (Myotis leibii) in Ontario*. Ontario Recovery Strategy Series, Prepared for the Ontario Ministry of Natural Resources and Forestry, Peterborough, Ontario. vi + 76 pp.
¹¹ Department of Fisheries and Oceans (DFO) Aquatic Species at Risk found online at: <http://www.dfo-mpo.gc.ca/species-especes/sara-lespeces/eng/index.html>
¹² Paulson, C. 2011. *Dragonflies and Damselflies of the East*. Princeton University Press, Princeton, NJ.
¹³ Harding, J.H. 1997. *Amphibians and Reptiles of the Great Lakes Region*. The University of Michigan Press, Ann Arbor, Michigan.
¹⁴ MNR. 2018. *City of Niagara Falls Species at Risk Table*. Guelph District.
¹⁵ Michigan Flora found online at <https://michiganflora.net/search.aspx>
¹⁶ Natural Heritage Information Centre (<https://www.ontario.ca/page/natural-heritage-information>)
¹⁷ McKnight, K.B. et al. 2013. *Common Mosses of the Northeast and Appalachians*. Princeton University Press, Princeton, New Jersey.
¹⁸ Oldham, W.J., and S.R. Brinker. 2009. *Rare Vascular Plants of Ontario*, Fourth Edition. Natural Heritage Information Centre, Ontario Ministry of Natural Resources, Peterborough, Ontario. 188 pp.



Appendix H

Design Summary

Appendix H

Design Summary

1.0 Introduction

This appendix is intended to provide a summary of the various design tools and techniques featured with this project. In general, each component of the drainage system was designed by evaluating land use and soil characteristics of the watershed area contributing to the component of interest.

1.1 Project Background

The watershed is located near the Village of Cameron, Ontario.

Land use within the contributing watershed contains a mainly agricultural upstream area, with smaller areas of bush, and low-density residential.

1.2 Existing Drainage Systems

The watersheds are not currently serviced by existing municipal drains, currently overland flow is the dominant runoff mechanism with random subsurface private drainage likely present.

Western Basin

The western basin currently begins in Lot 11, Concession 6 and outlets through surface culverts under both Cameron and Chambers Roads. Runoff travels through a surface low-run between the two roads on Lot 10, Concession 6 and enters a pond west of Cameron Road on Lot 10, Concession 5. From the pond, another low-run heads west where it turns into a shallow channel.

Southern Basin

The southern basin currently outlets under Cameron Road from Lot 9, Concession 6 through a surface culvert and proceeds west along a shallow swale turning northwards within the residential properties. Within the residential properties, the swale has an easement of varying widths. The swale becomes less defined as it proceeds north and west on pasture lands, outletting into the shallow channel discussed for the western basin outlet on Lot 9, Concession 5.

Eastern Basin

The eastern basin begins in Lots 9 & 10, Concession 6 as a low-run and crosses Highway 35 through a surface culvert. The low-run outlets into a pond on Lot 10, Concession 6 and into the western rail ditch on the City's rail trail. This ditch then crosses under the rail trail by an existing mixed-material culvert and outlets to the east into the wetland on Lot 10, Concession 6.

The design of the proposed Eastern Branch and the surface and subsurface Highway 35 crossings in particular were reviewed and summarized in the January 2020 hydrology and hydraulics report by Burnside, titled “Highway 35 Crossing Assessment”. Please refer to this report for more information, it is available upon request.

2.0 Design Criteria

2.1 Municipal Drains

2.1.1 Pipe Systems

The applicable sections of the “A Guide for Engineers Working Under the Drainage Act in Ontario” (Publication 852), and the applicable sections of the “Drainage Guide for Ontario” (Publication 29), both of which were published by the Ontario Ministry of Agriculture, Food, and Rural Affairs (OMAFRA), were used to determine and supplement the design considerations for this drain.

Closed municipal drainage systems are typically designed using the drainage coefficient method. This method is recommended for agricultural drainage design by the OMAFRA Publication 852.

Under this method, the system is sized to convey the flow rate resulting from draining a specific depth of water from the watershed area over 24 hours. **This depth represents the drainage coefficient which is 38.1 mm (1.5 inches) in this scenario.** The drainage coefficient of 38.1 mm is the maximum coefficient considered eligible for the Agricultural Drainage Infrastructure Program grant that is administered by OMAFRA.

This design methodology is applicable only to properties requiring agricultural tile drainage outlet within the contributing watershed.

2.1.2 Channel Systems

The *Guide for Engineers working under the Drainage Act in Ontario* recommends that open municipal drainage systems be designed to convey flows resulting from the 2-Year flood event as a minimum. Periodic flooding due to larger storms or snow melt conditions is considered acceptable for agricultural lands. **The sections of the Waite Municipal Drain channel requiring improvement has been designed according to this guideline as a minimum.**

Applicable components of the open drainage system were reviewed to ensure that the design criteria specified in Table 1 was met.

Table 1: Design Storm Return Period Selection

Component	Design Storm Return Period ¹
Channel - Rural/Agricultural	2 year
Field Crossings	2 - 5 year

Component	Design Storm Return Period ¹
Residential or Major Agricultural Crossings	5 - 10 year
Lower-Tier Municipal Road Crossing	5 - 10 year
Upper-Tier Municipal Road Crossing	10 - 25 year

¹The Municipality and Conservation Authority may require a design varying from those listed
 Source: OMAFRA Publication 852 (Table B2-2), dated 2018.

2.2 Overflow Pathways

Both the drainage coefficient method and design storm return periods were used to design the subsurface and channel drainage systems. Additionally, a defined overland flow path was designed as part of this project to accommodate larger RP flood while working in tandem with existing and proposed drainage system.

2.3 Culvert Crossings

2.3.1 MTO Right-of-way

The analysis of existing and proposed surface culvert designs within the MTO right-of-way were completed in accordance with the Ministry of Transportation’s Highway Drainage Design Standards, January 2008. Given that the culverts drain surface runoff from the roadway and adjacent private lands, the following standards were used:

- SD-1 Design Flows for Surface Drainage Systems; and
- SD-13 Design Flows and Freeboards for Culverts not on a Watercourse.

It should be noted that these design criteria were not used in the design of the downstream municipal drain system, as periodic flooding of agricultural lands is considered acceptable.

Further information regarding the Highway 35 crossing can be found in the January 2020 hydraulic assessment prepared by Burnside and available upon request.

2.3.2 Existing Culverts

Surface Culverts

The existing surface culverts on both Cameron and Chambers Road were included in the model, however they are not intended to meet the MTO drainage design requirements (no design RP flood was used). Instead, they act as ‘equilibrium’ culverts, allowing gradual transfer of runoff under the road over time. **When these culverts were installed by the road authority, surface storage was taken into account for practical reasons, requiring a smaller diameter culvert for this application.**

Channel Crossings

The existing Rail Trail crossing located on the Eastern Branch was evaluated against the OMAFRA Publication 852 requirements described in Table 1.

3.0 Hydrology

3.1 Drainage Coefficient Method

The criteria for piped drain design were determined using the drainage coefficient method. A drainage coefficient represents the depth of water to be removed from a watershed by the piped drain over a 24-hour period. Based on this depth, a design flow rate was calculated and used to determine the piped drain configuration.

Under OMAFRA Publication 29 - Drainage Guide for Ontario it is recommended to use a drainage coefficient for the underdrainage requirements of cleared, worked, agricultural land and to consider an additional drainage coefficient for the surface water requirements of all lands and roads within the watershed area.

For this project, a drainage coefficient of 19.05 mm ($\frac{3}{4}$ inch) for under drainage requirements, and 19.05 mm ($\frac{3}{4}$ inch) for surface water requirements over a 24-hour period has been used.

Together, this produces a combined design coefficient of 38.1 mm ($1\frac{1}{2}$ inches) in 24 hours, and following discussion with the property owners, this coefficient was selected as the design standard for this project.

3.2 Hydrological Modelling

PCSWMM was used to create a hydrologic and hydraulic model to simulate effects of various return period design rainfall events on components of the drainage system. PCSWMM software combines hydrologic and hydraulic inputs to provide both outputs simultaneously.

3.2.1 Input Parameters

Input parameters for hydrologic and hydraulic modelling were based on watershed land use gathered from aerial photography, soil reports and mapping, published hydrologic and hydraulic values, among other relevant resources.

Topographic information including ground elevations, channel cross sections, and culvert dimensions and invert elevations was collected during the on-site survey.

Hydrologic Soil Group

Publication 29 – the Drainage Guide for Ontario by OMAFRA classifies soils into Hydrologic Soil Groups (HSG) based on the estimated water intake rate of a soil after wetting, and inversely, the surface runoff rate from that soil per the United States Department of Agriculture (USDA) - *Technical Release 55 (1986)*.

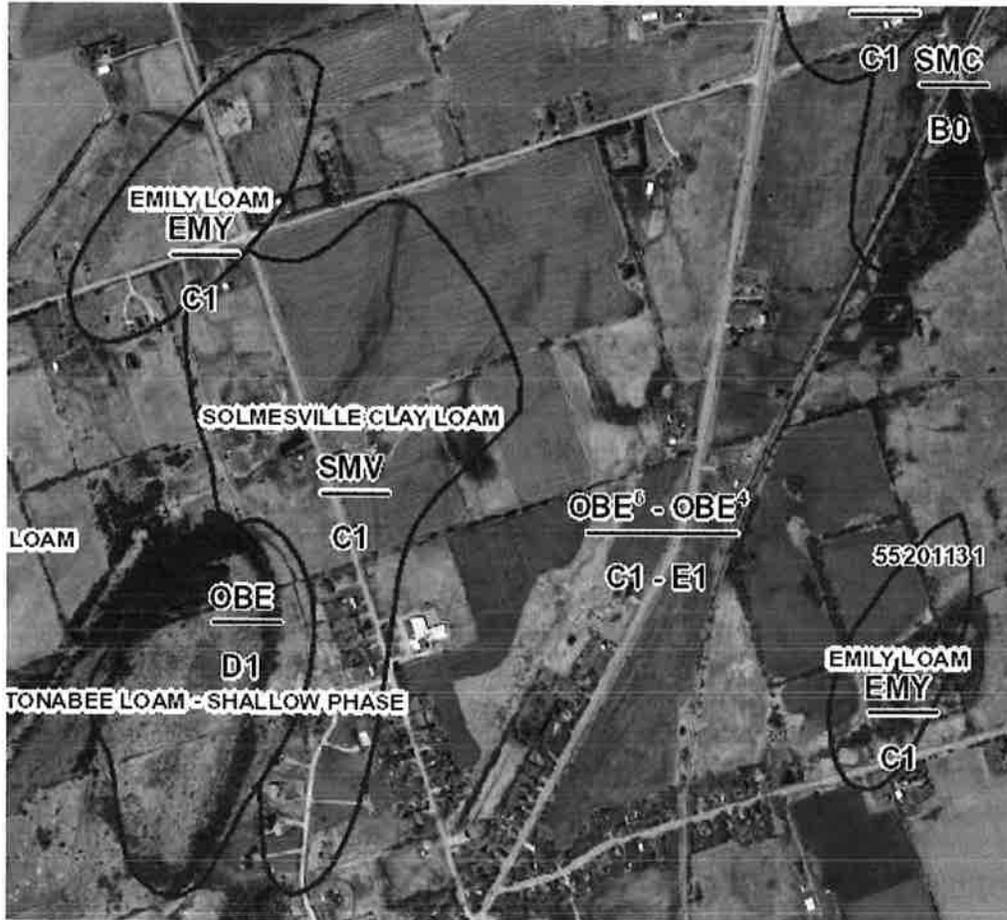


Figure 1: Watershed soil mapping (source: Ag Maps Website)

Otonabee Loam is classified as HSG 'B':

- Located primarily in the Eastern Branch watershed.
- Soil types classified under HSG 'B' soils, typically sandier, have moderate infiltration rates with good drainage.

Solmesville Clay Loam as HSG 'C':

- Located primarily in the Western & Southern Branch watersheds.
- Soil types classified under HSG 'C' soils, typically more clays, have slow infiltration rates with imperfect drainage.

Surface Runoff and Infiltration

The SCS curve number method was chosen to estimate surface runoff based on its development by the Natural Resources Conservation Service (NRCS) and the United States Department of Agriculture (USDA) for small watersheds as outlined in Technical Release 55 (1986) and the NRCS Engineering Handbook, Part 630.

This method estimates surface runoff based on land use and classifies soils into four hydrologic soil groups (HSG) as described above, with a comprehensive listing of curve numbers for both rural and urban environments and scenarios.

Design Storms

The 24-hour duration SCS Type II rainfall distribution from the Natural Resources Conservation Service (NRCS) was chosen to provide design storms for this simulation.

The SCS Type II storm distributions are applicable to large, rural, and mixed watersheds like the subject site. The 24-hour duration storm was then chosen in this simulation, as it produced the larger and more conservative flow estimates for this watershed than shorter duration storms.

The Ministry of Transportation (MTO) intensity duration frequency (IDF) curve tool was used to develop a local IDF curve for the watershed and determine rainfall amounts and intensities for various return period design events.

The various return periods and corresponding rainfall depths for a 24-hour storm are shown in Table 2.

Table 2: 24-Hour Rainfall Depths for the Project Site near Cameron, ON.

Rainfall Depth for Design Storm RP (mm)					
2-yr	5-yr	10-Yr	25-Yr	50-Yr	100-Yr
Site Location near Cameron, ON					
56.5	74.7	86.9	102.3	113.5	124.9
Source: MTO IDF Lookup Tool (2010 Curve Year) – Location: Cameron, ON. (Chosen for this project)					

Watershed Storage and System Assumptions

Initial abstractions in hydrology are parameters that represent the cumulative storage of rainfall prior to runoff occurring, which typically include:

- Interception;
- Infiltration;
- Evaporation; and
- Surface depression storage.

Infiltration and surface depression storage parameters are typically the most sensitive with event-based rainfall-runoff models due to the length of simulation and are represented by published values in this model. Additionally, interception is taken into account through land use and the associated curve number value selected.

As an industry best practice for one-dimensional models, watershed storage is not considered from a hydraulic perspective when simulating the peak flow hydrology for channel and structure design, for example the potential storage area upstream of a road when designing a culvert crossing. As such, the peak flow rates simulated for the watershed may be considerably larger than those observed within the watershed, and this was confirmed anecdotally through stakeholder comments.

All hydrological simulations for design flows (existing conditions) were run assuming a barrier free conduit system, where the peak flow at a given location is unobstructed where all sections of the drainage system were sized as required to accommodate unobstructed flow from all design storm events.

3.2.2 Simulation Results

The 2-year return period design storm was simulated with the PCSWMM model for design purposes, including current land use conditions within the contributing watershed. Additional hydrologic simulation results for return periods not shown are available upon request. Simulations were used to determine the peak flow rates at various points in the watershed, to aid in the design on the component of interest.

4.0 Hydraulic Review

4.1 Existing Pipe System

No known sub-surface systems were known to exist in the contributing watershed during the preparation of this report, therefore no review was completed.

4.2 Existing Channel and Structures

Existing Channels

A standalone review of the existing open drainage system was not performed for this project due to the overall minor deepening and widening proposed in an area that is currently agricultural.

Existing Structures

The existing surface and channel crossings were evaluated against the design criteria as described above (OMAFRA Publication 852).

5.0 Hydraulic Design

5.1 Drainage System Design

Sub-Surface Pipe System (Minor System)

The diameter of the pipe used in the design depends on the pipe grade, material, and conveyance required for the selected drainage coefficient. Using Manning's equation, the capacity of a given pipe design is calculated to determine if it meets or exceeds the conveyance requirements. A summary of the required conveyance capacity and design capacity of the various piped components for this system is provided in Table 3.

Table 3: Closed Drain Design Summary

Station (m)	Station (m)	Required Capacity (L/s)	Pipe Diameter (mm)	Mannings 'n'	Pipe Capacity (L/s)	Pipe Capacity (%)
<u>Eastern Branch – Option 1</u> (38.1 mm DC, total watershed contributing area = 48.6 ha.)						
0+231	0+182	172	525 HDPE	0.013	236	73
0+182	0+143	204	600 SWWSP	0.013	336	61
0+143	0+000	215	2 – 375 PDT	0.021	247	87
<u>Eastern Branch – Option 2</u> (38.1 mm DC, total watershed contributing area = 48.6 ha.)						
0+231	0+182	172	525 HDPE	0.013	236	73
0+182	0+143	204	600 SWWSP	0.013	336	61
0+143	0+000	215	450 HDPE	0.013	325	66
<u>Western Branch – Option 1</u> (38.1 mm DC, total watershed contributing area = 22.5 ha.)						
0+670	0+227	57	1 – 375 PDT	0.021	71	81
0+227	0+183	97	2 – 375 PDT	0.021	109	89

Station (m)	Station (m)	Required Capacity (L/s)	Pipe Diameter (mm)	Mannings 'n'	Pipe Capacity (L/s)	Pipe Capacity (%)
0+183	0+160	97	600 SWWSP	0.013	194	50
0+160	0+000	100	2 – 375 PDT	0.021	109	92
Western Branch – Option 2						
<i>(38.1 mm DC, total watershed contributing area = 22.5 ha.)</i>						
0+670	0+227	57	300 HDPE	0.013	236	91
0+227	0+183	97	450 HDPE	0.013	325	68
0+183	0+160	97	600 SWWSP	0.013	336	50
0+160	0+000	100	450 HDPE	0.013	247	70

It should be noted that the design was completed using Manning's Equation which assumes full pipe flow under gravity conditions resulting from the drainage coefficient method hydrology. Additional flow would surcharge the system leading to pressurized flow which was confirmed using the PCSWMM model.

Overflow Pathway (Major System)

The Eastern Branch's swale design was based on the peak flow from the 2-yr RP flood, while working in tandem with the sub-surface drainage system. This would essentially provide a designated overland flow path for larger flood scenarios. This conduit was designed as a grassed swale in all areas except for surface road culverts.

5.2 Channel System

The capacity of the proposed channel was designed to ensure it could convey a minimum 2-Year return period design flood as specified in Table 1 above. The channel design was performed using Manning's Equation using the design calculator 'Hydraulic Toolbox' by the Federal Highway Administration (FHWA) and PCSWMM simulations. Under OMAFRA publication 852, the minimum recommended channel freeboard of 0.1 to 0.3 m was included as part of this design.

5.3 Culvert Crossings

The Rail Trail culvert crossings was evaluated for capacity based on the simulated 2-yr and 5-yr RP peak flood results. The hydraulic performance of this crossing was evaluated using the HY-8 culvert analysis software from the FHWA, in addition to the PCSWMM simulations.

For a field crossing providing access to rural or agricultural land only, the structure should convey up to the 5-year floods without overtopping of the crossing.

This crossing evaluation for design was completed per the OMAFRA guidelines in Publication 852, specifying a 2 to 5-yr RP flood for this crossing type. The simulation results indicate that the existing crossing conveyed under both the 2-yr and 5-yr floods, with no overtopping.

Additionally, simulated outlet velocities from the existing culvert were approximately 1.8 m/s under the 5-yr RP flood. This will be addressed through rip-rap erosion protection and a stilling basin immediately downstream of the culvert.

In the future, should these or any new crossings should be re-evaluated when a new crossing is required to determine if an increase in capacity is desired by the landowners. Future replacement or new crossings should be evaluated by a qualified Engineer to determine specific minimum crossing sizing to ensure the crossing does not become an obstruction to the drain.

Table 8: 2-yr RP Design Flood – Design Summary

Station Interval (m)		Description	Required Capacity (*CMS)	Channel/Swale Dimensions
Western Branch (Channel)				
-W0+102	-W0+055	B. & K. Johnston (Roll No. 21-402)	1.15	<ul style="list-style-type: none"> • Bottom Width of 0.6 m; • Bench width of 1.4 m; • Bench height 0.3 m; • 3H:1V Sideslopes (one bank construction only); • 600 mm total depth (min).
-W0+055	W0+000	C. Malcolm (Roll No. 21-300)	0.69	
Southern Branch (Swale)				
S0+000	S0+118	B. & K. Johnston (Roll No. 21-402)	0.59	<ul style="list-style-type: none"> • Bottom Width of 2 m; • 5H:1V Sideslopes; • 450 mm depth (min).
S0+118	S0+239	C. Malcolm (Roll No. 21-300)	0.47	
S0+239	S0+429	Various	0.15	
Eastern Branch (Swale)				
SE0+000	SE0+167	B. Clive (Roll No. 010-369-00)	0.65	<ul style="list-style-type: none"> • Bottom Width of 2 m; • 5H:1V Sideslopes; • 450 mm depth (min).
SE0+167	SE0+174	MTO Highway 35	0.65	
Eastern Branch (Channel)				
-E0+108	-E0+061	G. Stewart (Roll No. 010-365-00)	1.05	<ul style="list-style-type: none"> • Bottom Width of 0.6 m;

Station Interval (m)		Description	Required Capacity (*CMS)	Channel/Swale Dimensions
-E0+051	E0+000	City of Kawartha Lakes (Rail Trail)	1.05	<ul style="list-style-type: none"> • 2H:1V Sideslopes; • 1.0 m depth (min).
*Conversion: 1 CMS = 1,000 L/s				

6.0 Additional Features for Water Quality

6.1 Agency Review

A submission regarding this project has been made to the DFO and MECP regarding species at risk (SAR), and discussions with the Kawartha Region Conservation Authority (KRCA) are ongoing.

The CA has timing windows for in-water works concerning erosion and sediment control. These would apply to proposed work in the proposed municipal drain and the design of piped drains outletting directly into it.

6.2 Sediment Control

Sediment Basins

Permanent sediment basins have been included with this design. Using these structures, the frequency of maintenance to the drain should be lowered, and work should be more concentrated to these cleanout areas. Maintenance work should be performed in a timely manner by the Drainage Superintendent to ensure the effectiveness of this approach.

A permanent sediment basin shall be constructed at the downstream end of the channel excavation on the following drains:

- **Eastern Branch**
- **Southern Branch**
- **Western Branch**

The permanent sediment basins were designed to be over-excavated to a specified depth (typically 600 mm to 1,000 mm below invert) to allow water to slow and deposit sediment.

Sediment Control Structure

Immediately downstream of the sediment basin, a rock protected bio-filter sock check dam shall be constructed to further enhance sediment deposition, prior to exiting the construction zone.

Both shall be constructed prior to construction commencing and in accordance with the applicable environmental agency regulations and instructions.

Prior to construction, bio-filter socks (or approved equivalent) will be installed in major low runs entering the channel from the side of the drain ROW, as directed by the Engineer. These socks are primarily to treat surface runoff from the adjacent fields prior to the establishment of the vegetative buffer strip.

6.3 Riparian Buffer Strips

A 3 m grassed buffer has been included with this design on both sides of the channel for the entire length of the proposed channel work on the proposed municipal drain. This buffer will serve as both a minimum setback distance for agricultural work, as well as a physical barrier for sediment laden runoff entering the channel.

Vegetated buffer strips along both natural watercourses and open drains are generally accepted as proper land stewardship and a Best Management Practice for the agricultural industry in Ontario and other parts of North America. This concept is supported by such OMAFRA publications as “Best Management Practices – Buffer Strips” and “A Guide for Engineers working under the Drainage Act in Ontario” (Publication 852)”. As part of the improvement to this municipal drain, buffer strips will be established and maintained along the open drain as described and applicable allowances provided accordingly.



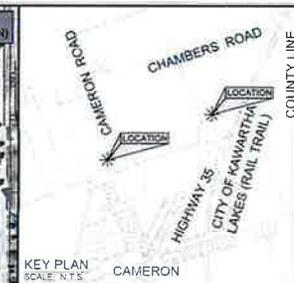
BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]



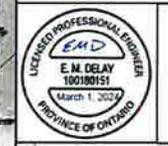
Appendix I

Drawings



- LEGEND:**
- WATERSHED BOUNDARY
 - SUB WATERSHED BOUNDARY
 - PROPOSED DRAIN LOCATION AND DIRECTION
 - BENCHMARK NUMBER
 - PROPOSED STRUCTURE
 - EXISTING DRAIN LOCATION AND DIRECTION
 - ACCESS ROUTE
 - DIRECTION OF SURFACE FLOW
 - ROLL NUMBER AFFECTED AREA
 - SHARED ROLL NO.

NOT FOR CONSTRUCTION



No.	Issue / Revision	Date	Auth.
1	ISSUED FOR INFO MEETING NO. 1	2018/05/02	EMD
2	ISSUED FOR INFO MEETING NO. 2	2018/07/25	EMD
3	ISSUED FOR AGENCY REVIEW	2019/04/18	EMD
4	ISSUED FOR DRAFT REPORT	APR 2023	EMD
5	ISSUED FOR ENGINEER'S REPORT	FEB 2024	EMD

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 Telephone (905) 355-1521, Fax (905) 357-3624
 web: www.burnside.com

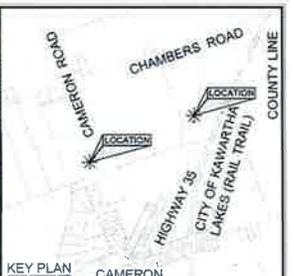
CITY OF KAWARTHA LAKES
 26 FRANCES STREET
 LINDSAY, ONTARIO
 K9V 5R8

WATER MUNICIPAL DRAIN
WATERSHED PLAN

- BENCHMARKS:**
- BENCHMARK # 1 ELEVATION 272.81m**
NAIL IN HYDRO POLE ON WEST SIDE OF HIGHWAY 35 SOUTH OF STA EC-169
 - BENCHMARK # 2 ELEVATION 269.67m**
NAIL IN HYDRO POLE ON WEST SIDE OF RAIL TRAIL AT STA B-0-050
 - BENCHMARK # 3 ELEVATION 275.37m**
NAIL IN HYDRO POLE ON EAST SIDE OF CAMERON ROAD AT STA W0-222
 - BENCHMARK # 4 ELEVATION 277.26**
NAIL IN HYDRO POLE ON SOUTH SIDE OF CAMERON ROAD AT STA W0-670

No.	OWNER	ROLL NO.	AFFECTED AREA (ha.)
1	C. PARSON & J. EAGAN	010-352-00	0.64
2	R. & B. WHYTE	010-353-00	0.16
3	I. & C. YOUNG & S. VAN EK	010-354-00	0.07
4	J. CUNHA	010-355-00	0.18
5	R. WHITE & T. THIELE	010-355-01	0.19
6	D. FISHER	010-356-00	0.26
7	R. & D. KIMBERLEY	010-356-01	0.17
8	E. CONNER	010-361-00	0.13
9	M. KELSO	010-209-01	0.2
10	K. MCQUADE & C. CARTER	010-209-02	0.21
11	R. & M. WATSON	010-209-03	0.21
12	T. & D. MCCONNELL	010-209-04	0.22
13	D. MACDONALD & L. KING	010-209-05	0.22
14	F. & A. HACK	010-325-01	0.76
15	A. & K. WELCH	010-325-02	0.88
16	J. & P. CADDEN	010-325-03	0.78
17	W. & F. MOORE	010-325-84	0.27
18	BOARD OF EDUCATION TRILLIUM LAKELANDS	010-362-00	3.21

Drawn By	Checked	Drawn	Checked	Drawing No.
GGB/MLC	EMD	GAG	EMD	
Sheet No.	Project No.			
201715107	300041611			
Scale				
1:8,000				

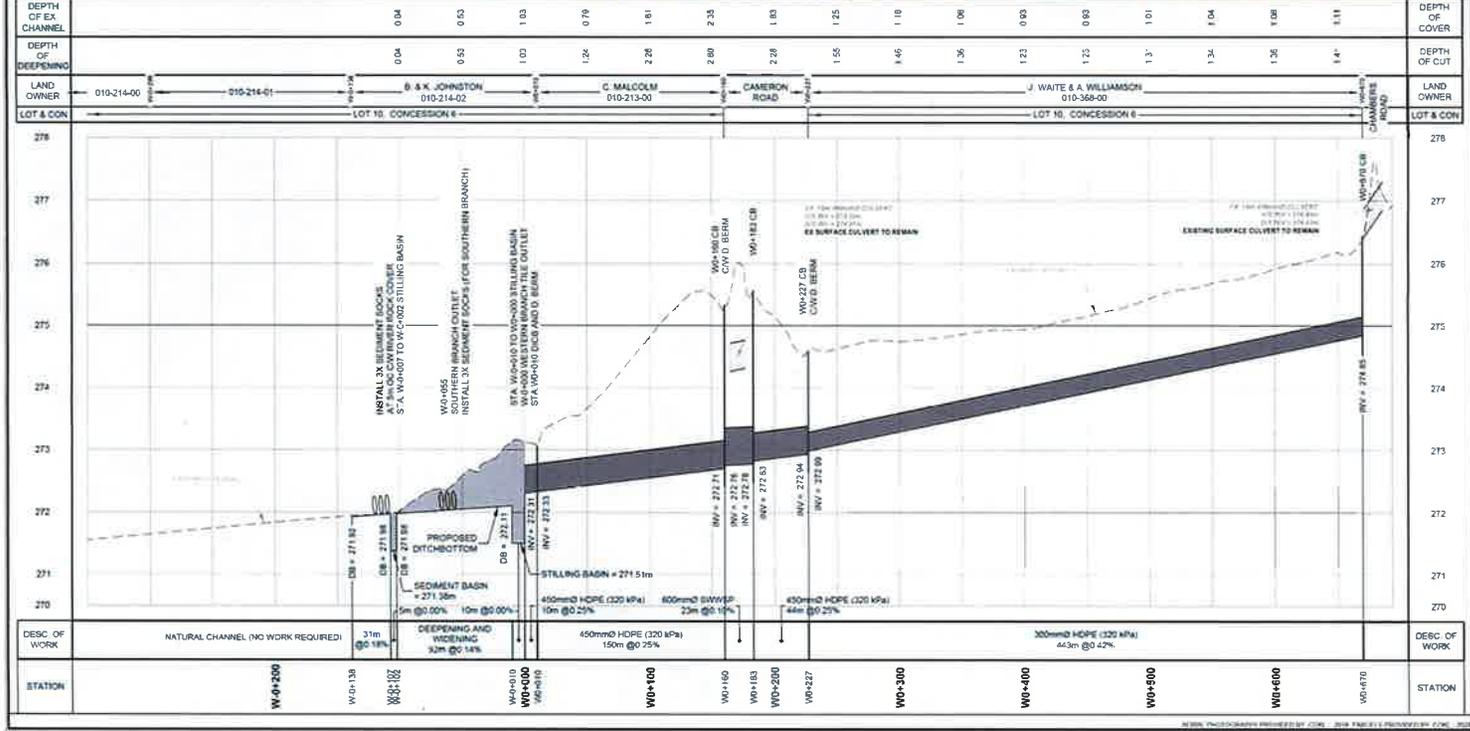


LEGEND:

- WATERSHED BOUNDARY
- SUB WATERSHED BOUNDARY
- PROPOSED DRAIN LOCATION AND DIRECTION
- BENCHMARK NUMBER
- PROPOSED STRUCTURE
- EXISTING DRAIN LOCATION AND DIRECTION
- ACCESS ROUTE
- DIRECTION OF SURFACE FLOW
- ROLL NUMBER AFFECTED AREA
- SHARED ROLL NO.

BENCHMARKS:

- BENCHMARK # 1 ELEVATION 272.81m
NAL IN HYDRO POLE ON WEST SIDE OF HIGHWAY 35 SOUTH OF STA E0-189
- BENCHMARK # 2 ELEVATION 268.27m
NAL IN HYDRO POLE ON WEST SIDE OF RAIL TRAIL AT STA E-0-050
- BENCHMARK # 3 ELEVATION 275.37m
NAL IN HYDRO POLE ON EAST SIDE OF CAMERON ROAD AT STA W0-220
- BENCHMARK # 4 ELEVATION 277.26m
NAL IN HYDRO POLE ON SOUTH SIDE OF CAMERON ROAD AT STA W0-670



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- Site drawings shall be read and understood in conjunction with all other plans and documents applicable to this project.
- All projects, plans and approvals shall be understood in relation only.

NOT FOR CONSTRUCTION

No.	Issue / Revision	Date	Auth
1	ISSUED FOR INFO MEETING NO. 1	2018/05/02	EMD
2	ISSUED FOR INFO MEETING NO. 2	2018/07/25	EMD
3	ISSUED FOR AGENCY REVIEW	2019/04/18	EMD
4	ISSUED FOR DRAFT REPORT	APR 2022	EMD
5	ISSUED FOR ENGINEER'S REPORT	FEB 2024	EMD

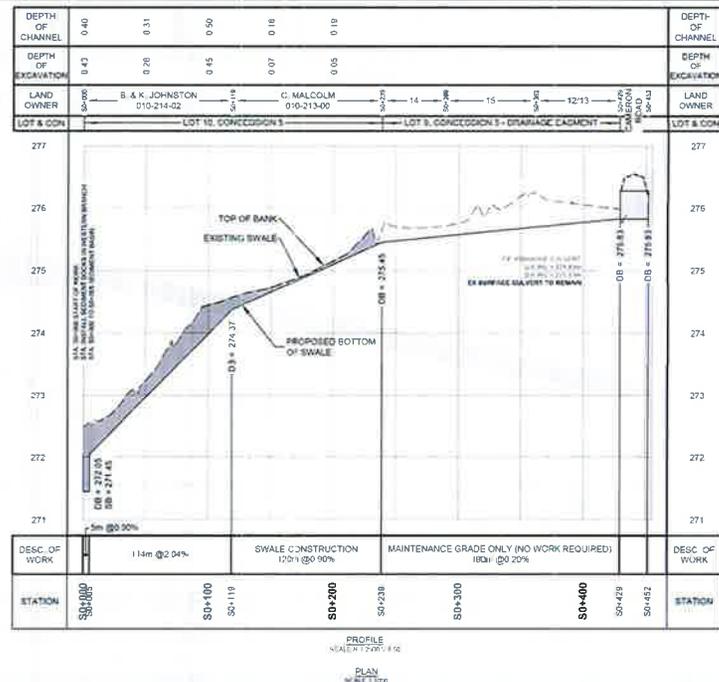
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 telephone (519) 357-1521 fax (519) 357-3624
 web: www.burnside.com

CITY OF KAWARTHA LAKES
 25 FRANCES STREET
 LINDSAY, ONTARIO
 K9V 5R8

Drawn by: **WATE MUNICIPAL DRAIN**
WESTERN BRANCH

Checked DGB-NLC	Checked EMD	Drawn GAG	Checked EMD	Drawing No. 2 of 8
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Date: 2023/11/07
 Project No: 300041511
 Scale: 1:2,500



KEY PLAN
SCALE: N.T.S.
CAMERON

LEGEND:

- WATERSHED BOUNDARY
- SUS WATERSHED BOUNDARY
- PROPOSED DRAIN LOCATION AND DIRECTION
- BENCHMARK NUMBER
- PROPOSED STRUCTURE
- EXISTING DRAIN LOCATION AND DIRECTION
- ACCESS ROUTE
- DIRECTION OF SURFACE FLOW
- ROLL NUMBER AFFECTED AREA
- SHARED ROLL NO.

NOT FOR CONSTRUCTION

Licensed Professional Engineer
E.M. DELAY
100180151
March 1, 2023
PROVINCE OF ONTARIO

NO.	Issue / Revision	Date	Auth.
1	ISSUED FOR INFO MEETING NO. 1	2018/09/02	EMD
2	ISSUED FOR INFO MEETING NO. 2	2018/07/25	EMD
3	ISSUED FOR AGENCY REVIEW	2019/04/18	EMD
4	ISSUED FOR DRAFT REPORT	APR 2023	EMD
5	ISSUED FOR ENGINEER'S REPORT	FEB 2024	EMD

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CITY OF KAWARTHA LAKES
28 FRANCES STREET
LINDSAY, ONTARIO
K9V 5R8

WATER MUNICIPAL DRAIN
SOUTHERN BRANCH

Checked	Checked	Drawn	Checked	Checked
GGB/M.C.	EMD	GAG	EMD	

Cell Date: 2017/11/07
Project No: 300041611
Scale: AS NOTED

3 of 8



KEY PLAN
SCALE: N.T.S.
CAMERON

LEGEND:

- WATERSHED BOUNDARY
- SUB WATERSHED BOUNDARY
- PROPOSED DRAIN LOCATION AND DIRECTION
- BENCHMARK NUMBER
- PROPOSED STRUCTURE
- EXISTING DRAIN LOCATION AND DIRECTION
- ACCESS ROUTE
- DIRECTION OF SURFACE FLOW
- ROLL NUMBER AFFECTED AREA
- SHARED ROLL NO.

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- All property lines are approximate and subject to information provided.

DEPTH TO OBVERT	1.88	1.75	2.00	2.00	2.00	1.80	1.80	3.05	2.02	1.79	1.90	1.54	1.87	1.79	1.71	1.63	1.54	1.49	1.38	1.30	1.22	1.14	1.06	1.15	1.01	0.82	0.55	0.32	0.79	1.45	0.30	0.28	0.15	0.15	0.05	0.04	0.03	
DEPTH TO INVERT	2.21	2.32	2.55	2.56	2.53	2.40	2.23	3.05	2.62	2.24	2.35	2.30	2.32	2.24	2.16	2.08	1.99	1.91	1.83	1.75	1.67	1.59	1.51	1.40	1.15	1.01	0.62	0.55	0.32	0.79	1.45	0.30	0.28	0.15	0.15	0.05	0.04	0.03
LAND OWNER	D. GARDNER (D10-369-01)			HIGHWAY 35			B. CLIVE (D10-369-00)			CITY OF KAWARTHA LAKES (TRAIL) (000-630-00)										G. STEWART (D10-365-00)																		
LOT & CON	LOT 10 CONFESSION 8			LOT 10 CONFESSION 8			LOT 10 CONFESSION 8			LOT 10 CONFESSION 8										LOT 10 CONFESSION 8																		

NOT FOR CONSTRUCTION

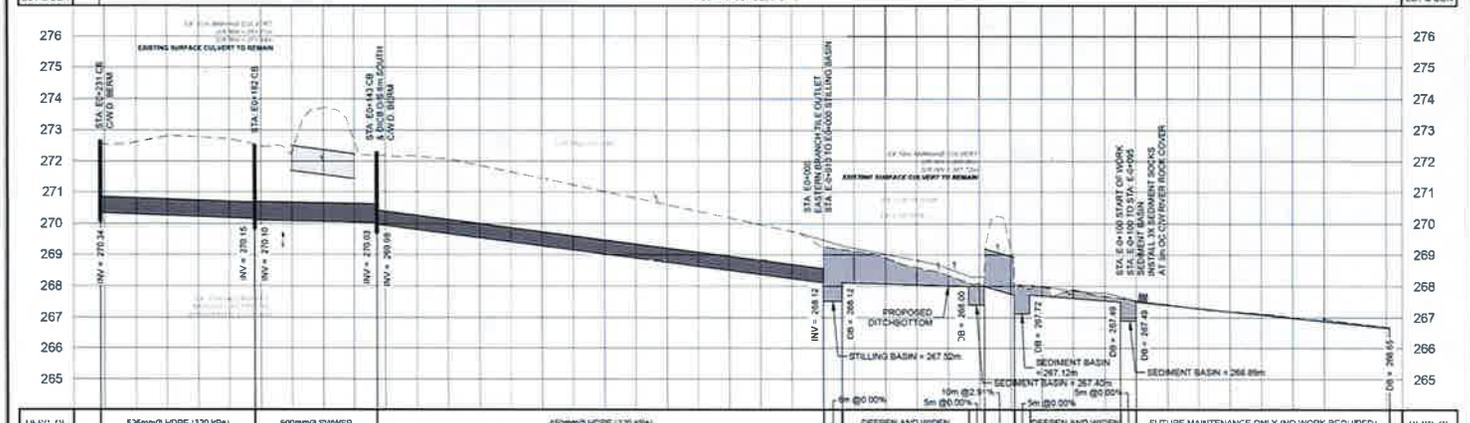


No.	Issue / Revision	Date	Auth.
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2	ISSUED FOR INFO MEETING NO. 2	2018/07/25	EMD
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5	ISSUED FOR ENGINEER'S REPORT	FEB 2024	EMD

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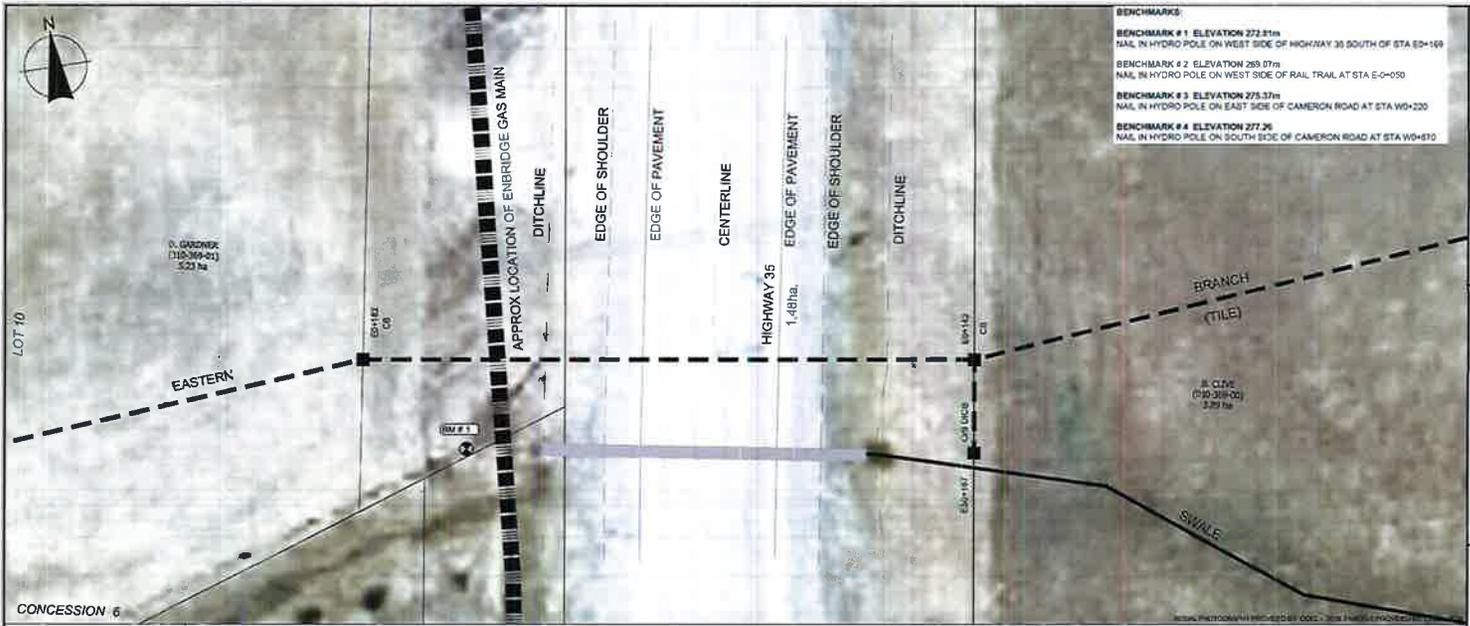
CITY OF KAWARTHA LAKES
26 FRANCES STREET
LINDSAY, ONTARIO
K7V 5R8

WAITE MUNICIPAL DRAIN
EASTERN BRANCH



STATION	DESC. OF WORK	STATION	DESC. OF WORK
E0+201	525mm HDPE (320 kPa) 4m @ 0.3%	E0+110	DEEPEN AND WIDEN 45m @ 1.04%
E0+220	600mm SSWSP 3m @ 0.20%	E0+120	DEEPEN AND WIDEN 29m @ 0.20%
E0+210		E0+130	
E0+200		E0+140	
E0+190		E0+150	
E0+180		E0+160	
E0+170		E0+170	
E0+160		E0+180	
E0+150			
E0+140			
E0+130			
E0+120			
E0+110			
E0+100			
E0+090			
E0+080			
E0+070			
E0+060			
E0+050			
E0+040			
E0+030			
E0+020			
E0+010			
E0+000			
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E0+050			
E0+060			
E0+070			
E0+080			
E0+090			
E0+100			
E0+110			
E0+120			
E0+130			
E0+140			
E0+150			
E0+160			
E0+170			
E0+180			

Logos for GGS/NLC, EMD, GAG, and EMD. Project No. 201721-1-07, Project Name: 30004 MB11. Scale: 1:1,000. Drawing No. 4 of 8.



BENCHMARKS:

BENCHMARK # 1 ELEVATION 272.51m
NAIL IN HYDRO POLE ON WEST SIDE OF HIGHWAY 35 SOUTH OF STA ED+189

BENCHMARK # 2 ELEVATION 269.07m
NAIL IN HYDRO POLE ON WEST SIDE OF RAIL TRAIL AT STA E-0+050

BENCHMARK # 3 ELEVATION 275.37m
NAIL IN HYDRO POLE ON EAST SIDE OF CAMERON ROAD AT STA W0+320

BENCHMARK # 4 ELEVATION 277.36
NAIL IN HYDRO POLE ON SOUTH SIDE OF CAMERON ROAD AT STA W0+410

KEY PLAN
SCALE: N.T.S.

LEGEND:

- WATERSHED BOUNDARY
- SUB WATERSHED BOUNDARY
- PROPOSED DRAIN LOCATION AND DIRECTION
- BENCHMARK NUMBER
- PROPOSED STRUCTURE
- EXISTING DRAIN LOCATION AND DIRECTION
- ACCESS ROUTE
- DIRECTION OF SURFACE FLOW
- ROLL NUMBER AFFECTED AREA
- SHARED ROLL NO.

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- All property lines are approximate and to be determined by plan only.

DEPTH TO OBVERT	1.92	1.86	1.82	1.60	2.81	3.06	2.94	2.03	1.57	1.78	1.83	1.90	1.92	DEPTH TO OBVERT
DEPTH TO INVERT	2.44	2.40	2.42	2.23	3.47	3.65	3.54	2.68	2.17	2.24	2.28	2.35	2.37	DEPTH TO INVERT
LAND OWNER	D. GARDNER (010-368-01)			HIGHWAY 35				B. CLIVE (510-385-00)						
LOT & CON	LOT 10 CONCESSION 6													
277														277
276														276
275														275
274														274
273														273
272														272
271														271
270														270
269														269
268														268
267														267
266														266
DESC. OF WORK	525mm HDPE (320kPa) 49m @ 30%			600mm HDPE (320kPa) 39m @ 20%				450mm HDPE (320kPa) 143m @ 30%						
STATION	ED+185	ED+186	ED+180	ED+175	ED+170	ED+165	ED+160	ED+155	ED+150	ED+145	ED+140	ED+135	ED+130	ED+125

BOREHOLE DETAIL

- SILTY SAND - VERY DENSE
- SILTY SAND - LOOSE
- SILT CLAY - HARD
- GRAVEL - VERY DENSE
- LIMESTONE - BEDROCK

NOT FOR CONSTRUCTION

REGISTERED PROFESSIONAL ENGINEER
E.M. DELAY
100780151
MARCH 1, 2020
PROVINCE OF ONTARIO

No. Issue / Revision | **Date** | **Auth**

1	ISSUED FOR INFO MEETING NO. 1	2018/05/02	EMD
2	ISSUED FOR INFO MEETING NO. 2	2018/07/25	EMD
3	ISSUED FOR AGENCY REVIEW	2019/04/18	EMD
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CITY OF KAWARTHA LAKES
26 FRANCES STREET
LINDSAY, ONTARIO
K9V 5R8

WAITE MUNICIPAL DRAIN
HIGHWAY 35 CROSSING ENLARGED PLAN

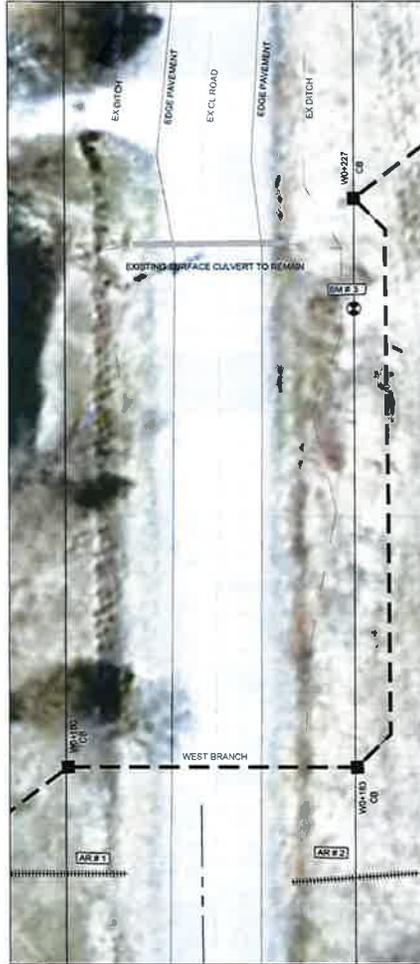
Project: GGB/ILC
Checked: EMD
Drawn: GAG
Checked: EMD
Drawing No: 5of8

Project No: 2017/11/07
Project No: 000041681

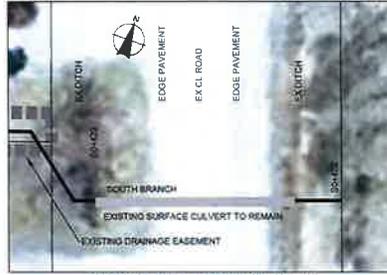
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BENCHMARKS:

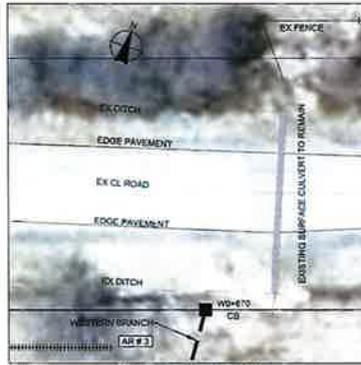
- BENCHMARK # 1 ELEVATION 272.81m**
NAIL IN HYDRO POLE ON WEST SIDE OF HIGHWAY 35 SOUTH OF STA ES-169
- BENCHMARK # 2 ELEVATION 269.07m**
NAIL IN HYDRO POLE ON WEST SIDE OF RAIL TRAIL AT STA E-0-050
- BENCHMARK # 3 ELEVATION 275.37m**
NAIL IN HYDRO POLE ON EAST SIDE OF CAMERON ROAD AT STA W0-220
- BENCHMARK # 4 ELEVATION 271.26**
NAIL IN HYDRO POLE ON SOUTH SIDE OF CAMERON ROAD AT STA W0-670



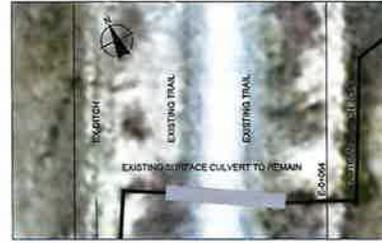
CAMERON ROAD CROSSING DETAIL (WEST BRANCH)
SCALE: 1:200



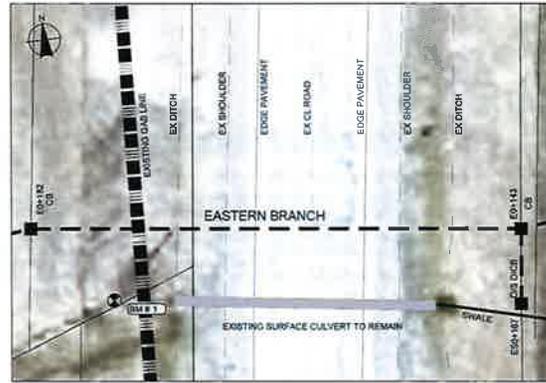
CAMERON ROAD CROSSING DETAIL (SOUTH BRANCH)
SCALE: 1:200



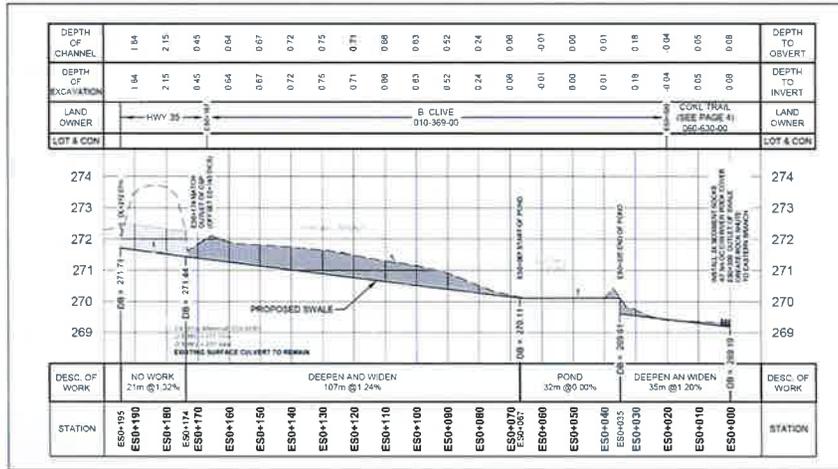
CAMERON ROAD CROSSING DETAIL
SCALE: 1:200



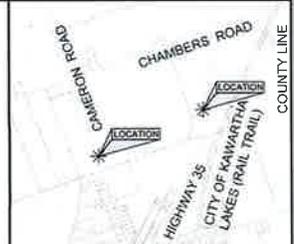
RAIL TRAIL CROSSING DETAIL
SCALE: 1:200



HIGHWAY 35 CROSSING DETAIL
SCALE: 1:200



EASTERN BRANCH SWALE
SCALE: 1:100 (V. 1:20)



KEY PLAN
SCALE: N.T.S.
CAMERON

LEGEND:

- WATERSHED BOUNDARY
- SUB WATERSHED BOUNDARY
- PROPOSED DRAIN LOCATION AND DIRECTION
- BENCHMARK NUMBER
- PROPOSED STRUCTURE
- EXISTING DRAIN LOCATION AND DIRECTION
- ACCESS ROUTE
- DIRECTION OF SURFACE FLOW
- ROLL NUMBER AFFECTED AREA
- SHARED ROLL NO.

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 - All property lines are approximate and the delineation is not shown.

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No.	Issue / Revision	Date	Auth.
1	ISSUED FOR INFO MEETING NO. 1	2019/05/02	EMD
2	ISSUED FOR INFO MEETING NO. 2	2018/07/25	EMD
3	ISSUED FOR AGENCY REVIEW	2019/04/18	EMD
4	ISSUED FOR DRAFT REPORT	APR 2023	EMD
5	ISSUED FOR ENGINEER'S REPORT	FEB 2024	EMD

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Wingham, Ontario N0G 2Y0
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web www.burnside.com

Client:
CITY OF KAWARTHA LAKES
26 FRANCES STREET
LINDSAY, ONTARIO
K0V 5R6

Drawing Title:
WAITE MUNICIPAL DRAIN
DETAIL PLANS AND EASTERN SWALE

Prepared	Checked	Issue	Control	Thawing
GGB/NLC	EMD	GAG	EMD	
Sheet Date: 2019/11/07	Project No: 300041611			

Code:
AS NOTED

PIPE TABLE						
PIPE MATERIAL	JOINING METHOD	DIAMETER (mm)	STATION		LENGTH (m)	NOTES
			FROM	TO		
WESTERN BRANCH (OPTION 1)						
2 - HDPE (320kPa)	SPLIT-COUPLER	375	W0+000	W0+010	10	C/W RODENT GRATE
2 - PDT (SOLID)	SPLIT-COUPLER	375	W0+010	W0+160	150	
SWWSP	WELDED	600	W0+160	W0+183	23	O.D. 6.35 mm THICKNESS
2 - PDT (SOLID)	SPLIT-COUPLER	375	W0+183	W0+227	44	
PDT (SOLID)	SPLIT-COUPLER	375	W0+227	W0+670	443	
WESTERN BRANCH (OPTION 2)						
HDPE (320kPa)	SPLIT-COUPLER	450	W0+000	W0+160	160	C/W RODENT GRATE
SWWSP	WELDED	600	W0+160	W0+183	23	O.D. 6.35 mm THICKNESS
HDPE (320kPa)	SPLIT-COUPLER	450	W0+183	W0+227	44	
HDPE (320kPa)	SPLIT-COUPLER	300	W0+227	W0+670	443	
EASTERN BRANCH (OPTION 1)						
HDPE (320kPa)	BELL & SPIGOT	2 - 375	E0+000	E0+006	6	C/W RODENT GRATE
2 - PDT (SOLID)	SPLIT-COUPLER	2 - 375	E0+006	E0+143	137	
SWWSP	WELDED	600	E0+143	E0+182	39	O.D. 6.35 mm THICKNESS
HDPE (320kPa)	SPLIT-COUPLER	525	E0+182	E0+231	49	
EASTERN BRANCH (OPTION 2)						
HDPE (320kPa)	SPLIT-COUPLER	450	E0+000	E0+143	143	C/W RODENT GRATE
SWWSP	WELDED	600	E0+143	E0+182	39	O.D. 6.35 mm THICKNESS
HDPE (320kPa)	SPLIT-COUPLER	525	E0+182	E0+231	49	

PIPE NOTES:

1. ALL PIPE AND PIPE WORKS SHALL CONFORM TO THE GENERAL SPECIFICATIONS
2. ALL CONCRETE DRAINAGE TILE (CDT) SHALL BE NON-REINFORCED 20000 RATED, OR APPROVED EQUAL
3. ALL HIGH DENSITY POLYETHYLENE (HDPE) PIPE SHALL BE DUAL-WALL, 320 KPA PIPE STIFFNESS, OR APPROVED EQUAL
4. ALL SMOOTH WALLED WELDED STEEL PIPE (SWWSP) USED IN JACK AND BORING INSTALLATIONS SHALL BE MEASURED ON OUTSIDE DIAMETER (O.D.) UNLESS OTHERWISE NOTED
5. ALL CORRUGATED STEEL PIPE (CSP) SHALL BE GALVANIZED AND CONFORM TO THE GENERAL SPECIFICATIONS
6. ALL OUTLET PIPES SHALL BE CORRUGATED STEEL PIPE (CSP) OR HIGH DENSITY POLYETHYLENE (HDPE)
 - 6.1. CSP OUTLET PIPES SHALL FIT AROUND THE LAST SECTION OF TILE WITH A MINIMUM OVERLAP LENGTH OF 450mm. COMPLETE WITH A GEOTEXTILE WRAPPED CONNECTION.
 - 6.2. HDPE OUTLET PIPES SHALL BE THE SAME DIAMETER AS THE LAST SECTION OF TILE, COMPLETE WITH A BELL CONNECTION TO FIT AROUND THE PIPE. THIS CONNECTION SHALL BE GEOTEXTILE WRAPPED.
 - 6.3. ALL OUTLET PIPES SHALL HAVE A RODENT GRATE AND HAVE RIP-RAP PROTECTION.

CHANNEL TABLE						
STATION FROM	STATION TO	LENGTH (m)	TYPE	BOTTOM WIDTH (m)	SIDE SLOPES	NOTES
W0+000	W0+405	405	TRAPEZOIDAL	0.6	3H 1V	BENCH WIDTH OF 1.4m BENCH HEIGHT 0.3m MINIMUM DEPTH 600mm
SOUTHERN BRANCH						
S0+000	S0+420	429	TRAPEZOIDAL	2.0	5H 1V	MINIMUM DEPTH 450mm
EASTERN BRANCH						
E0+000	E0+100	100	TRAPEZOIDAL	0.6	2H 1V	MINIMUM DEPTH 1.0m
E0+100	E0+180	80	TRAPEZOIDAL	0.6	2H 1V	MINIMUM DEPTH 1.0m
EASTERN BRANCH (SWALE)						
E0+000	E0+174	174	TRAPEZOIDAL	2.0	5H 1V	MINIMUM DEPTH 450mm

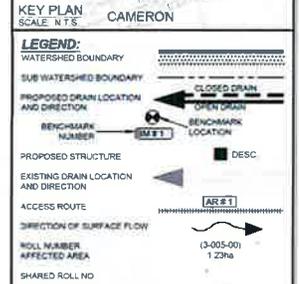
CHANNEL NOTES:

1. ALL CHANNEL WORKS SHALL BE IN ACCORDANCE WITH THE PROVIDED TABLE, PROFILE, AND SPECIFICATIONS.
2. ALL CHANNEL WORKS SHALL CONFORM TO THE GENERAL SPECIFICATIONS.
3. ALL CHANNEL WORKS AND EXCAVATIONS SHALL CONFORM TO THE GOVERNING OPSS AND OPSS.
4. ACCESS TO THE CHANNEL AND WORKING SPACE SHALL BE EXECUTED IN ACCORDANCE WITH THE SPECIAL PROVISIONS.
5. SPOIL SHALL BE SPREAD ON THE DESIGNATED CHANNEL BANK, A MINIMUM OF 2m FROM THE TOP OF THE BANK, UNLESS OTHERWISE DIRECTED BY THE ENGINEER IN THE SPECIAL PROVISIONS OR AT THE TIME OF CONSTRUCTION.
6. ALL FUNCTIONING OUTLET PIPES AFFECTED BY THE EXCAVATION SHALL HAVE RIP-RAP EROSION PROTECTION (MINIMUM 2m) PLACED BELOW THE OUTLET.
7. ALL WORKING OUTLET PIPES DAMAGED DURING THE EXCAVATION SHALL BE REPLACED SECURELY WITH CORRUGATED STEEL PIPE (CSP) OR HIGH DENSITY POLYETHYLENE (HDPE) TO THE SATISFACTION OF THE ENGINEER.
8. ALL WORKING OUTLET PIPES SHALL HAVE A RODENT GRATE.

STRUCTURE TABLE						
STATION	TYPE	SIZE (mm)	TOP/LOW WALL ELEV. (m)	GRATE	NOTES	
WESTERN BRANCH						
W0+010	DICB	300 X 1200	273.10	BIRD CAGE	C/W D BERM	
W0+160	DICB	300 X 1200	275.24	BIRD CAGE		
W0+183	DICB	300 X 1200	275.54	BIRD CAGE	C/W D BERM	
W0+227	DICB	300 X 1200	274.60	BIRD CAGE		
W0+670	DICB	600 X 600	276.38	BIRD CAGE		
EASTERN BRANCH						
E0+143	CB	300 X 1200	272.19	BIRD CAGE		
E0+143	DICB	600 X 600	271.40	BIRD CAGE	O/S 6m SOUTH	
E0+182	CB	300 X 1200	272.62	BIRD CAGE		
E0+231	CB	300 X 1200	272.54	BIRD CAGE		

STRUCTURE NOTES:

1. ANY VARIATION FROM THE ELEVATIONS AND DIMENSIONS OF THESE STRUCTURES MUST BE APPROVED BY THE ENGINEER
2. STRUCTURES NOT MANUFACTURED AS SPECIFIED MAY BE REJECTED FOR USE AND SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR
3. ALL ABOVE GRADE STRUCTURES SHALL HAVE A MINIMUM INVERT OF 300mm UNLESS OTHERWISE NOTED; BURIED STRUCTURES ARE NOT REQUIRED TO BE BENCHMARKED
4. ALL ABOVE GRADE STRUCTURES SHALL HAVE BIRD CAGE GRATES TO SUIT AND RIP-RAP C/W GEOTEXTILE UNDERLAY FOR ONE METRE AROUND THE STRUCTURE, UNLESS INDICATED OTHERWISE IN THE SPECIAL PROVISIONS.
5. ALL ABOVE GRADE STRUCTURES ARE TO HAVE POSTS AND MARKERS
6. ALL GRATES AND COVERS SHALL BE FASTENED TO THE STRUCTURE IN AN APPROVED MANNER.
7. ALL STRUCTURES MUST HAVE PLUGGED INLETS IN THE SIDES NOT UTILIZED BY THE MUNICIPAL DRAIN TO ACCOMMODATE A 250mm DIA. HDPE PIPE SET 0.10m ABOVE THE OUTLET INVERT, UNLESS OTHERWISE NOTED. ALL PLUGGED INLETS MUST HAVE THEIR LOCATION IDENTIFIED ON THE INSIDE OF THE STRUCTURE.
8. ALL CONNECTIONS TO STRUCTURES MUST BE MADE USING RIGID PIPE WHICH MUST SPAN FROM THE STRUCTURE TO UNDISTURBED NATIVE SOIL.
9. WHERE 900mm X 1200mm STRUCTURES ARE SPECIFIED, THE MUNICIPAL DRAIN INLETS AND OUTLETS SHALL BE INSTALLED IN THE 1200mm WALLS AND THE PLUGGED INLETS SHALL BE IN THE 900mm WALLS, UNLESS NOTED OTHERWISE
10. ALL STRUCTURES SHALL BE CAST WITH A MINIMUM OF A 150mm HIGH RISER SECTION TO ALLOW FOR ADJUSTMENT OF THE TOP ELEVATION TO SUIT FIELD CONDITIONS; ACCORDINGLY NO MONOLITHIC STRUCTURES WILL BE PERMITTED
11. A CATCHBASIN (CB, OR DICB) IS INTENDED TO TAKE ON SURFACE WATER, AN OBSERVATION BOX (OB) IS INTENDED FOR TILE CONNECTIONS AND TO SERVE AS AN OBSERVATION/INSPECTION POINT
12. ALL 600mm X 600mm DICB TO HAVE A 2:1 SLOPE AND ALL 900mm X 1200mm DICB TO HAVE A 3:1 SLOPE WITH CORRESPONDING BIRD CAGE GRATES.



1. This drawing is the exclusive property of E.J. Burnside & Associates Limited. The reproduction of any part without the express consent of the office is strictly prohibited.
2. The contractor shall verify all dimensions, levels, and datum on site and report any discrepancies to the engineer in the office prior to construction.
3. This drawing is to be read and understood in conjunction with all other plans and documents applicable to this project.
4. All projects have an appropriate need for minimum pathmarking.

NOT FOR CONSTRUCTION

NO.	Issue / Revision	Date	Auth.
1	ISSUED FOR INFO MEETING NO. 1	2018/05/02	EMD
2	ISSUED FOR INFO MEETING NO. 2	2018/07/05	EMD
3	ISSUED FOR AGENCY REVIEW	2019/04/18	EMD
4	ISSUED FOR DRAFT REPORT	APR 2023	EMD
5	ISSUED FOR ENGINEER'S REPORT	FEB 2024	EMD

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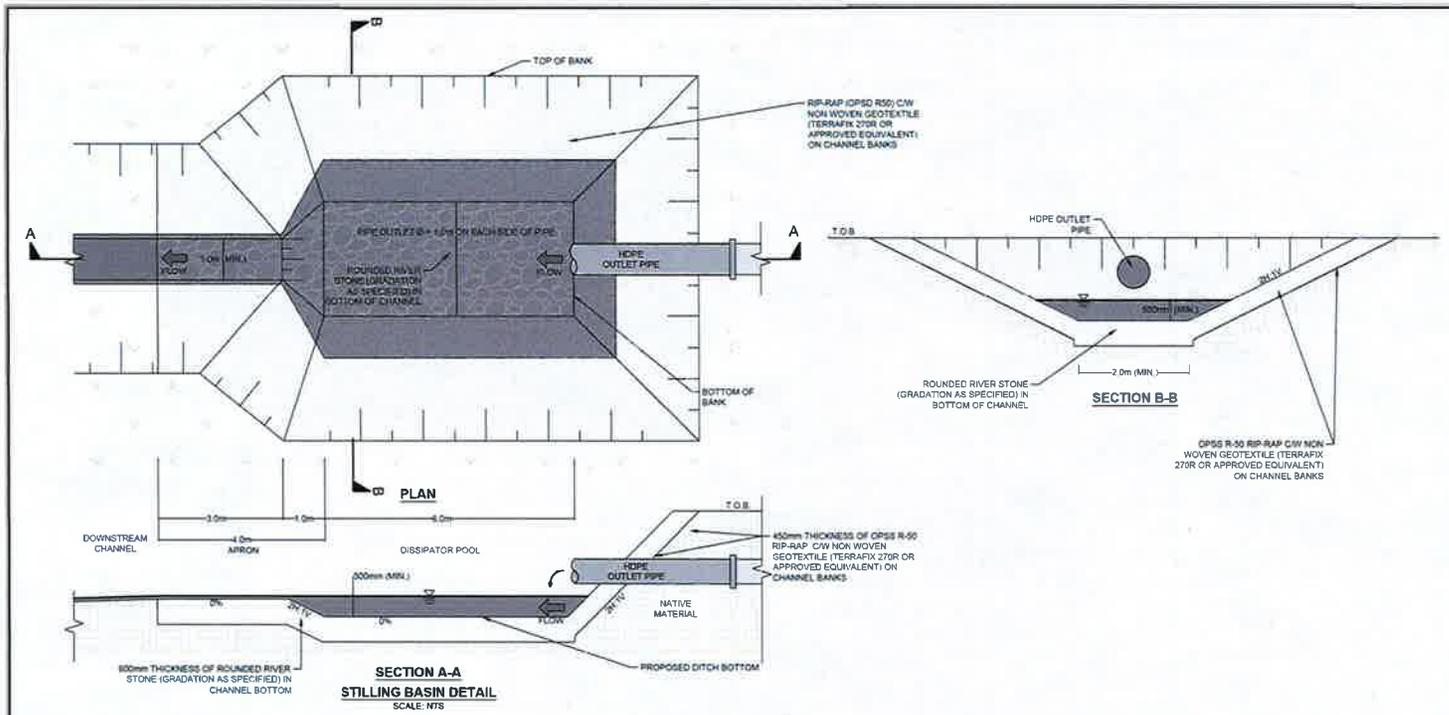
Client:
CITY OF KAWARTHA LAKES
25 FRANCES STREET
LINDSAY, ONTARIO
K9V 5R8

Drawing No:
WAITE MUNICIPAL DRAIN

TABLES AND NOTES

Designed	Checked	Drawn	Overhead	Printing No.
GGBNLC	EMD	GAG	EMD	
Print Date:	Project No.:			
2017/10/07	300041611			
Scale:	NOT TO SCALE			

7 of 8



KEY PLAN
SCALE: N.T.S. CAMERON

LEGEND:

- WATERSHED BOUNDARY
- SUB WATERSHED BOUNDARY
- PROPOSED DRAIN LOCATION AND DIRECTION
- BENCHMARK NUMBER
- PROPOSED STRUCTURE
- EXISTING DRAIN LOCATION AND DIRECTION
- ACCESS ROUTE
- DIRECTION OF SURFACE FLOW
- ROLL NUMBER AFFECTED AREA
- SHARED ROLL NO.

Notes:

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- The contractor shall verify all dimensions, levels, and depths, on site and report any discrepancies or omissions to the office prior to construction.
- The drawings are to be read and constructed in connection with all other plans and documents applicable to this project.
- All property lines are approximate and for information purposes only.

NOT FOR CONSTRUCTION



No.	Issue / Revision	Date	Auth.
1	ISSUED FOR INFO MEETING NO. 1	2018/05/02	EMD
2	ISSUED FOR INFO MEETING NO. 2	2018/07/25	EMD
3	ISSUED FOR AGENCY REVIEW	2019/04/18	EMD
4	ISSUED FOR DRAFT REPORT	APR 2023	EMD
5	ISSUED FOR ENGINEER'S REPORT	FEB 2024	EMD

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KW 5R6

Drawing Title:
WAITE MUNICIPAL DRAIN

DETAIL BLOCKS

Design	Checked	Drawn	Checked	Drawing No.
GGB/NLC	EMD	GAG	EMD	8 of 8
Start Date:	2017/11/07	Project No.:	300041611	
Scale:	NOT TO SCALE			

